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PLAUSIBLE PICTURES FOR DATA GOVERNANCE: A NARRATIVE NETWORK APPROACH

Research Paper

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Abstract

Workaround-centric data activities (WCDA) can impact data integrity/quality. Despite this, one can view WCDA as an enhancement to organisational Data Governance (DG) maturity. However, these WCDA are primarily undocumented and poorly understood. Therefore, we need a means of creating plausible pictures for DG – by modelling WCDA visually. This study draws on the theory of organisational routines to develop WCDA modelling rules. It is the first study to leverage the Narrative Network (NN) approach as a conceptual lens to model WCDA visually. We identify five WCDA modelling rules: 1) a narrative fragment must come from a process actor, 2) a narrative fragment has three attributes: actor, action & resource, 3) all attributes in a narrative fragment establish the action type, 4) a narrative fragment must contain a data activity, and 5) a narrative fragment data activity must follow a standard naming convention. In conclusion, we discuss the advantages of our approach.

Keywords: workarounds, data governance, organisational routines, narrative network, data activities, theory-building approach, modelling rules

1 Introduction

Data Governance (DG) might be the most used - yet least understood term in the business world today. There is broad agreement on the *"importance"* and *"criticality"* of DG (cf. Berson and Dubov, 2011, p. 399). However, too many organisations are still *"undisciplined"* in terms of their level of DG maturity (Fisher, 2009, p. 82). Research shows that DG initiatives cross *"functional, organisational, and system boundaries"* and are *"enormously challenging"* (cf. Berson and Dubov, 2011, p. 399). Nonetheless, they are viewed as strategically essential undertakings centred around *"mobilising organisational resources to leverage data as an enterprise asset"* (Berson and Dubov, 2011, p. 400). Therefore, at its most basic, DG is *"a methodology or a philosophy for gathering, managing, and benefiting from your data"* (Fisher, 2009, p. 65). In fact, according to Carruthers and Jackson (2018, p. 141), effective DG influences four data specific areas (e.g., data *availability*, *usability*, *integrity*, and *security*) and can affect an organisation's business outcomes and regulatory compliance.

Research suggests that *"data is the lifeblood of an organisation"* (Fisher, 2009, p. 82). So, all transactional business data should be *"viewed through the lens of data quality"* (Fisher, 2009, p. 65). However, it is argued that most data quality (*integrity*) issues in organisations are linked to *"broken processes"* and *"once the issues emerge, the search for scapegoats is on"* (Fisher, 2009, p. 83). The human agency linked to the execution of these "broken processes" motivates this research work, focusing on the duality of structure and agency. Therefore, to overcome data integrity issues, we replace scapegoating with a visual understanding of the story behind the data activities.

In short, these data activities (linked to overcoming data integrity issues) are what we refer to as workaround-centric data activities (WCDA). For example, consider a situation where centralised system functionalities do not support an employee's reporting need. As a result, the employee executes a workaround by *downloading* data from the centralised information system, *analysing* the data on a spreadsheet and *uploading* the data back to the centralised information system. In this case, *downloading*, *analysing*, and *uploading* data are examples of workaround-centric data activities (WCDA). So, one can see these WCDA are efforts to improve DG maturity for an organisation - albeit they are most likely undocumented and poorly understood. As a result, we need to provide a means of creating plausible pictures for DG, in order to further advance the collective appreciation of such organisational innovations (these WCDA), especially in this era of digitally transforming and being data-driven.

Workarounds are not something those working in a centralised information systems environment want to hear when a business process is being described. The creativity that comes with workarounds often suggests that system deficiencies exist. Therefore, such post-adoption behaviours can lead to significant organisational data challenges. So, while someone gets the job done, they may be doing so in a way that simply papers over the operational cracks (broken processes). Over time these operational cracks can damage the organisational foundations and the value of its strategic data assets. After all, it has to be remembered that *"your data is your business"* (Fisher, 2009, p. 81) and *"it is a true competitive differentiator"* (Fisher, 2009, p. 82). However, bad habits around data create *"data debt"* (Carruthers and Jackson, 2018, p. 42). Therefore, we argue that establishing *if WCDA are bad habits* should be a strategic priority as part of developing an initial theorisation of WCDA.

Even though workaround research has discussed WCDA – primarily as workaround examples, they are not the real focus of the investigation. Instead, researchers tend to describe WCDA as part of more general topics such as *compliance and data protection* (Walters, 2013; Burns et al., 2015; Eikey, Murphy, Alison, Reddy and Xu, 2015; Silic, Barlow and Back, 2017; Sillic, 2019), *adoption and resistance* (Behrens, 2009; Zamani, Giaglis and Pouloudi, 2013; Malaurent and Avison, 2016; Alraddadi, Champion and Lagna, 2018; Bozan and Berger, 2018), *organisation misalignment* (Beerepoot and van de Weerd, 2018), *coordination* (Djalali et al., 2015), and *information quality* (Drum, Pernsteiner and Revak, 2017; Bozan and Berger, 2018). Therefore, even though WCDA have been studied, our understanding of their impacts on data remains incomplete.

