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THE ISD PROCESS AS A ?LIVE ROUTINE?: THE MINDLESS BEHAVIOURS OF A NARRATIVE NETWORK

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THE ISD PROCESS AS A 'LIVE ROUTINE': THE MINDLESS BEHAVIOURS OF A NARRATIVE NETWORK

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Abstract

The objective of this exploratory study is to view an ISD process as a 'live routine' in an effort to identify the inefficiencies in the process caused by mindless behaviours. To meet this objective we present the findings from a sixteen month case study of an ISD organisation, examining the ISD process, the starting point of which is the requirements elicitation (RE) phase. A variety of data gathering techniques are used across two phases of data collection. The case data is organised as a narrative network (NN) of the live routine (ISD process) allowing us to understand the ISD process as a collection of functional events/patterns of action, generated by the enactment of the routine. The NN is showing itself to be a very powerful device to appreciate the knock-on impacts of vague and incomplete requirements (poor requirements elicitation) on downstream ISD process actions. The components of mindfulness are also utilised within the data analysis process to associate ISD process inefficiencies to mindless behaviours. In the findings of this research we generate an 'ostensive' rule that defines a valid sequence of action in the ISD process to overcome mindless behaviour. As a case study, the methods and results provide a means of comparison to additional cases of ISD organisations.

Keywords: Routines, Information Systems Development (ISD), Narrative Network, Mindfulness, Case Study.

1   Introduction

Information Systems Development (ISD) should be seen as more than a 'technical activity' and should be understood from the 'wider social and organisational context in which it takes place' (White Baker, 2011, p.156). Extant literature has presented the ISD process as a 'knowledge-intensive activity' involving 'collaborative social interaction' between various actors where knowledge on requirements is 'shared, absorbed and co-constructed' leading to the development of 'shared mental models' by these actors through 'a continual process of communication' (c.f. Chakraborty *et al.*, 2010; Pee at al., 2010). Irrespective of the strategies or methodologies adopted to organise an organisation's ISD process, the *requirements elicitation* (RE) phase is the most important, yet least understood, activity of systems development (c.f. Pitts and Browne, 2007; Chakraborty *et al.*, 2010). In fact, it is widely reported that incomplete and inaccurate user requirements collection, during RE, can lead to failed ISD projects (Mathiassen *et al.*, 2007; Chakraborty *et al.*, 2010; Byrd *et al.*, 1992) and is a 'major stumbling block' (Pitts and Browne, 2007) in the ISD process. While Pitts and Browne (2007, p.89) argued that *"without proper attention to the task, analysts are likely to 'short-cut' requirements elicitation, resulting in incomplete and inaccurate requirements"*; they further suggested that there are limited initiatives in both research and practice aimed at providing methods and tools for improving RE. Therefore, while there is a substantial body of knowledge around RE, enumerating factors, tools, and techniques focused on creating an effective RE process (c.f. Benbasat *et al.*, 1987; Byrd *et al.*, 1992; Mathiassen *et al.*, 2007; Pitts and Browne, 2007; Chakraborty *et al.*, 2010), the intricacies of the RE process remain under-researched.

While ISD is viewed as a 'social process rather than a merely technical one' (Hansen and Rennecker, 2010, p.450) and RE is also viewed as a socio-behavioural process enacted by various actors (development team members, e.g. project managers (PM), business analysts (BA), developers, testers, etc.), there are very few studies examining how the social process associated with RE unfolds (Chakraborty *et al.*, 2010). Therefore, we embrace the arguments of Chakraborty *et al.* (2010) suggesting that a clearer, in-depth understanding of the RE process demands developing insights into the 'subtle nuances of the process' and the various actor interactions. This allows us to understand the behavioural/social processes associated with RE and 'how and when' the process unfolds. In an effort to address this paucity of research around examining how the social process associated with RE unfolds, we propose that the ISD process should be viewed as a 'live routine' (c.f. Pentland and Feldman, 2008), the first phase of which is RE. Therefore, we argue that accurately visualising the *'performative'* aspects of the ISD process would allow us to understand the ways in which the process unfolds and the behaviours that shape the process. For the purposes of this paper we use a narrative network (NN) to visualise and express the ISD process which is a novel approach to highlighting the *'performative'* and *'ostensive'* aspects of such a 'live routine'.

The objective of this exploratory research study is to view an ISD process as a 'live routine' in an effort to identify the inefficiencies in the ISD process caused by the mindless behaviour of development team members. To meet this objective we present the findings from a sixteen month exploratory case study of an ISD organisation, examining the ISD process (the starting point of which is the RE phase). A variety of data gathering techniques are used across two phases of data collection. The case data is organised as a narrative network (NN) allowing us to understand the ISD process as a collection of functional events/patterns of action, generated by the enactment of the 'live routine'. The patterns of action, caused by mindless behaviours, will be the key unit of analysis in our discussion. Furthermore, the components of mindfulness are used during data analysis, as a theoretical lens, to further explore and analyse those aspects of the ISD process that are shaped by mindless behaviours.

