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UTILISING MINDFULNESS TO ANALYSE AGILE GLOBAL SOFTWARE DEVELOPMENT

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Abstract

As Information Systems Development (ISD) organisations face increasing market demands, ISD strategies such as Agile development and Global Systems Development (GSD) have been employed to help address these demands. With anecdotal evidence pointing to substantially successful implementations, organisations are beginning to embrace the combination of these seemingly orthogonal strategies with beneficial results. However, with the two areas of research still maturing, the bulk of research is made up of anecdotal studies. Utilising mindfulness, a theoretical concept for understanding how organisations can achieve flexibility and reliability, this paper explores how to effectively integrate Agile and GSD methodologies. Incorporating a longitudinal case study, an operationalised mindfulness instrument is applied and triangulated with qualitative data. The findings depict an in-depth analysis of a GSD organisation and provide key contributions for practitioners. Furthermore, theoretical contributions of the paper include: (i) a comprehensive definition of mindfulness that incorporates shared understanding as a key component, and (ii) the development of relationships between the individual mindfulness components.

Keywords: Agile, Information Systems Development (ISD), Global Systems Development (GSD), Mindfulness

1 INTRODUCTION

Faced with increasing demands for/on Information Systems, the software development industry has come under increasing pressure to produce higher quality systems more efficiently. With extensive and formal planning and processes restricting traditional Waterfall methodologies, Information Systems Development (ISD) organisations have increasingly shifted their focus towards Agile methodologies (Lee and Xia, 2010). Based on the four key tenets of (i) individuals and interactions over processes and tools, (ii) working software over comprehensive documentation, (iii) customer collaboration over contract negotiation, and (iv) responding to change over following a plan, the Agile manifesto (www.agilemanifesto.org) outlines 12 principles from which a number of ISD methodologies have spawned. Furthermore, driven by industry practitioners, methodologies like XP (eXtreme Programming), Scrum, DSDM (Dynamic System Development Method) and FDD (Feature Driven Development) have been widely adopted. Yet, with little participation of the research community in the evolution of Agile methods, there is a significant lack of empirical research and understanding on how to implement an Agile development approach (Conboy, 2009; Lee and Xia, 2010). As a result, many simple questions like those around the effectiveness or benefits of Agile methods in creating an Agile ISD environment are for the most part unanswered or unsupported (Boehm, 2002). However, even with the theoretically and conceptually limited research on Agile methods there is evidence of high-level challenges and a justified need to assess the organisation as a guide to implementing an Agile methodology (Nerur *et al.*, 2005).

2 THEORETICAL GROUNDING

2.1 Agile Global Information Systems Development

Just as many organisations moved towards Agile methodologies to cope with the increased demand placed on ISD organisations, many have also incorporated Global Software Development (GSD) as an alternative solution. This has become a popular strategy due to the number of potential benefits, which include: reduced development costs due to salary savings, reduced development duration due to greater time zone effectiveness, cross-site division of work, larger talent pools, increased innovation potential, closer proximity to customers/markets, and increased learning potential and knowledge transfer (Conchuir *et al.*, 2009). Nonetheless, to implement a strategy of GSD an organisation must fully understand the critical challenges that such a strategy brings (Carmel and Agarwal, 2001). However, just like the area of Agile software methodologies, the amount of empirical studies is relatively small. As a result, "the majority of the studies represent problem-orientated reports focusing on different aspects of GSD management rather that in-depth analysis of solutions for example in terms of useful practices or techniques" (Smite *et al.*, 2010 p 91). Yet, one area of research that is gaining strong interest is that of global/distributed software development utilising Agile methods (Agerfalk *et al.*, 2009). The motivation of combining both Agile and distributed development stems from the synergistic ability to get the best from both methodologies (Ramesh *et al.*, 2006). Consisting of incongruent tenets (e.g. Agile relies on informal processes, whereas distributed development relies on formal mechanisms) the two methodologies were initially deemed an unsuitable match (Turk *et al.*, 2002). Even so, there is research to suggest that the blending of Agile with distributed methods is not only possible but essential in addressing the critical communication and control issues that arise from distributed development (Ramesh et al., 2006). This embraces the reality that Global Software Development is becoming much more common (Stotts *et al.*, 2003), with virtual teams being a common element of many organisations (Paul *et al.*, 2004). They have developed to such an extent that they are vital to the success of many organisations outside the software industry (Lurey and Raisinghani, 2001).There are tools to assess the suitability of an Agile method for a project/organisation (cf. McAvoy *et al.*, 2007), yet they do not address the Global nature of development with its associated issues.