One strategy to theorise WCDA is to model them as a chain of activities and analyse them. This strategy aligns well with previous research informing that a workaround constitutes a *set of activities* (Haag, Eckhardt and Bozoyan, 2015). So, a researcher should not analyse a workaround as a single isolated action (Dunford and Perrigino, 2018). Researchers can use a modelling technique called a Narrative Network (NN) approach (Pentland and Feldman, 2007). Research shows that the NN approach is beneficial to model WCDA (cf. Wibisono, Sammon and Heavin, 2020). However, it does not have an existing ruleset as a guideline to model WCDA. Therefore, to support modelling WCDA, we pose the following research question:

- *What are the rules for modelling workaround-centric data activities (WCDA)?*

Developing these rules will help researchers uncover WCDA in their empirical studies, moving toward better WCDA theorisation. Also, modelling WCDA will enable organisations to create plausible pictures for DG. In fact, creating plausible pictures for DG, through visualising WCDA, is akin to taking a *"bottom-up"* or organic approach to *"formalise informal data practices"* (Ladley, 2020, p. 63). This is a pragmatic approach to getting started with DG in a meaningful way, especially where an organisation aspires to be data-driven. As highlighted by Redman (2016, p. 2) "*Most companies don't manage data very well"*. This presents a real challenge as most employees *"depend on data created elsewhere to do* [their] *work"*; therefore, *"finding and fixing flawed data soon becomes a permanent fixture"* (Redman, 2016, p. 1). While correcting errors in the data we need *"seems the fastest, most efficient way to complete the task at hand"*, it is in fact *"expensive and time-consuming"* and *"doesn't*

work well" (Redman, 2016, p. 1). Therefore, to avoid finding and fixing flawed data, organisations need to *"prevent errors at their sources"* using *"data provocateurs"* (Redman, 2016, p. 2).

A *data provocateur* is an individual who addresses data proactively, disrupts by advancing a data quality agenda, and challenges the status quo by questioning how they deal with data. As argued by Redman (2016, p. 2)*: "everyone whose job depends on data"* should *"see themselves as a potential provocateur"*. Therefore, in this research, we use the data provocateur role to highlight those within an organisation most likely to represent our target audience (those who will value the approach presented in this research).

The remaining sections of this paper are as follows. Section two describes the theoretical background of our study. Next, section three shows how we extend the NN modelling approach and produce the rules for modelling WCDA. After that, section four applies our proposed method in a hypothetical scenario (inspired by reality). We analyse and discuss our findings in section five. Finally, section six concludes our study and highlights the future potential of this research.

2 Theoretical Background

This section explains the theoretical background of our study. We discuss the theory of organisational routines (Feldman and Pentland, 2003) and the three attributes of the NN approach (e.g., narrative, narrative fragment, and NN). We use the theory of organisational routines (NN specifically) as a conceptual lens to better represent and visualise WCDA. It can be useful to understand how employees enact a process (e.g., a workaround).

2.1 Theory of Organisational Routines

We use the theory of organisational routines because it underpins the original NN approach (Pentland and Feldman, 2007, p. 781). So, the theory facilitates our approach's sound ontological and epistemological stance. The theory of organisational routines is about *processes* that manifest in *organisations* – referred to as "organisational routines" (Feldman and Pentland, 2003; Pentland, Feldman, Becker and Liu, 2012). Here, processes are "*repetitive*, recognisable patterns of *interdependent actions*, which multiple actors carry out" (Feldman and Pentland, 2003; Pentland, Hærem and Hillison, 2010; Pentland and Hærem, 2015). Organisational routines emphasise the duality of structure (e.g., *ostensive*) and agency (e.g., *performative*) (Feldman and Pentland, 2003). Research shows that duality is responsible for any change and stabilisation of a process (Feldman and Pentland, 2003). Thus, exploring the two aspects and their interactions is pivotal in understanding how a process evolves in an organisation.

The *ostensive aspect* is the ideal process form (Feldman and Pentland, 2003). It is a generalised idea regarding how a process should materialise (Feldman and Pentland, 2003, 2008). It is responsible for guiding an actor to execute a process in the future (Feldman and Pentland, 2003; Pentland and Feldman, 2005). The *performative aspect* is the actual performance. It is the manifestation of an *ostensive aspect*, and it occurs with specific people, at particular times, and places (Feldman and Pentland, 2003). An ostensive aspect can produce multiple performative aspects (Pentland and Feldman, 2005). For instance, consider a process of *order to cash* (OTC) by a wholesale company to sell goods to a customer. Typically, the process encompasses four consecutive activities: sales order, goods shipment, invoicing, and payment. However, situations can vary in the real world. For example, a customer can make the payment first (down-payment) and later accept goods shipments. However, a customer may obtain the invoice first before receiving the goods on another occasion. Also, the payment may never occur in the event where a customer refuses to pay. In this case, one can see how an ideal form can turn into multiple performances. Hence, a single observation "is insufficient" to capture the performative aspect of a process. If some of these performances do not have, or do not follow, a script then they are viewed as workarounds.