The remainder of this paper is organised as follows. The next section presents the theoretical grounding for the study, focusing on the use of a narrative network (NN) to represent 'live routines' and organisational mindfulness as a lens to appreciate the behaviours associated with 'live routines'. This is followed by a description of the research design. The case analysis is then presented where the

ISD process is visualised as a NN and four 'patterns of action' are highlighted (reflecting the inefficiencies in the ISD process). The components of mindfulness are mapped against these 'patterns of action' during data analysis to associate the ISD process inefficiencies to mindless behaviours. The paper concludes with an *'ostensive'* rule to address the ISD process inefficiencies and highlights the theoretical contribution of the study.

2 Theoretical Background

2.1 Live Routines and a Narrative Network

Organisational routines are a foundation for understanding business processes and are defined as repetitive and recognisable patterns of action carried out by multiple actors (Pentland and Feldman, 2007; 2008). The theory of organisational routines emphasises the participation of multiple actors (human and non-human) and *'this is what distinguishes a routine as organisational rather than individual'* (Pentland and Feldman, 2007, p.787). Indeed, if organisational routines are viewed as a generative system, multiple human actors suggests a multiplicity of perspective and understanding; therefore, different actions may be taken and different actors may be involved at various points in accomplishing the same routine (Pentland and Feldman, 2007; 2008). This view of organisational routines promotes the concept of 'live routines' over 'dead routines', where 'live routines' involve people, who are capable of *'learning from experience'* and 'dead routines' are artefacts that are *'rigid, mundane, mindless'*, and can be explicitly stored (c.f. Pentland and Feldman, 2008). Therefore, 'live routines' are not fixed patterns; they are generative systems that can produce patterns of action based on local judgements and improvisations by human actors.

Any social system that satisfies the definition of an organisational routine must consist of two complementary aspects: the *'ostensive'* and the *'performative'* (Pentland and Feldman, 2007; 2008). While the *'ostensive'* aspect consists of the abstract, generalised understandings of the human actors regarding enacting a routine (*a model of*) and the steps involved in accomplishing the task (*a model for*), the *'performative'* aspect consists of the concrete, specific performances/enactments of the routine (Pentland and Feldman, 2007). However, in the realities of an organisational environment, while *"performances are often filled with improvisations – adjustments and variations that make it possible to get things done in diverse situations"* (Pentland and Feldman, 2007, p.787) there is a need for an effective representation of the patterns of action that define these performances of 'live routines'.

A narrative network (NN) is a new methodological device that provides *"an explicit representation of an organisational routine as a pattern of action'* and provides *'a way to describe patterns of action* [a collection of functional events]*, as well as the actions* [a single functional event]" (Pentland and Feldman, 2008, p.244). The NN is an appropriate conceptual tool when examining 'live routines', where different patterns of action are expected to emerge over time, therefore, facilitating a dynamic and longitudinal focus on organisational practices (c.f. Yeow and Faraj, 2011; Pentland and Feldman, 2008). The NN is founded on key principles emerging from a synthesis of research on: structuration theory, actor-network theory, and organisational routines (c.f. Yeow and Faraj, 2011; Pentland and Feldman, 2008). The NN is defined as *"a collection of functional events related by their sequential occurrence in a story or set of stories"* (Pentland and Feldman, 2008, p.244). Therefore, the *"functional event is the building block of a narrative; it is a fragment that advances the story"* (Pentland and Feldman, 2008, p.244). A functional event is similar to the structure of a simple sentence, two actors (human and non-human) connected by some action, *'subject-verb-object'* and uncovers *'important information about who does what'* (Pentland and Feldman, 2008, p.244). In the context of this research study, typical functional events for an ISD process include: *a customer requests a system*, *a business analyst gathers customer requirements*, *a developer writes code*, and *a tester evaluates the system*. Therefore, the NN perspective represents the functional events/narrative fragments of a 'live routine' as 'nodes' in the network and the sequence of functional events as 'ties' in the network (c.f. Yeow and Faraj, 2011; Pentland and Feldman, 2008). As a result, the NN

perspective facilitates the explicit *"capture of actors, artefacts and actions as well as the process by which work is currently or potentially done"* (Yeow and Faraj, 2011, p.118).