2.2 Mindfulness

Originally conceptualised through Buddhism (Thich, 1999; Thomas, 2006), mindfulness was first applied to the academic discipline of psychology (Langer, 1989) but has more recently been utilised in the domains of management science (Fiol and O'Connor, 2003; Levinthal and Rerup, 2006), organisational learning (Langer, 1997) and information systems (Swanson and Ramiller, 2004; Butler and Gray, 2006; Valorinta, 2009). Mindfulness has been defined as attentiveness and the ability to respond with flexibility (Argote, 2006) and is deemed to incorporate a number of characteristics, namely: openness to novelty and new information, awareness (implicit/explicit) of multiple perspectives, sensitivity to different contexts, orientation in the present, continuous creation of new categories, and institutional pre-emption (Langer, 1997; Sternberg, 2000; Swanson and Ramiller, 2004). Mindlessness on the other hand denotes a lacking in organisational cognitive processes, which manifests itself through a reliance on existing routines or 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; Fiol and O'Connor, 2003; Argote, 2006). Recognised as an antecedent to a fault free and reliable organisation, mindfulness provides a wider response portfolio, better process awareness, and stronger accountability, which can lead to superior firm performance (Thompson, 1995; Weick *et al.*, 1999). However, so far there has been a lack of theoretical development around mindfulness, besides the conceptualisation of the components (Weick *et al.*, 1999) and operationalisation (Mu and Butler, 2009) of the measures of mindfulness. Illustrated in Figure 1, these constructs include: (i) deference to expertise, (ii) preoccupation with failure, (iii) reluctance to simplify interpretations, (iv) sensitivity to operations, and (v) commitment to resilience.

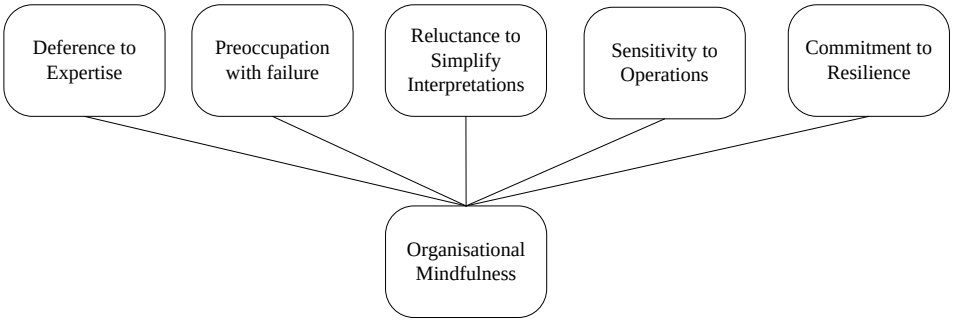

Figure 1: Key constructs for measuring organisational mindfulness (Weick *et al.*, 1999)