2.2 Data Activities and Workarounds

We define a workaround as an adaptive process in a centralised system environment. As an adaptive process, all actions are assumed to be mindful and purposeful. So, mindless actions (e.g., inattention, accidents, or mistakes) are not workarounds - even though eventually they may produce unexpected events or changes.

As an adaptive process, we view workarounds as follows:

1. A workaround is a process that does *not have* a formal script.
2. A workaround is a process that does *not follow* a formal script.

Overall, a workaround is a purposeful adaptation to overcome workflow disruptions in a centralised system environment. As a process, a workaround can contain one or more data activities. *A data activity* is an *activity* that relates to organisational data. For example, consuming, producing, manipulating, storing, and transferring data. A *non-data activity* encompasses any *action* that does not involve organisational data. For example, a nurse *measures* the patient's vital signs, *records* them on a paper-based file, and inputs them into the hospital information system. We have two data activities (e.g., *record* and *input*) and one non-data activity (e.g., *measure*).

A data activity will be performed in both workaround and non-workaround actions (see Table 1 – Type 1 & Type 2). For example, if a nurse enters data on the Electronic Health Record (EHR) *late* or *incompletely* and does so in a way that is not following the SOP (standard operating procedure) for the specific process in question; therefore, this *pattern of action* would be characteristic of a WCDA (workaround-centric data activity).

Action	Workaround	Non-Workaround
Data activity	Type 1	Type 2
Non-data activity	Type 3	Type 4

Table 1. The typology of action

2.3 Narrative, Narrative fragment, Narrative network

The NN approach embodies three components: the narrative, the narrative fragment, and the NN (Pentland and Feldman, 2007). In this section, we explain these in more detail.

The first component is the *narrative* or the users' *stories* (Feldman and Almquist, 2012). Here, a narrative is an event chain with a purpose or goal (Pentland and Feldman, 2007). The sequence must have a definite *start*, *middle*, and *endpoint* (Pentland and Feldman, 2007). For example, consider the "plan a holiday" story. One could enter the travel website (*start*), book a hotel (*middle*), book a flight (*middle*), and pay the bill (*end*). To be valid, a narrative must have moving actions (from *start* to *end*) (Feldman and Almquist, 2012). Also, the order of these actions must be *meaningful* for achieving the stipulated goal (Feldman and Almquist, 2012). If we randomly re-arrange the order of the actions, then the narrative could be questionable. That is, pay the bill (*start*), book a hotel (*middle*), enter the travelling website (*middle*), and book a flight (*end*). Here, the sequence is illogical (e.g., how can one pay *without* ever entering a website and booking something?). Hence, the order should be logical to create a plausible narrative.

The second component is the narrative fragment – which later becomes the atomic building block for the NN (Pentland and Feldman, 2007). It comprises at least two *actants* (either human or nonhuman) and one *action* that links them (Pentland and Feldman, 2007). For example, "the *user* visits the *website*", "the *web server* authenticates the *user*", and "the *firewall* blocks the *protocol*" (Pentland and Feldman, 2007). For these examples, we have five actants (e.g., user, website, web server, firewall, protocol) and three actions (e.g., visits, authenticates, blocks). Furthermore, Pentland and Feldman (2007) expect that the action within a narrative fragment has a timespan. The timespan expresses that the actant requires

time to complete a task. The timespan also means that a legitimate action should have determined start- and end-points (*not infinite*).

The third concept is the NN. A NN is a directed dyadic graph that expresses a set of interconnected narrative fragments in chronological order (Pentland and Feldman, 2007; Pentland, Recker and Wyner, 2017). It signifies the coherence of the narrative fragments in a unity of purpose (Pentland and Feldman, 2007). Moreover, a NN represents one process (Pentland and Feldman, 2007). Hence it is a process model (Hayes, Lee and Dourish, 2011; Yeow and Faraj, 2011). According to the theory of organisational routines, a single actor only understands parts of the process (*not complete*) (Pentland, 1999; Feldman and Pentland, 2003; Pentland and Hærem, 2015). Therefore, the NN approach must involve multiple actors to construct the process. For this reason, a NN must accommodate multiple narratives in one single graph – even though some narratives vary significantly from others (Pentland and Feldman, 2007). A NN signifies and visualises patterns of action (Pentland and Feldman, 2008, p. 244; Pentland et al., 2017). It articulates both *actual* and *potential* patterns of action (Pentland and Feldman, 2008). Consequently, it could capture the complex inter-relationships across actors' viewpoints on how to complete tasks (Hayes et al., 2011). These features are pivotal to model WCDA. The following section explains our proposed approach and the WCDA modelling rules. To achieve these objectives, we focus only on Type 1 and Type 2 activities (e.g., data activities).

3 Proposed Research Approach

In this section, we explain the WCDA modelling rules. After that, we consider a hypothetical scenario (inspired by reality) and, using these modelling rules, we build a plausible picture for DG by modelling WCDA visually.