2.2   Live Routines and Interactive Routines

'Interactive routines' are based on *"activities and routines that explicitly aim at providing opportunities to question expectations and behavioural routines and to evoke awareness context in interaction"* (Jordan et al., 2009, p.468). These 'interactive routines' that effectively promote mindfulness and reflection-in-action within small groups are effectively highlighting an awareness of the difference between the *'ostensive'* and the *'performative'* aspects of the 'live routines'. For example, in the case of mindful HROs, Weick et al (1999, p.87) argued that *"there is variation in activity, but there is stability in the cognitive processes that make sense of this activity"*, which is effectively making reference to the *'performative'* and *'ostensive'* aspects of a 'live routine', respectively. However, organisational mindlessness on the other hand would denote 'a state of reduced attention' that could lead to 'mechanically employing cognitively and emotionally rigid, rule-based behaviours' (c.f. Fiol and O'Connor, 2003), manifesting a type of organisational cruise control that has only one destination, restricting ability to react in a flexible manner or to change direction (Weick *et al.,* 1999). It is important to understand that mindfulness does not exclude or oppose the idea of routines, and in fact it may often build upon 'routinised action' or the 'adequacy of routines' in certain organisational environments (Jordan *et al.,* 2009; Levinthal and Rerup, 2006), especially if the routines need to be characteristic of 'interactive routines'.

'Interactive routines' involve *"engaging in comparison, considering alternatives, seeing things from different perspectives and drawing inferences"* (Jordan et al., 2009, p.466), therefore, constituting a major element of 'learning from experience'. This concept of 'learning from experience' embraces the view of Pentland and Feldman (2007; 2008) who suggest viewing organisational routines as generative systems, where 'live routines' involve social actors, who are capable of 'learning from experience'. Therefore, live/interactive routines are not fixed patterns; they are generative systems that can produce patterns of action based on local judgements and improvisations by actors. However what happens if the local judgments and improvisations are inappropriate or indeed mindless?

The narrative network (NN) perspective facilitates the examination of actual patterns of action that emerge from the living routines and not just a limited view of expected/idealised patterns reflected in a process design (Pentland and Feldman, 2008). Furthermore, the NN perspective facilitates focusing on the tasks that actors engage in when enacting a 'live routine' in all its variations, as opposed to just simply focusing on one version of the process and its decision points, as provided by process flowcharts (Yeow and Faraj, 2011). Furthermore, in this study the mindfulness components: *reluctance to simplify interpretations, preoccupation with failure, sensitivity to operations, commitment to resilience,* and *deference to expertise* (c.f. Nagle *et al.,* 2011) will be used to highlight the mindless behaviour (absence of an 'interactive routine') associated with the ISD process. In the next section we now present the case study research design.

3   Research Design

Incorporating case studies as a research method is deemed appropriate in situations where 'little is known about a phenomenon', or 'current perspectives seem inadequate because they have little empirical substantiation', or 'they conflict with each other or common sense' (Eisenhardt, 1989, p.548). Indeed, in the context of this research study, this 'freshness in perspective' is required on the topic despite the fact that the ISD process and the associated methodologies themselves have received considerable attention in past research. Therefore, in light of the lack of theoretical maturity around the viewing of an ISD process as a 'live routine', this exploratory research sought to build theory using a single instrumental case study design. From the perspective of this research study, the following description of the appropriateness of a case study to a particular type of research seems accurate: *"case research is particularly appropriate for certain types of problems: those in which research and*

theory are at their early, formative stages, and sticky, practice-based problems where the experiences of the actors are important and the context of action is critical" (Benbasat *et al.,* 1987, p.369). Furthermore, an 'instrumental case study' research strategy was adopted for this study. This allowed the researchers to pursue a deep understanding of an issue as a primary focus, while the case itself was of secondary interest (as per Stake, 2000, p.437). Therefore, to fulfil the objective of this research, studying a single instrumental case facilitated uncovering and teasing out the diverse organisational stories of those 'living the case' (Stake, 2000).

3.1 Case Study

Emerging from a strong organisational necessity, the research objective was in line with the CEO's requirement for an external analysis of TexunaTech's ISD process and his belief that it could be more efficient. Therefore, the objective of this research was to view an ISD process as a 'live routine' in an effort to identify the inefficiencies in the ISD process caused by mindless behaviour. Exploring the value of this theoretical lens provided a fresh perspective to understanding the organisation's ISD process as a 'live routine' (visualised and expressed as a NN) and an insight into how inefficiency in TexunaTech is associated with mindless behaviour. As a result, this was the point of departure for the three person research team from which the case study research protocol was developed (see Table1).