Although there are no existing theoretical links between the concept of Mindfulness and Agile software development in extant literature, there does appear to be parallels between the two. At a high level, the key goal of both is to develop flexibility and reliability (Weick et al., 1999; Argote, 2006; Lee and Xia, 2010). Mindfulness concerns the ability to produce a consistent and reliable output rather than having repeatable and reproducible individual routines (Weick *et al.*, 1999). Within the ISD domain it was found that traditional software methodologies became restrictive with regard to dynamic environments. Once a project started it proved difficult to incorporate new requirements without sacrificing significant time delays, resource drains, or reduced quality (Neill, 2003). As a result, Agile methodologies emerged to make software development firms more flexible. As an example, mindfulness promotes continuous learning through role rotation (Lillrank, 2003; Jordan *et al.*, 2009). Within Agile methodologies, pair programming is used to enable role rotation and better disseminate new knowledge throughout the project group (Wray, 2010). Furthermore, mindfulness involves developing routines that encourage awareness of context in interaction (Jordan *et al.*, 2009). This can be linked to the philosophy of customer collaboration and techniques such as daily "stand-up" meetings of Agile methodologies that promote full awareness of the context from all project participants. However, at a more specific level the constructs for mindfulness measurement, identified by Mu and Butler (2009) can be directly linked to principles of Agile software development (Table 1). These Agile principles add more detail to the Agile manifesto (Koch, 2004): providing guidance as to

what it is to be Agile (Hunt, 2005); providing a guideline for a development team's vision (Augustine, 2005); and justifying the Agile practices (Abrahamsson, 2007).

Mindfulness factors (Mu and Butler, 2009)	Agile Principles
Deference to expertise: to empower knowledgeable team members allowing them to deal with an incipient problem and act on emerging opportunities.	Build projects around empowered/motivated individuals in self-organizing teams with the ability to make changes as required (Boehm and Turner, 2004; Conboy and Fitzgerald, 2004; Greer and Ruhe, 2004).
Preoccupation with failure: Identify errors and problems so that their implications can be addressed	Agile preoccupation with failure is addressed through its idea of fail fast. Problems can be identified and actioned as feedback is regular and immediate. This is best seen through short-iterations with retrospective reviews (Spayd, 2003; Baker, 2005).
Reluctance to simplify interpretations: the simultaneous presence of different perspectives that challenge the status quo.	By the inclusion of roles from all facets of ISD (customer, test, and development) multiple perspectives and opinions are expressed and challenged (Knox, 2003; Andersson and Bache, 2004; Lindstrom and Jeffries, 2004).
Sensitivity to operations: an awareness of underlying practices and operations	Agile promotes an open reflective environment with regard to processes. This can be seen through frequent customer interaction, which raises awareness of the impacts of existing operations (Poole and Huisman, 2001; Phillips, 2004; Salo, 2004).
Commitment to resilience: realisation that the world is complex, errors can happen at any time and the need for the organisation to adapt as necessary.	Agile embraces change (even late in development). This can be seen through increased customer involvement and the incorporation of highly flexible work plans (Beck, 1999; Stephens and Rosenberg, 2003; Highsmith, 2004).

Table 1: Links between mindfulness constructs and Agile principles

As highlighted in Table 1, there appears to be a strong overlap between Agile methods and mindfulness. Yet, mindfulness also incorporates a much wider organisational perspective, with research demonstrating it as a strong framework for understanding global and cultural interactions (Thomas, 2006). With this in mind, this paper aims to utilise mindfulness to further explore and analyse the use of Agile in Global Software Development. In particular, specific interest is focused on the integration of both Agile and Global ISD. In addition, notwithstanding the fact that mindfulness is only now beginning to mature within the IS domain, it still supports the opportunity to further build and strengthen the theoretical foundation of Agile GSD (in contrast to past anecdotal studies). Furthermore, leveraging mindfulness against a rich contextual research method, practitioner insights are also targeted.

3 RESEARCH METHOD

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). As a result, "building theory from case study research is most appropriate in the early stages of research on a topic or to provide freshness in perspective to an already researched topic … to generate the kind of novel theory which is desirable when extant theory seems inadequate" (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 software methodologies (both Agile and GSD) themselves have received considerable attention in past research. 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).

In light of the lack of theoretical maturity around Agile Global Software Development this exploratory research sought to build theory using a single longitudinal (instrumental) case study design. While an 'instrumental case study' (Stake, 2000 p.437) research strategy was adopted for this study, it allowed the researchers to pursue a deep understanding of an issue (mindfulness and Agile GSD) as a primary focus, while the case itself was of secondary interest (Stake, 2000). Therefore, to fulfil the objective of this research, studying a single instrumental case facilitated uncovering and teasing out the diverse organizational stories of those 'living the case' (Stake, 2000). See Table 2 for a detailed outline of the case study research protocol.