3.1 Constructing a Narrative Network

Our proposed approach is based on *four general steps to construct a NN* (Pentland and Feldman, 2007). These four steps are relevant and are helpful, but they are generic. So, they need further elaboration to deal with the idiosyncrasies of WCDA. For this reason, we extend the steps by proposing our five modelling rules; uniquely for WCDA modelling. Therefore, when using the four steps to construct a NN, we apply Rule 1 to Step #2 and Rules 2, 3, 4, and 5 to Step #3 (see Table 2). These five rules within the four steps are now presented below.

No	Step	Note
1	Choose a process and define its boundary	Focus on the "purpose."
2	Adopt a point of view	*Rule 1*
3	Collect the narratives and code the fragment	*Rule 2, Rule 3, Rule 4, Rule 5*
4	Relate code with sequences	Visualise the NN

Table 2. There are four general steps to constructing a narrative network (after: Pentland and Feldman, 2007).

3.2 Step #1. Choose a process and define its boundary

For step #1, a data provocateur must select a process to examine (cf. Pentland and Feldman, 2007). Here, an organisational process can be part of an infinite web of actions. Thus, it can have an unclear boundary (e.g., where to start and end). A data provocateur needs to articulate a process based on its purpose to solve this issue. So, it can have a more explicit boundary. For example, consider a *training personnel* process. The process can be part of both a "regular training process" and a "vendor billing process" (see that we have two purposes for training personnel). Each process can involve actors from two or more

different units. So, as a combination of perspectives, the process can become very complex. In this situation, the data provocateur must select one purpose, ignoring the others. The data provocateur can determine the start and where the process should end with an explicit purpose. This information is essential to determine the actors in the process. A data provocateur could extract their point of view (see step 2).

3.3 Step #2. Adopt a point of view

Step #2 outlines that the data provocateur needs to collect narratives to build a NN (cf. Pentland and Feldman, 2007). The data provocateur and other stakeholders must understand how the process works (Pentland and Feldman, 2007). For example, consider the process of *regular training* where trainers, supervisors, and managers will know how employees execute the process. As their stories tend to be fragmented, they must select the most appropriate point of view to represent the actual enactment of the process.

To satisfy our research objective, we need to know where the workaround actors reside. To answer this question, we develop *Rule 1* from the theory of organisational routines. The theory informs that a process contains two aspects: *ostensive* and *performative*. The ostensive aspect indicates the abstract idea about how an actor performs a routine. The performative aspect shows the actual performances of the routine (Pentland and Feldman, 2005). The theory informs that the performative aspect is highly associated with specific actors (e.g., process actors) (Feldman and Pentland, 2003; Pentland and Feldman, 2008). Here, a process actor is the one who executes one or more activities. Process actors typically work at an operational level (e.g., operator, administrator, clerk). These process actors can take improvisational actions to overcome "broken processes" situations.

Further, process designers, owners, managers, and supervisors are not "process actors" unless they directly enact a process. Since process actors are the actual process enactors who can take improvisational actions, they would be considered workaround actors. Therefore, one way to capture workarounds is to identify all process actors and then narrate the workaround story from the perspective of these actors. Hence, process actors are the best sources to establish narrative fragments.

Rule 1. *A narrative fragment must come from a process actor.*

3.4 Step #3. Collect the narratives and code the fragment

Step #3 outlines that the data provocateur needs to collect narratives from process actors and code the narrative fragments accordingly. A *narrative fragment* is the building block of the NN approach and consists of at least two actants and one action (Pentland and Feldman, 2007). Following the actor-network theory, an actant can be both human and nonhuman (Pentland and Feldman, 2007). So, given our research objective to model WCDA, we use three attributes to construct each narrative fragment for the second rule. These attributes are *actor*, *action*, and *resource*. Here, actor and resource are both extensions of actant. An *actor* is someone that *acts*. In our context, the actor MUST be a *human* because "technology appropriation" (e.g., workarounds) is only viable whenever the process actor is *human*. Action is the activity that an actor performs (Pentland et al., 2012). In our case, it must reflect the data activity. For example, *analysing* data, *transferring* data, and *storing* data.

Further, every action requires a resource that the actor uses to execute the action. There are three types of resources: *human*, *artefact*, and *data*. A resource can be a *human* (e.g., an "intermediate actor") that an actor uses to complete the action, in other words: a proxy. For example, a physician uses a medical scribe to record data when interacting with patients during consultations (Barrett, 2018). An *artefact* is a human-made object with specific objectives (D'Adderio, 2011). It is part of a process and assists an actor to execute an action. An artefact has technical functions—for example, cloud services, paper-based files, software, and USB sticks. Finally, *data* is any symbol or representation of specific events. Data must be attached to either an artefact or a human during process execution.

Rule 2. *A narrative fragment has three attributes: actor, action & resource.*

For the third rule, a narrative fragment is a composite component (consists of three attributes: *actor*, *action* & *resource*). It exists at the atomic level (Pentland and Feldman, 2007). Therefore, we cannot use a single attribute (e.g., *action*) to establish if the narrative fragment represents a workaround. We also have to examine the *actor and/*or the *resource* in association with the *action*. For example, physicians use their own devices (*unauthorised resources)* to store data (*action*) from the EHR. Another example is a physician using a medical scribe (*unauthorised actor*) to enter data (*action*) in the EHR, or a physician entering data (e.g., a patient's diagnosis) in the wrong EHR field (e.g., text area instead of using a drop-down menu) (an *action* incorrectly using *a resource*). Therefore, we need to assess the three attributes in combination to determine the *nature* of an *action*, to establish if it is a workaround.