Research Activity	Description
Objective	To identify the inefficiencies in an ISD process
Approach	Case Study (October 2009 – January 2011)
Motivation	CEO's interest in achieving ISD process efficiencies.
Case Selection Process	A software development organisation where the CEO sought improvements in the ways of working
Case Access	A unique openness to share information and a willingness to make personnel available for the research, to the extent that operations were suspended for three days to enable workshops to be carried out
Instrument	The research team (three researchers) were the primary research instruments in the application of the data gathering techniques
Boundary Device	ISD lifecycle, the first phase of which is *requirements elicitation* (RE)
Data Gathering Techniques	On-site observations by research team; Semi-structured interviews; Round table discussions; Intensive on-site workshops with global project team participants
Data Organisation & Analysis Techniques	The NN perspective was used to organise the case data and facilitate the data reduction and analysis process to build a logical chain of evidence for the case. The components of mindfulness were also utilised within the data analysis process to associate ISD process inefficiencies to mindless behaviour.

Table 1.   Case Study Research Protocol (after: Kelliher, 2005)

Having been setup just ten years ago (now with over 40 employees and turnover in excess of £2 million), TexunaTech has established itself on the global market as a trusted service provider of web-based data management applications, serving a range of government, healthcare, and private sector organisations. TexunaTech values long term relationships with its clients, to meet and exceed their evolving expectations, which is evident in the long term contracts they hold with their clients. From a process perspective TexunaTech demonstrate continuing commitment to developing its software products to the highest quality standards (e.g. UK e-Government Interoperability Framework, and W3C-WAI). Furthermore, TexunaTech offices are certified to the ISO 27001 standard for information management and security by the British Standards Institute (BSI), ensuring that all information handled conforms to best practices in a highly secure and audited data management environment. Coupling geographical location with specific segments of the software development lifecycle, the organisations structure is defined as follows: (i) London (UK) – incorporates business analysis, project management and business development, (ii) Cork (Ireland) – incorporates call centre operations, after sales service and first line support, (ii) Moscow (Russia) - incorporates software development, technology infrastructure maintenance, and software testing.

3.2 Data Gathering and Data Analysis

The sixteen month exploratory research project was broken into two phases for the purposes of data gathering. The data gathering was conducted over a seven month period (October 2009 – April 2010) using a variety of techniques, as presented in Table 1. Phase 1 data gathering involved preliminary group based interviews and discussions that provided a detailed background description of the organisation and its ISD process at a high level. Following on, Phase 2 of the research strategy set out to further develop a deeper understanding of the organisation's ISD process. In particular, after phase 1, themes were identified from the preliminary group-based interviews/discussions. This provided the research team with the opportunity to focus their attentions for phase 2 data gathering. It was important that phase 2 data gathering was effective as the organisation made a significant commitment to the research both financially and in terms of disruption to operations during the three workshops. Two of the workshops took place in Moscow (Russia) and employees from the London (UK) and Cork (Ireland) offices were also made available for participation over a three day period. The third workshop took place in Cork (Ireland) and several London (UK) employees were also made available for participation. It is important to note that as the primary emphasis of this paper is on the ISD process, some of the data gathered on the Cork office was deemed outside of scope and as a result is excluded from the paper.

Furthermore, phase 2 data gathering workshops were organised around the projects which defined the fabric of the ISD organisation to date. For the most part these projects are revenue generating for external customers (predominantly long-term public sector contracts), with a growing number of internal customer projects initiated in more recent years – to introduce efficiencies through technology enhanced processing. Workshop participants were challenged on aspects of *requirements elicitation* (RE), development, test and release activities, currently undertaken by various organisational actors as part of the existing ISD process execution, in order to provide examples of inefficiencies in their day to day behaviour. Also, due to the globally distributed nature of the organisation, attention was focused on the effectiveness of the communication tools used (specifically by business analysts/project managers and developers in the absence of face-to-face communication) in support of various activities in the ISD process.

Analysing the data collected in phase 2, the case data is visualised as a narrative network (NN) of the 'live routine' (ISD process). The steps associated with constructing a NN are presented in Table 2.

Step	Description	This Research Study
1. define boundary of focal phenomenon	The NN is defined by a generic storyline that defines some sphere of activity.	ISD process
2. choose a point of view	Fieldwork data will contain data from someone's point of view, so we never know the whole story. The researcher can pick a single point of view or aggregate several different ones.	Aggregate of views from BAs/PMs, developers, testers
3. collect narratives and code the fragments	Gather data using methods that seem appropriate to ensure that narrative fragments are complete and that the researcher can uncover the connections that informants are making	Face-to-Face Interviews; Intensive Workshops; Observation
4. relate codes by sequence	Narrative fragments need to be related in ordered sequence – a *'what happens next'*?	All events were connected in sequence

Table 2.   Construction of a Narrative Network (after: Pentland and Feldman, 2008)