Aligning with the research objective the case-study focuses on a global software development organisation. Coupling geographical location with specific segments of the software development lifecycle, the organisations global 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. Furthermore, as testament to the access afforded to the research team, during the case-study the organisation agreed to scale down operations for 3 days and bring as many employees to the Moscow office to provide unlimited access to complete the qualitative mindfulness analysis. This qualitative analysis was preceded by quantitative analysis employing Mu and Butlers (2009) operationalisation of mindfulness.

Research Activity	Description
Objective	To explore Agile Global Software Development implementation through mindfulness
Approach	Longitudinal Case Study (October 2009 – November 2010)
Motivation	CEO's interest in the adoption of Agile methods for global software development.
Case Selection Process	A global software development organization 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 interview/workshops to the extent that operations were suspended for 3 days to enable the research
Instrument	The research team (3 researchers) where the primary research instruments in the application of the data gathering techniques.
Boundary Device	Organisational Mindfulness.
Data Gathering Techniques	Completion of mindfulness assessment questionnaires (38 respondents); On-site observations by research team (3 researchers); Semi-structured interviews (approx. 30 hours); Informal Conversations and round table discussions; 3 days of intensive workshops with global project team participants.
Data Analysis Techniques	Both the mindfulness and Agile principles were utilised within the data reduction process to build a logical chain of evidence for the case. In addition a series of Explanatory Effects Matrices (Miles and Huberman, 1994) were also developed.

Table 2: Case Study Research Protocol (after: (Kelliher, 2005))

4 RESULTS

4.1 Quantitative

Employing the mindfulness instrument (Mu and Butler, 2009) within the organisation returned conclusive results that pointed to a highly mindful organisation. While utilising the instrument it is important to also take into account the mindfulness ratings attached the to the instrument: 50% or less denotes low mindfulness, between 50% and 70% regular mindfulness, and a score of over 70% denotes a high mindfulness rating. Drawing on Table 3, it is quite clear that it is not just one location in the organisation or one mindfulness component that is skewing the overall measure of mindfulness within the organisation. With the exception of London's *preoccupation with failure* all results show high measures of mindfulness across all locations in all the mindfulness components. Furthermore, aggregating the results, the overall mindfulness percentage comes in at 79%; well above the borderline score of 70%. This provides a strong indication that the organisation is flexible, reliable and effective in its operations.

Mindfulness Assessment	Overall/38	Cork/11	London/9	Moscow/18
	% SCORE (overall)			
Organisational Mindfulness	79%	83%	78%	77%
Reluctance To Simplify Interpretations	73%	73%	76%	71%
Preoccupation With Failure	76%	81%	65%	78%
Sensitivity To Operations	81%	88%	85%	74%
Commitment To Resilience	86%	87%	89%	83%
Deference To Expertise	85%	91%	82%	83%

Table 3: Quantitative measure of mindfulness using Mu and Butlers (2009) instrument.

4.2 Qualitative

Having determined a mindfulness measure for the organisation, one of the key aims of the longitudinal study was to get a deeper understanding of this measure. More specifically an understanding of the configuration of Agile and Global Software Development that attributed to the mindfulness score is examined.

Reluctance to simplify interpretations: One of the key aspects of this component is the inclusion of multiple perspectives. This is evident in all three locations with the data highlighting instances where (i) all team members are asked to comment on problems or situations within Moscow, (ii) regular department meetings and customer meetings take place in the London, and (iii) Cork incorporates views from London and Moscow in developing new processes. However, besides Cork there is a lack of perspectives being shared between the locations. For instance, Moscow were seen as failing to outline their perspectives on organisational processes. So much so, that the last recorded organisation process improvement recommendation made by Moscow was 9 months previous.