Rule 3. All attributes in a narrative fragment establish the action type.

For the fourth rule, the theory of organisational routines informs that all narratives should be coherent. For example, narratives ensure that the sequence of events demonstrates the similarities of purpose or goal (Pentland and Feldman, 2007; Feldman and Pentland, 2008). Therefore, we only aim to visualise the data aspect after identifying the narratives. Therefore, a data provocateur needs to model the data activities only (Action Types 1 & 2) and exclude the non-data activities (Action Types 3 & 4). By removing non-data activities, the data provocateur can simplify the NN.

Rule 4. A narrative fragment must contain a data activity.

For the fifth rule, the theory of organisational routines informs that understanding a routine can vary from one individual to another (Pentland and Feldman, 2005). As a result, two actors could label an identical action with two different names. For example, *sending data* (cf. Ignatiadis and Nandhakumar, 2009), *transferring data* (cf. Zimmermann, Rentrop and Felden, 2016), and *transmitting data* (cf. Chua, Storey and Chen, 2014) can refer to the same data activity. So, as a routine grows into a complex web of action (Pentland and Hærem, 2015), labelling identical actions with inconsistent naming conventions can create issues. Therefore, we need to standardise the label for such a data activity.

Rule 5. A narrative fragment data activity must follow a standard naming convention.

3.5 Step #4. Relate code with sequences

After coding all narratives into narrative fragments, we relate them into an ordered chain (Pentland and Feldman, 2007). A data provocateur needs to determine the order of the fragments. The output from this step is a complete NN to visualise the data activities (both workaround and non-workaround). In the next section, we demonstrate our WCDA modelling approach.

4 Applying our Approach in a Hypothetical Scenario Inspired by Reality

This section explains how we transform a narrative into a narrative fragment and further into a NN. To achieve this goal, we devise a hypothetical scenario inspired by reality. We use this scenario to achieve practical clarity in applying our method in a data-centric scenario. This scenario shows how to transform the narrative into narrative fragments, which contain Type 1 and Type 2 actions only (e.g., data activities). This differs from the traditional NN approach, which would require the articulation of all activities (e.g., Types 3 and 4 also). Thereafter, we present a brief analysis of the NN.

4.1 The Hypothetical Scenario Inspired by Reality

We develop a hypothetical scenario describing one patient's hospital admission (see Table 3). Following step #1 (see see Table 2), the *purpose* of the process is to admit a patient to the hospital and assess, diagnose, and treat them (see Table 3). Further, the scenario is presented as a narrative so that the reader of this paper (a prospective *data provocateur*) can identify the narrative fragments (*actor*, *action* and *resource*) and code the Type 1 and Type 2 actions only. Also, the scenario is assumed to represent a complete extract of an operative's (e.g., process actor's) narrative.

Table 3. A hypothetical scenario (inspired by reality)

A 40-year-old female arrived at the Emergency Department (ED) with flu-like symptoms. An ED administrator captured biographical data and symptoms to create an ED patient chart. Later, the triage nurse captured temperature, blood pressure, and blood oxygen readings. Next, she recorded them on the ED patient chart. She also checked other biographical data with the patient (e.g., date of birth, gender) and mobile number, health insurance policy number and a history of the symptoms. At this point, the triage nurse instructed the patient to go to an ED examination suite for examination by an ED consultant. Sometime later, the ED consultant examined the patient. The consultant corrected the symptoms recorded on the patient chart based on the patient's responses. However, the result contradicted the earlier account provided to both the triage nurse and the admissions officer. The ED consultant suggested that medication would be administered to reduce the patient's temperature. Before leaving the examination suite, the consultant suggested that a member of their ED team would arrive with the medication shortly. The consultant left and took the patient chart with them in error. Some minutes later, another ED physician brought the medication for the patient. They do not have the patient chart to hand. So, they recorded the dose and time on their dispensing chart and on post-it notes, which they stuck to the end of the patient's examination suite bed. Because the ED was busy, the physician also sent the medication dose and time to the ED consultant over WhatsApp. The ED physician explained that because the ED consultant had the patient chart. So, they could record the medication dose and time data later. They took it from the post-it (if in the room) or the WhatsApp message if elsewhere. Roughly 30 minutes after taking the medication, the patient's temperature was not normalising. Later, the ED consultant visits the patient. The ED consultant asked the patient how they were feeling and if they received the medication and when. The patient confirmed how they were feeling. Also, the patient referred to the post-it note (at the end of their bed). Besides, the physician who administered the medication sent a WhatsApp message to the consultant to create a digital record of the dose and time. The consultant took the post-it and recorded the dose and time on the patient chart. However, in doing so, the ED consultant also checked the WhatsApp message to ensure the details were correct. At this point, the ED consultant suggested that the patient would be admitted to the hospital for observation overnight. The consultant informed the patient that their hospital admission patient record would be complete once they are settled in the hospital ward. About one hour later, the patient was transferred to the hospital ward. The ward nurse updated their digital admission patient record. The ward nurse referred to the ED patient chart and clarified some information with the patient directly also. The ward nurse took a swab from the patient and sent it to the lab to test for the flu.