Furthermore, analysing the data collected in phase 1 and 2, 'chains of evidence' were constructed to permit an 'explanation-building analytic strategy' (Lapointe and Rivard, 2005, p.471). In order to discover patterns (mindless behaviours and their impact on the ISD process) the coding of data involved categorising team participant's description of the ISD process against the five components of mindfulness. This categorisation was based on the sentiments expressed within participant's descriptions, extracted from the research team's analysis of the 25 hours of interview data and the 24 hours of workshop data. This data was further organised in 'conceptually distinct matrices' (against the four ISD process patterns of action, named by the organisational actors as: *'BA/PM Helplessness'*,

'Awaiting Communication', *'Buffer Time Erosion'*, *'Pressure Cooker Development'*). For the purposes of this paper a finalised output of our data analysis approach is presented in Table 4 (see Nagle et al., 2011 for additional case description and analysis).

4   Case Analysis

In this section, for the purposes of clarity, we present one aggregated *'performance'* (c.f. Pentland and Feldman, 2008) of the functional events associated with the 'live routine' (ISD process). For the purposes of this paper we are interested in representing the patterns of action of the TexunaTech personnel for the *requirements elicitation* (RE) and development efforts only (with ISD testing being outside the scope of the research). It is also worth noting that we are documenting what can be considered the *'worst-case scenario'* within the ISD process. It is not to say that these patterns of action always occur within TexunaTech but they do at times define the fabric of the organisation's approach to the ISD process and by the organisation's own admission are unacceptable and need to be changed. Furthermore, analysing the rich data gathered, using the mindfulness lens, a number of mindless behaviours were identified that in-turn impacted on the ISD process efficiency. In particular, these mindless behaviours were found to be impacting on the RE phase of the ISD process, which had further knock on effects downstream. The NN and mindfulness analysis are presented in the next section.

4.1   ISD Process as a Narrative Network

The NN presented in Figure 1 represents the visual of the 'expected/idealised' ISD process (*'ostensive'* aspect of the 'live routine') within TexunaTech. Table 3 contains a list of the functional events defining this representation of the ISD process (pattern of action).
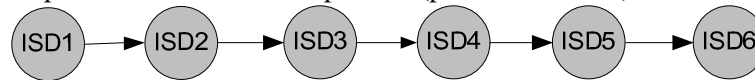

Figure 1.   Narrative Network of the ISD Process ('Ostensive')

NN Label	Functional Event
ISD1	BAs/PMs gather customer requirements
ISD2	BAs/PMs create tickets (requirements) with a 'pending status' on in-house ticketing system
ISD3	Lead developers spend time cleaning the specification (tickets) with BAs/PMs
ISD4	Lead developers assign tickets to developers
ISD5	Developers conduct technical research on requirements
ISD6	Developers write code based on requirements

Table 3.   Functional Events of the ISD Process ('Ostensive')

As in Figure 1, the ISD process begins with the BAs/PMs in the London office gathering the customer requirements (ISD1) and structuring the ISD project requirements as a set of tickets on the in-house ticketing system (ISD2). The lead developers in the Moscow office then clean the requirements specification with the BAs/PMs (ISD3). At this point the lead developers assign the 'high priority' fully specified requirements to developers (ISD4). The developers then undertake research on the technical aspects required to fulfil each requirement (ISD5). On completing their research the developers then write code based on the requirement (ISD11). While the pattern of action presented in Figure 1 represents the 'expected/idealised' ISD process execution (*'ostensive'* aspect of the 'live routine') within TexunaTech; however, the *'performative'* aspect of the 'live routine', based on the actual perfomances of the ISD process by various actors (PMs/BAs/lead developers/developers), reflects a different reality. Based on the storytelling of the actors and appreciating the functional events generated from their representation of the ISD process (see Figure 2), four defining patterns of action emerged which represented a macro perspective on the functional events of the ISD process inefficiency caused by mindless behaviour. Table 4 provides detail of the narrative fragments

associated with the four mindless behaviour patterns of action and each pattern of action is now discussed.

4.1.1 'BA/PM Helplessness' Mindless Behaviour Pattern of Action

Within TexunaTech the BAs and PMs, based in the London office, are the first points of contact with their customers. Therefore, the BAs/PMs are responsible for gathering the system requirements from these end-users; however, managing these customers is a problem for the BAs/PMs and as one PM described the situation *"we often feel helpless when determining the requirements of the customer"*. Based on our analysis it is obvious that this sense of helplessness comes from the customers' lack of appreciation of the immediate nature of requirements elicitation (RE) as part of an efficient ISD process. However, the BAs/PMs inability to challenge the status quo (*reluctance to simplify interpretations*) ensures that this state of 'helplessness' constantly reoccurs. In fact, this lack of immediacy is linked to the organisation's willingness to accommodate the customer and the nature of the customer themselves. While this willingness is a unique selling point for TexunaTech (in the market for attracting and retaining business) it is the root cause of inefficiencies to their internal downstream ISD processes, due to the fact that the RE process cannot be completed in an expeditious fashion and with the required completeness of information. Furthermore, the BAs/PMs fear of making a mistake (e.g. not satisfying the customer or losing a client contract) is paradoxically exacerbating the helplessness, as they do not learn from their mistakes and close calls (*preoccupation with failure*). The resulting impact is felt in downstream ISD processes, as incomplete and late requirements creates issues for the software engineering part of the ISD process.