Preoccupation with failure: Within project iterations Moscow consistently flag errors and subsequently deal with those errors effectively. In the same light, London understand how important the customers are to the well being of the organisation and specifically focus on customer fulfilment errors. Being a service centre for the organisation and front line support, Cork have the most robust processes in identifying, analysing and correcting errors with their service provision. For instance, real-time reports on all live support calls are utilised to ensure a consistent and reliable service is

	Indicators	Moscow	London	Cork
Reluctance to simplify interpretations	Positive	Strong inclusion ethos within the department	Regular internal meetings with whole department and with customer to get a clear understanding of the current situation.	Acts as a bridge between locations and actions problems through new processes.
	Negative	Renege responsibilities for challenging organisational wide processes	Minimal external inclusion from Cork or Moscow	
Preoccupation with failure	Positive	Consistently flags errors and reacts well to all technical errors and problems within project iterations	Focus solely on customer fulfilment issues.	Robust processes in place for analysis of errors/issues/problems with service provision
	Negative	Do not action close calls as errors and evidence of firefighting	Do not action close calls as errors and evidence of firefighting	
Sensitivity to operations	Positive	Cohesive team with good understanding of all technical and development operations.	The use of a wiki to develop awareness of customer requirements	The use of Redmine application to document all decisions and communications ensures that all parties are aware of operations
	Negative	Lack of organisational process awareness.	Lack of awareness of organisational processes and downstream processes. Over use of documentation is evident creating confusion among developers	Isolated from many of the core software development processes.
Commitment to resilience	Positive	Through their own unstructured routines they have the ability to cope with late changes despite negative impacts	High flexibility towards the customer	Ability to support software even though they get it very late
	Negative		Impacts on downstream development processes	
Deference to expertise	Positive	Solve as many problems in house as possible	Business Analyst's (BA's) are empowered to interact with customer	
	Negative	High reliance on a small number of individuals and often have to refer to BA's due to lack of information	Lack of BA skills at certain levels (e.g. simplifying requirements)	High process orientated which creates automatic escalation procedures, limiting empowerment

Table 4: Qualitative analysis

constantly maintained. On the negative side there was evidence of a contagion of "firefighting" across London and Moscow. This was resulting from both locations not identifying close calls as mistakes, for example: where the impact of late changes to requirements, while welcomed, were not assessed.

Sensitivity to operations: this mindfulness component denotes an awareness of underlying operations and practices. Throughout each of the locations, Redmine an opensource project management tool is used as a communication conduit in the organisation. However, it was only Moscow that explicitly demonstrated a cohesive team with a strong understanding of their operations, where Agile protocols such as an open plan office and strong informal communication are employed. In Cork and London they use Redmine and Twiki (customer requirements wiki) to communicate information within their respective locations, but they were cases where the applications led to information overload rather than clarity of operations. Overall the benefit was classed mostly as positive; however, this benefit was mainly intra-location as opposed to inter-location.

Commitment to resilience: the ability to cope with the complexity of the real world and adapt to the unexpected is also evident across the individual locations of the organisation. As in the previous components of mindfulness, London have a high focus towards the customer and are highly flexible when it comes to incorporating changes in contracts or project plans. This has a knock-on effect for both Cork and Moscow as they also deal with late changes. Moscow, have their own unstructured routines where they reprioritise tasks and Cork are highly capable of supporting software even though they get it very late with not much training. However, there was evidence that the organisation was being almost too flexible which pushed the boundaries of what could be dealt with effectively.

Deference to expertise: the empowerment of employees and their ability to solve problems on their own initiative is a key component of an efficient organisation. Within London, all the Business Analysts are empowered to deal with all customer issues. In Moscow, all employees are encouraged to solve as many problems in-house. However, in Moscow a lot of emphasis is placed on a small number of individuals. In addition, these individuals constantly refer back to London Business Analysts due to a lack of concise information. This escalation procedure is a common occurrence that stresses the communication lines between locations. In Cork, call centre protocols create automatic escalation procedures, which limit employee initiative or empowerment.