From the narrative in Table 3, we extract actors, actions, and resources based on the subject-verb-object structure to build the narrative fragments (Pentland and Feldman, 2007). A subject is represented as an actor, a verb as an action, and an object as a resource. For example, in the sentence "an ED administrator captured biographical data and symptoms to create an ED patient chart", the subject (actor) = ED Administrator, the verb (action) = Captured data, and the object (resource) = [i] Biographical Data and Symptoms (data resource) and [ii] ED Patient Chart (artefact resource) (see NF2 in Table 4) for this coded translation). Overall, this scenario consists of six actors: ED administrator, triage nurse, ED consultant, ED physician, and Ward Nurse (see Table 4). Once all the narrative fragments are extracted from the scenario (Type 1 and Type 2 actions only), we standardise the name of each narrative fragment's action in order to improve the readability of the resulting NN.

4.2 Unpacking the Hypothetical Scenario

Figure 1 shows the final visualisation, a NN containing all narrative fragments in sequence. There are 16 data activities, of which four are Type 2 (non-workaround). These activities are *retrieve* data, *enter* data, *transfer* data, and *store* data (see Figure 1). Within the NN, both *retrieve* data and *enter* data are the most frequent data activities, followed by *compare* data. Furthermore, we show that a completed data activity can become a WCDA when another actor uses the data. For example, consider $NF_{1,}$ where an ED actor enters data in the formal system. This action is a regular activity. However, when another ED actor reads the data, they find it to be incorrect (e.g., NF_5), and correct the data.

NF	Action Type	Actor	Action	Resource		
				Human	**Artefact**	**Data**
1	Type 2	ED Administrator	Capture data (*retrieve data*)	Patient		Biographical data and symptom
2	Type 2	ED Administrator	Create data (*enter data*)	-	ED Patient chart	Biographical data and symptom
3	Type 2	Triage Nurse	Measure vital signs (*retrieve data*)	-	Medical Devices	Temperature, blood pressure and blood oxygen
4	Type 2	Triage Nurse	Enter vital sign (*enter data*)	-	ED Patient chart	Temperature, blood pressure and blood oxygen
5	Type 1	Triage Nurse	Check data (*compare data*)	Patient	ED Patient chart	Date of birth, gender, mobile number, health insurance policy number, history of the symptoms
6	Type 2	ED Consultant	Examine (*retrieve data*)	Patient	-	Patient's examination data
7	Type 2	ED Consultant	Correct data (*enter data*)	-	ED Patient chart	Patient's examination data
8	Type 1	ED Physician	Record data (*store data*)	-	Dispensing chart	Medication dose and time
9	Type 1	ED Physician	Record data (*store data*)	-	Post-it Note	Medication dose and time
10	Type 1	ED Physician	Send data (*transfer data*)	-	WhatsApp	Medication dose and time
11	Type 1	ED Consultant	Ask data (*retrieve data*)	Patient	-	Medication dose and time
12	Type 1	ED Consultant	Ask data (*retrieve data*)	-	Post-it Note	Medication dose and time
13	Type 1	ED Consultant	Record data (*enter data*)	-	ED Patient chart	Medication dose and time
14	Type 1	ED Consultant	Check data (*compare data*)	-	WhatsApp, ED Patient chart	Medication dose and time
15	Type 1	Ward Nurse	Update data (*Enter data*)	-	Digital Patient Admission Record	Patient's record
16	Type 1	Ward Nurse	Clarify data (*compare data*)	Patient	ED Patient chart	Patient's record

Table 4. Narrative fragments extracted from the scenario (Type 1 & Type 2 actions only)

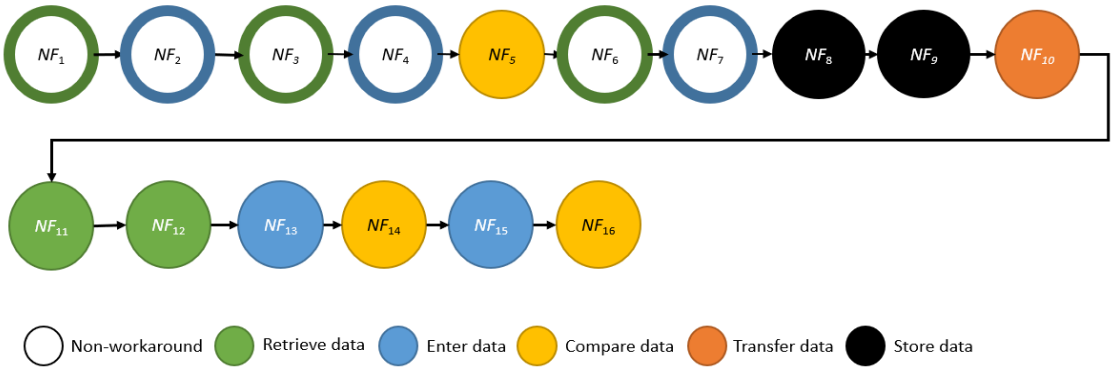

Figure 1. The NN of the scenario

Therefore, when a data provocateur identifies such a pattern of action in their narrative, they should reclassify the previous data activity (e.g., NF_1) as a workaround (WCDA). A data provocateur could observe at least two patterns of action from the codified hypothetical scenario.