As presented in Figure 2, the defining characteristic of the *'BA/PM Helplessness'* pattern of action (ISD1 → ISD2 → ISD3 → ISD7), worryingly, is the fact that the RE process ends up with the lead developers categorising some of the incomplete/vague high priority requirements with an *'in discussion'* status (ISD7). Therefore, TexunaTech often find that they are commencing the development of the customer solution with incomplete, vague and in some cases missing system requirements. Some of the missing requirements are identified later in the ISD process as being extremely critical to the functionality of the system overall. These incomplete, vague and missing requirements create what is referred to as the '*Awaiting Communication*' pattern of action.

4.1.2 'Awaiting Communication' Mindless Behaviour Pattern of Action

As already identified, London performs a number of mindless practices and push incomplete requirements downstream. This creates a situation where the Moscow developers are awaiting communication for a number of requirements. Three differing '*Awaiting Communication*' patterns of action are observed within the TexunaTech ISD process, caused directly by the ineffective RE process (see Figure 2 and Table 4). Two of the mindless behaviour patterns of action (ISD9 → ISD10) and (ISD9 → ISD11 → ISD12) relate directly to the way in which customer requirements are communicated to the developers, by the BA/PM, using their in-house ticketing system. It emerged during the case that BAs/PMs document requirements by going into a level of overcomplicated technical detail that is not required by the developers. As suggested by one of the developers *"we want to know what to do, not how to do it, therefore, the BA should better define the problem, not the solution"*. In one extreme case an example was made of a requirements ticket where four to five years of data history was captured but contained *'zero useful information for the developers'*. This excess detail is a waste of time for both developers and BAs/PMs themselves and links directly to the ineffective representation of the customer requirements by the BA/PM in the first instance, not to mention if the requirements are also vague/incomplete. This has led to a situation where for 100% of all requirements, captured on the ticketing system for a project release, the developers seek some form of simple/complex clarification from the lead developers (ISD9). Depending on the nature of the clarification being sought, lead developers either provide the information to the developers directly (ISD10) at which time the developers then write code based on the requirement (ISD6), or the lead developers seek clarification on the issues from the BAs in the London office (ISD11). When the

BAs/PMs provide clarification on the issues (ISD12), the lead developers pass the information onto the developers (ISD10), at which time the developers either commence writing code (ISD6) or undertake technical research (ISD5) before coding the requirement (ISD6).

The remaining and most challenging of the '*Awaiting Communication*' patterns of action (ISD7 → ISD8) triggers what developers (Moscow office) refer to as the 'fire-fighting stage' and relates to the number of vague/incomplete requirements remaining to be developed at the end of a project release to the customer. An example provided of this situation was identified on a project where there was twelve vague/incomplete requirements remaining to be developed in a project release, with only two weeks development time remaining. The key point of this example is the fact that these requirements are considered 'high priority' for the release by the BA/PM and the customer, but remain incomplete in terms of specification. Their incorporation into the existing system release will need to be researched by developers to avoid technical inconsistencies, and the collective development workload required to complete the release is much greater than the two weeks remaining. Based, on our analysis, it is the developers who flag the existence of these vague/incomplete requirements to the BA/PM coming toward the end of the release. This creates what is referred to as 'B*uffer Time Erosion*' pattern of action by the BAs/PMs. Therefore, similar to London, Moscow displays evidence of an issue with a *reluctance to simplify interpretations* and particularly in challenging the status quo, which enables this practice to constantly reoccur. Moreover, Moscow display an over-reliance on seeking guidance in all they do, something that senior developers in Moscow acknowledge as being excessive *deference to expertise*. This escalation procedure is a common occurrence that stresses the communication lines between the locations. While attention to technical details is always a priority, there are instances where operational inefficiencies are ignored (*preoccupation with failure*), leading to the problem where lessons are not learnt from operational/process errors. In addition, these issues are compounded by the lack of understanding from London of the effect of their procedures on the processes at the later stages of development (*sensitivity to operations*).