4.3 Summary

While searching for contributing Agile and GSD factors towards mindfulness, it was found that practices such as: (i) project iterations, (ii) customer involvement, (iii) regular/informal meetings, and (iv) employee empowerment, did have significant impacts on the mindfulness of the organisation. These practices were mainly utilised in London and Moscow, whereas Cork employed more GSD factors by acting as a bridge between the other two locations. However, what stands out in the findings is that the qualitative analysis does not reflect the high mindfulness score obtained in the quantitative survey. Instead of getting data that pointed to a highly mindful organisation, the data depicted a contrasting scenario. However, the qualitative data does not totally contradict the survey. In fact the qualitative data does demonstrate that the organisation is mindful. Yet, this mindfulness is bounded within each of the locations. For instance, Moscow employs Agile techniques and is highly mindful in the development of software. London also is quite mindful in the method in which they fulfil customer's needs, as is Cork in their customer service provision. Issues arise between the interactions between the locations. As the organisation provides high flexibility towards their customers, London has developed an overwhelming willingness to fulfil their customers every need. As a result, London often lose sight of the downstream impact of their actions. So much so, that high instability with regard to customer requirements does create significant problems for the Moscow office that overstretch their unstructured prioritisation routines. Moreover, even though Moscow is very effective in developing new processes within their location they fail at suggesting organisational process improvements. This further culminates is a substantial amount of firefighting from both London and Moscow as they strive to delivery quality software on time. Furthermore, a feeling of helplessness was

often expressed with regard to organisational processes (a notion in direct opposition to that of mindfulness). On the other hand, Cork does indicate high organisational mindfulness, but are somewhat isolated from the London/Moscow axis of software development.

5 DISCUSSION AND CONCLUSION

As expected many of the Agile practices utilised within the organisation improved mindfulness within the individual locations. This is inline with research that shows that Agile works best in one site projects (Highsmith, 2004). Although not picked up in the survey instrument, not all Agile factors were mindful within a GSD context. In particular, the organisations over exuberant employment of customer involvement and flexibility was deemed to create organisational issues that stemmed from London to the rest of the organisation. As a result, this was a mindless practice within the realms of GSD. This raises the question, why the quantitative analysis significantly differed from the qualitative analysis? From the findings the high mindfulness measure can be attributed to the high internal evidence of mindfulness for each of the individual locations. Yet, inter-location or organisation wide mindfulness was totally absent from the score which would have significantly reduced the result. Literature does point to two types of mindfulness routines: (i) individual or group routines, and (ii) organisational routines (Butler and Gray, 2006; Jordan *et al.*, 2009). From the data collected it is suggested that Mu and Butler's (2009) instrument focuses only on the routines within the individual locations. While this is important, the data illustrates that this does not give a complete picture of mindfulness within an Agile GSD organisation. Further explanation of this anomaly may lie in the fact that research points to the existence of an organisational cognition as one of the key elements of mindfulness (Fiol and O'Connor, 2003; Butler and Gray, 2006). However, through each of the mindfulness components there is no reference to this shared cognition or attempt to measure it. It is possible that simpler organisational structures were assumed through the development of the mindfulness components/instrument and the analysis of a globally dispersed organisation has only brought this issue to light. Nonetheless, this research posits the need for an additional component in the measure of mindfulness for a GSD organisation.

5.1 Contribution To Theory

As already discussed shared understanding has been identified as an additional component within mindfulness. However, to further the theoretical foundations of Agile GSD and mindfulness, a more comprehensive theoretical model is identified through the case study (see Figure 2). Firstly, shared understanding is highlighted as a key element to mindfulness within an Agile GSD organisation. Without shared understanding there is no way to make mindful decisions in combining Agile practices across globally dispersed locations. Secondly, for a shared understanding to take place there must be an awareness of operations (**Sensitivity to operations**) and for the shared understanding to be well founded there also needs to be an input from multiple perspectives (**Reluctance to simplify interpretations**). The research also posits a bi-directional relationship between these two elements, as operational awareness enables a stronger ability to debate operations and stronger debate creates a better awareness among the organisation. Finally, building an awareness of operations also enables an organisation to have more empowered employees (**Deference to expertise**), that are highly critical of their own performance (**Preoccupation with failure**), and are able to deal with the complexity of the world and all that it brings (**Commitment to resilience**).