Firstly, a pattern of *enter data* precedes *compare data* on three occasions (see $NF_4 – NF_5$; NF_{13} - NF_{14}; NF_{15} - NF_{16}). This *pattern of action* indicates that workarounds occur *retrospectively* and not *prospectively*. For example, actors tend to execute the action first (e.g., *enter data*) and check whether the data is correct later (e.g., *compare data*). As such, because actors look back something in the past, correcting data is *retrospective*. This situation is different from that advised by (Alter, 2014) where they suggest that workarounds are *prospective*, in that an actor develops a set of alternatives before executing a workaround. Given this observation, our NN approach could facilitate further workaround theorising.

Secondly, a data provocateur could observe that actors *store data* twice (see $NF_8 – NF_9$). This pattern of action could be an indicator that *data duplication* is occurring. As a result, the ED department (as in this scenario) could experience *data inaccuracy* as data duplication requires actors to reconcile data if/when differences arise in future use. Further, as the reconciliation process could unintentionally remove facts, *data loss* could also occur. Therefore, the data provocateur needs to provide relevant measures to avoid this pattern of data duplication, which reveals the value of the NN as a plausible picture for DG. Third, the data provocateur could observe that a workaround can create another workaround. For example, an actor could enter data *incompletely* (see NF_{13}). As a result, other actors need to re-enter the missing data (see NF_{15}) and clarify the data (see NF_{16}). Here, one can see that both NF_{15} and NF_{16} are workarounds that materialise to compensate for the previously enacted workaround (NF_{13}).

5 Discussion: Plausible Pictures for Data Governance

WCDA can be hard to identify. As stated earlier, while these WCDA are oftentimes innovative efforts to improve organisational DG maturity, they are most likely undocumented and somewhat invisible. Therefore, our proposed approach to create plausible pictures for DG, emphasises plausibility over accuracy in providing such visibility. In this section, we elaborate on the advantages and disadvantages of our approach.

Modelling WCDA provides some benefits. First, it reveals how a process materialises and explains how the process's data are created, analysed, and used. Second, the relationships among narrative fragments can reveal the most important actor in a process. Third, we can expose what artefacts are frequently used to store or process data. By having this information, a data provocateur could better understand the realities of the process landscape. By doing so, the data provocateur could formulate better data-related policies.

Moreover, a NN approach has advantages in modelling WCDA visually. First, it helps data provocateurs accommodate diverse viewpoints, i.e., how different actors execute a process (Pentland and Feldman, 2007). This feature is helpful to deal with the unique and situational characteristics of workarounds.

Once these characteristics surface, two actors can have different viewpoints about how a workaround materialises (Feldman and Pentland, 2003; D'Adderio, 2011). Second, a NN approach establishes a shared vocabulary for multi-level stakeholders in an organisation (Pentland et al., 2017). A NN contains sequential relations among actions in chronological order, so one can follow the flow (Pentland et al., 2017). Therefore, all organisational stakeholders can examine the different patterns of action and share their interpretations with others (Pentland et al., 2017). This step is pivotal to ensuring that the NN is unbiased, complete and improves its accuracy overall.

However, our proposed NN approach has limitations. First, research indicates that WCDA can materialise as "no action" (do nothing). For instance, a physician does not enter data in an EHR (van den Hooff and Hafkamp, 2017; Blijleven, Koelemeijer and Jaspers, 2019). Thus, the required data is missing for subsequent users (Jagannath, Sarcevic and Forte, 2018; Jagannath, Sarcevic, Young and Myers, 2019). Second, a workaround could be naturally *unobservable* to a data provocateur (Wibisono et al., 2020). For instance, *entering data* can be a workaround – even though it looks like a regular activity. An employee can enter data *inaccurately*, *incompletely*, or *in the wrong location*. However, to unearth such *unobservable* situations, a data provocateur must try hard and probe to model all data activities.

6 Conclusion

To achieve a certain level of quality, data provocateurs must establish how employees create, analyse, and use operational data. Data provocateurs need to visualise how a business process is enacted. They must show how the data are produced and consumed throughout the business process and by whom. So, we propose an extension to the NN approach (Wibisono et al., 2020) to model WCDA. Following this strategy, drawing from the theory of organisational routines (Feldman and Pentland, 2003), we propose five WCDA modelling rules. These rules are helpful for data provocateurs to assure meaningful and quality outputs for DG. Further, we leverage our approach to model WCDA using a hypothetical scenario. So, we can represent, observe, and analyse workarounds and their data activities, thereby understanding the true nature of the data activities associated with business processes.