4.1.3 'Buffer Time Erosion' Mindless Behaviour Pattern of Action

During projects, Moscow personnel consistently flag vague/incomplete requirements that are high priority and, nearing the end of a project release; this flags to the BAs/PMs that these requirements need to be specified immediately as they know a failure to do so will lead to a missed customer release. From the BA/PM perspective the term '*Buffer Time Erosion*' suggests that the end of the release is close for the specific project and as one PM suggests "*the developers have nothing to do on the project and are awaiting responses on the high priority requirements that are still vague/incomplete in terms of specification*". It is important to note that the incompleteness of the requirements is a BA/PM problem and demands an additional execution of the RE process by the BAs/PMs. Therefore, the BA/PM gets the customer to provide a complete specification for the outstanding requirements and passes the details to the developers in the Moscow office. As a result, an ineffective RE process at the outset of the release (the '*BA/PM Helplessness*' pattern of action) creates the '*Buffer Time Erosion*' pattern of action (ISD8 → ISD1 → ISD13) at a later stage in the release (ISD process) requiring a further attempt at RE by the BA/PM. However, this revisited completion of the specification of requirements triggers the '*Pressure Cooker Development*' pattern of action (see Figure 2). For example, as time progresses through the release of the project (a release usually lasting 3 months on average for most projects) some of the 'in discussion' status tickets remain incomplete and the developers email the BAs/PMs for clarification on these requirements (ISD8) in an effort to complete the release on time. This necessitates the BAs/PMs to urgently gather requirements from the customer (ISD1) and once the required information is gathered the BAs/PMs send the updates by email to the developers (ISD13) to complete the release. On receipt of this requirements clarification information, the developers undertake further technical research (ISD5) before coding the requirement (ISD6). This further illustrates the BAs/PMs lack of understanding of their impact on the downstream ISD processes in the organisation (*sensitivity to operations*). Conversely, when problems with requirements are identified by Moscow, it is noted that London 'pull out all the stops' and adapt to these circumstances, doing whatever is necessary to correct the problems (*commitment to resilience*).

However, as this is a continuous reoccurring problem, questions must be asked as to why this has become the norm in projects. This can be linked to BAs/PMs lack of learning from past mistakes (*preoccupation with failure*) and their failure to challenge the status quo (*reluctance to simplify interpretations*).

4.1.4 'Pressure Cooker Development' Mindless Behaviour Pattern of Action

The *'Pressure Cooker Development'* pattern of action (ISD13 → ISD5 → ISD6) exists due to the incorporation of vague/incomplete requirements into an existing system release which will need to be researched by developers, prior to writing the code, to avoid technical inconsistencies with existing functionality. As a result, the collective development workload required by developers to complete the release is greater than the time period remaining (see example in *'Awaiting Communication'* pattern of action). Moscow personnel's understanding of the organisation is a true reflection of current operations; after all they are the downstream ISD process actors that get impacted the most from the inefficient and ineffective RE phase. However, notwithstanding these issues, in Moscow all personnel are encouraged to solve as many resource issues as possible in-house. For example, in an effort to complete the project release, additional developers may need to be seconded to the development efforts to ensure that the expected release date to the customer is not missed. It was reported by developers that this has an impact on the progress made in other projects at that point in time but is a necessary step to ensure customer satisfaction in terms of the delivery of expected functionality. Other issues are caused by this reassignment of developers but they are beyond the scope of what is being specifically addressed in this paper: for example, the late testing of the functionality contained in the release. As a result, Moscow personnel also ensure that they can deliver the project release to the customer on time through a strong *commitment to resilience* by, as London above, 'pulling out all the stops' and adapting team composition and creating *ad hoc* processes as necessary to get the product to the customer. However, as with London in *'Buffer Time Erosion'*, questions must be asked as to why this has become the norm in projects. By not challenging the status quo (*reluctance to simplify interpretations*), these problems have become the norm, and by continually passing over problems as opposed to addressing them (*preoccupation with failure*), there is nothing to stop these same problems occurring in future projects/releases.

NN Label	Functional Event
ISD7	Lead developers flag incomplete requirements with 'in discussion' status on in-house ticketing system
ISD8	Developers email BAs/PMs about 'in discussion' status tickets
ISD9	Developers seek clarification on tickets (requirements) from lead developers
ISD10	Lead developers clarify issues for developers
ISD11	Lead developers seek clarification of issues from BAs/PMs
ISD12	BAs/PMs clarify issues for lead developers
ISD13	BAs/PMs send requirements clarifications by email to developers