Analysing the customer involvement issue it is possible to suggest that with a shared understanding, the problem of over-flexibility could be moderated and later fixed. However, throughout each of the mindfulness components analysed within the case there is a distinct lack of shared understanding. This is seen in (i) London's inability to understand its downstream impact, (ii) Moscows inability to recommend a solution, and (iii) Corks lack of knowledge of the issue. Shared understanding or organisational tacit knowledge has long been attributed to organisational effectiveness within the realms of knowledge management (Langer, 1997). Key to organisational learning it is thus surprising

that it is not incorporated in the domain of organisational mindfulness. While Agile practices lend themselves to the mindfulness of the individual locations, it is noted that for these Agile practices to be implemented mindfully within a GSD setting there is a need for shared understanding as a basis for balancing these practices to the effective optimum. From the qualitative evidence, Cork had a history of implementing new organisational processes. As a result, it is quite possible that with a strong shared understanding Cork would be able to instigate a mindful solution to the customer involvement issue.

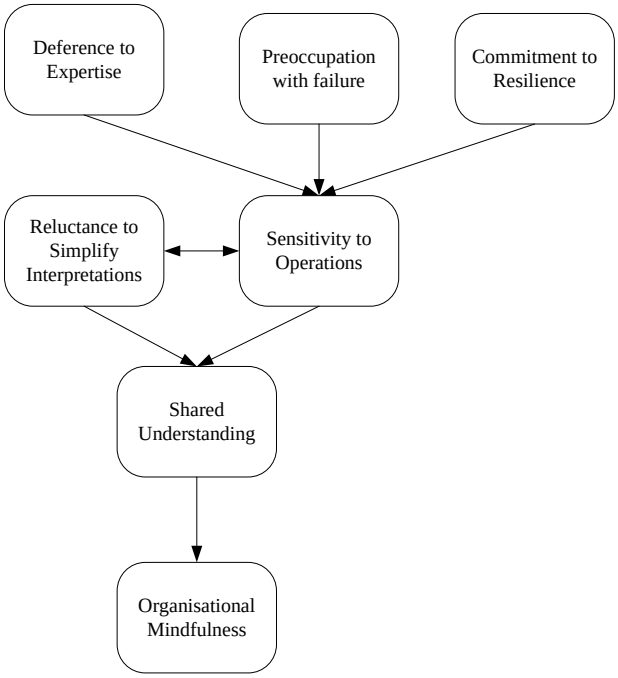

Figure 2: Mindfulness components for an Agile GSD organisation

5.2 Contribution To Practice

In order to build a shared understanding, IS/IT alignment literature points to development of a common language or communication platform to provide a basis for improved technological effectiveness (Cohen and Toleman, 2006). Agile methods promote the use of user stories: a user story being a description of a requirement, written in a few sentences, which describes the customers view of a requirement. Developed as a communication platform the user story practice is however optimised for single site projects. While not specifically employing user stories, the organisation utilised a project management tool to communicate tasks and priority lists. However, it was found that the tool was highly inadequate in providing the "big picture" or shared understanding of projects. As a result, one possible recommendation is to adapt the project management tool to incorporate a tiered user story approach. At the top level is a user story which describes the project, under which are the individual user stories, written by the customer, which together describe the requirements. These tiered stories provide a simple common description of what is required by the customer, and are ultimately the goal of all teams (be they customers, business analysts, developers, tester, or project managers). Each team can then open their own tasks under the user story which address the issues that they will address in order to achieve their element of the user story. Any element of the team's work that changes the higher level user story then needs to be raised up the hierarchy to the user story level, which is then visible to all teams. As a result, each team can then determine the impact that this will have on their own work. This approach would enable a greater shared understanding across locations in an Agile GSD organisation.

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