6.1 Theoretical and Practical Contributions

In terms of theoretical contribution, we have advanced the applicability of the NN approach by providing rules to model and visualise WCDA. These rules serve as the novelty of our work – because our research is the first to do so. These rules complement the generic guidelines for using the NN approach proposed by Hayes et al. (2011), Yeow and Faraj (2011), and Feldman and Almquist (2012). However, these general guidelines have limitations. First, they assume that the process is predetermined and standard (e.g., WCDA are NOT). Second, they do not contain data as their essential elements. Third, they do not standardise the label used in the NN approach. Hence, they are challenging to model WCDA as a prevalent organisational phenomenon. With this in mind, we show how to visualise workarounds and their data activities.

There are a number of advantages to using our proposed NN approach. It does not require in-depth technical process mapping expertise, as it adopts an accessible, user-centric approach that democratises modelling efforts for all data provocateurs in an organisation. Also, the NN allows us to compile multiple viewpoints in a single diagram (Yeow and Faraj, 2011), enabling us to visualise resource and actor variabilities. Furthermore, the workaround research community can use our approach as a theory-building tool. For example, narratives gathered for a specific process can be analysed quickly (leveraging standardised data activity names) to highlight the patterns of action associated with the workaround. These benefits could lead to a complete understanding of WCDA. Hence, we contribute to the workaround literature.

As to practical contributions, previous research shows that workarounds tend to be hidden and are challenging to find (Silic and Back, 2014; Mallmann et al., 2018). Our five modelling rules could facilitate data provocateurs to find and visualise WCDA. As a result, data provocateurs can produce a

quality process model, which is indispensable to formulate relevant data-related policies. These policies are essential to ensure that an organisation can maintain data quality/integrity over time. Also, these rules can serve as guidelines to support collaboration among data provocateurs. These data provocateurs can better allocate individuals to capture business processes based on the rules. Similarly, it helps to reconcile differences across process models (e.g., by standardised naming of data activities).

6.2 Implications

These research implications are for organisations – especially data provocateurs. As now organisations are primarily data-driven, the data pervasiveness and complexities are evident. It is also understood that bad data have severe impacts at all organisational levels – from operational to strategic (Khatri and Brown, 2010).

Where the NN approach is user-centric, it facilitates a new approach to DG. It allows domain experts to reflect on how they produce, consume, and transfer data. So, the NN approach provides an accessible, flexible, and innovative approach to revealing news insights about data activities. Organisations could leverage these insights to inform any ongoing or future DG programmes/strategies.

Further, this new DG approach is not a top-down approach as is often the case with regular DG initiatives. Instead, it is a novel bottom-up approach. Therefore, it has the potential to respond and react to changes to data activities occurring "on the ground". Employees who work on the same "working goals" belong to the same *data tribe*. They could eventually visualise and govern their data with minimal intervention from top management. Therefore, we call this concept *tribalistic data governance*.

A tribalistic DG structure could emerge by isolating actor-relationships in the generated *patterns of action*. The structure reflects how these actors (e.g., employees) work in reality, capturing nuances of work beyond formal organisational structures. Therefore, it could better reflect data-related roles and responsibilities. This strategy addresses one DG challenge: data flow and logic may not follow the formal structure of an organisation (Janssen et al., 2020). Also, the organisation could establish DG functions based on this structure. These functions refer to master activities for effective DG, such as policies, principles, processes, and decision rights (Al-Ruithe, Benkhelifa and Hameed, 2019). So, the organisation could introduce relevant and applicable DG functions over time. By having these functions, we could solve several barriers to deploying DG: lack of policies, processes and defined roles in the organisation (Al-Ruithe, Benkhelifa and Hameed, 2016). By doing so, we could avoid and mitigate data silos in organisations. Also, we could improve organisational DG maturity.

6.3 Future Research

We outline several research opportunities. First, we could apply our approach in the real world and measure its applicability. For example, we could focus on highly-regulated organisations like healthcare, banking, insurance, pharmaceutical, finance, transportation, and manufacturing. Data are essential for these organisations to measure the alignment between process executions and regulation.

Second, we could compare the NN approach to existing industry-standard modelling approaches such as Business Process Modelling Notation (BPMN). This comparison would allow us to further interrogate the strengths and weaknesses of the NN approach. Particularly, as an accessible and flexible means of visualising WCDA.

Third, we plan to investigate how employees develop their own modelling rules in dealing with WCDA. Primarily, we seek to understand what assumptions underpin WCDA modelling in reality. These assumptions would affect how employees produce the final NN. It subsequently determines the plausibility of the NN.

Fourth, we seek to understand how the NN approach facilitates the emergence of tribalistic DG. For example, we intend to comprehend how tribalistic structures emerge from WCDA. Can we capture the most primitive DG functions that these structures have? What are they? How are they related to each other? Who is responsible for overseeing them? Hence, we could introduce effective alternative strategies to govern data. By doing so, organisational DG maturity will be further enhanced.

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