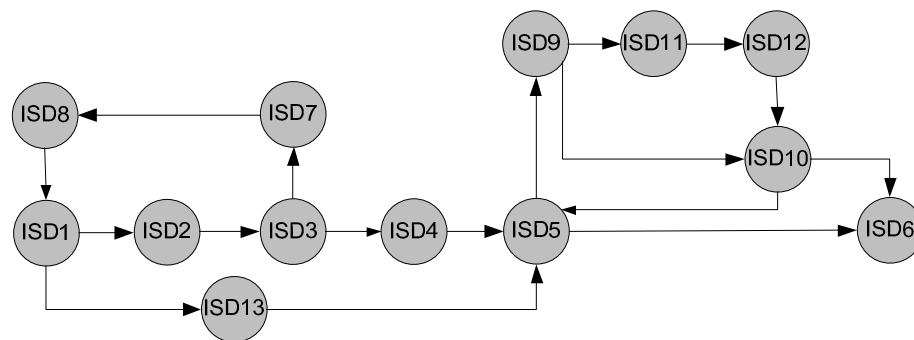*Table 4.   Functional Events of the ISD Process ('Performative')*

Figure 2.   Narrative Network of the ISD Process ('Performative')

5   Summary: An Ostensive Rule to address Mindless Behaviour

Organisations are continually looking to improve the process of gathering and documenting user requirements, and developing solutions around what the customer wants. Therefore, the *'performative'* aspects of a 'live routine' need to be appropriate without constraining the enactment of the routine. For example within our case, 'adapting team composition and creating *ad hoc* processes as necessary to get the product to the customer' is an illustration of the *'performative'* aspects of the ISD process where the *'ostensive'* aspects are being challenged even though this altered performance is necessitated by an absence of an 'interactive routine' being a feature of the ISD process itself. Therefore, the actors' local judgements and improvisations lead to the four patterns of action presented previously and are linked to mindless behaviours on the part of the ISD actors. Therefore, we argue that to promote and maintain mindfulness and reflection-in-action, organisations need to create an environment to introduce 'interactive routines', thereby providing opportunities to actors to question expectations and behavioural routines. Therefore, actors enacting (performing) a 'live routine' are encouraged to assess the efficiency/adequacy or otherwise of the 'live routine', and by 'learning from experience' this suggests that on-going improvements should become a feature of the 'live routine' itself. In the context of our exploratory case study research, it appears that 'interactive routines' are something TexunaTech need to introduce for ISD process efficiencies, especially for the RE phase.

A set of rules could be suggested to model a partial representation of the *'ostensive'* aspect of the ISD process in an effort to express a *"potentially infinite set of performances with a finite set of rules"* (c.f. Pentland *et al.*, 2010, p.929). This rule could define a valid sequence of action in the ISD process, however, it is important to appreciate that this simple rule (see Table 5) may not always be attainable in practice. Therefore, while a future failure to completely specify requirements could be generated by expedience, time pressure, customer uncertainty, etc., the actors may be more equipped to appreciate the implications of such a failure and the improvisations that need to be made as a result of having a partial representation of the *'ostensive'* aspect of the 'live routine' (ISD process). While we have suggested generating a rule, that defines a valid sequence of action for the RE phase of the ISD process, it is not suggested as imposing excessive structure (c.f. Fiol and O'Connor, 2003) on the *'performative'* aspect of the 'live routine', but more to highlight an efficiency building *'ostensive'* aspect.

Pattern of Action	Functional Event Collection	ISD Process Inefficiency	Ostensive Rule
BA/PM Helplessness	ISD1 → ISD2 → ISD3 → ISD7	*'High priority'* customer requirements are not completely specified by BAs/PMs	Every customer requirement that is gathered, if of a *'high priority'*, should be completely specified regarding 'what the customer wants' - otherwise its priority is dropped until complete specification is available
Awaiting Communication	(ISD7 → ISD8) / (ISD9 → ISD10) / (ISD9 → ISD11 → ISD12)	Developers seek clarification on *'high priority'* customer requirements	
Buffer Time Erosion	ISD8 → ISD1 → ISD13	BAs/PMs return to customer to gather *'high priority'* requirements before eminent end of release	
Pressure Cooker Development	ISD13 → ISD5 → ISD6	Developers work under pressure to complete *'high priority'* requirements for customer release	

Table 5.   Ostensive Rule to address Mindless Behaviour Patterns of Action

To conclude, within the context of this research study viewing the ISD process as a 'live routine' has significant value, for example, irrespective of the methodology adopted for ISD there will always be an associated recognisable pattern of repetitive actions (e.g. requirements gathering, coding, testing) to be carried out by various actors. However, while the *'ostensive'* aspects of the 'live routine' may be captured in the design of the organisational artefact (e.g. the adopted ISD methodology), and while this may constrain the performances in some desirable way, it is the actual performances

('*performative*' aspects) inherent in the execution of the ISD process (enactment of the routine) that are of most interest in an effort to understand how the routine actually *lives* in the organisational environment.

Acknowledgement

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