

**For better or for worse:
Field based studies into the language,
mental representation and utility of heuristics used by
experienced decision makers**

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The candidate confirms that the work submitted is his own and that appropriate credit has been given where reference has been made to the work of others.

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ABSTRACT

Applying a grounded theory methodology and completing the first three stages of a full life cycle research program, this thesis examines judgment and decision-making in two contrasting contexts. It does so with a particular focus on language and somatic syntax and on exploring cognitive representations of real-world decision-making problems in response to the question raised in Hastie's (2001) review of JDM research.

In the first context, foreign exchange trading, characterised by risky decisions associated with intangible human constructs, i.e. money, errant emotions and behaviours were observed following a small run of losses, emotion and behaviours described as 'irrational' by those exhibiting them. Analysis of in-depth interviews led to the proposition that subconscious abstract (metaphor-based) mental simulations of profit and loss accounts were the cause of trader's problematic emotions and behaviours. Having confirmed plausibility of this proposition via reference to diverse lab-based psychological literature; two questions were raised. Firstly, do traders routinely use other metaphors that may impact their performance? Secondly, what roles do mental simulations play in a less abstract context, where frequent risk decisions are made, but where the risk and incidents are tangible?

Two studies were conducted to address these questions. In the first, a metaphor analysis of trader discourse confirmed the systematic use of metaphors which prior research has confirmed could be problematic regarding judgment and decision making. The second investigated the differential performance of safety leaders in a global oil and gas company. Applying the grounded theory approach from the first study, a theory of anticipated regret based safety performance was developed. Like the first study, the theory has a strong basis in embodied mental simulation, and was found to be supported by and connect diverse theories from within the psychological literature.

In both decision making contexts patterns in the content and qualia of mental simulations was associated with biased perceptions of probability (higher) and increased in negative affect. In the trading context, these patterns led to negative outcomes and the desire to address both the biased sense of probability and reduce irrational negative affect. In contrast, these patterns led to improvements in safety performance with safety leaders seeking to increase the biased perception of probability and increase negative affect.

The role of metaphor and embodied mental simulation and relationships between both played a central role in the development of propositions and theory within both studies, and it is therefore proposed that they, along with research in context, should play a greater role in future JDM research.

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0.4 Abbreviations

AR: Anticipated regret

CL: Cognitive linguistics

CMT: Conceptual metaphor theory

CRM: Crew resource management

CTA: Cognitive task analysis

EU: Expected utility

FFH: Fast and frugal heuristics

HRO: High reliability organisations

JDM: Judgement and decision-making

JND: Just noticeable difference

L&J: Lakoff and Johnson

MIP: Metaphor identification process

NDM: Naturalistic decision making

NLP: Natural language processing

P&L: Profit and loss account

RE: Resilience engineering

SEU: Subjective expected utility

1. Introduction

This thesis responds to calls for field based research to play a greater role in the development of psychological theory (Cialdini, 1995), calls that include the argument for research to begin with active engagement with practitioners to ensure research programs and strategies are formulated with an understanding of what is of concern, and so would be most valued by them and their constituents (Corley and Gioia, 2011). The research described herein is thus a journey of exploration that starts from identifying a topic of concern, and with insights into the concern then guiding the next stage of research, with each stage always returning to the question of value for practitioners, and so avoiding the temptation to become reductive, or abstracted from practice.

The research journey starts with an exploration of the world of foreign exchange traders, exploration that identified a particular concern. Traders were experiencing “irrational” emotional responses to a “typical” run of losses (3 or more in a row) that can lead to an undesired deviation from trading strategy and money management, resulting in escalating losses. Insights into the causes of the “irrational” emotion raise a number of questions. One of these was answered by the second study which takes a broader look at the language of traders, in particular metaphoric language that was posited to reveal conceptualisations that subconsciously shape their judgments and decisions. The journey concludes via an in-depth grounded theory study of safety leaders within the oil and gas industry, which was focused on the company’s concern to understand the causes of higher safety performance, and addressed a question arising from the first study. In addition to unfolding through a series of insights and questions, the three studies included in this thesis are connected by a topic of interest to the author, that is, decision-making in high-risk environments. A brief summary of each stage in the exploration now follows.

The journey started with observations and interviews with the foreign exchange traders, analysis of which identified the use of metaphors with associated subconscious mental representations when conversing about the magnitude of their profit and loss accounts (P&L) . For example, “*my pot*” which related to a mental image of a pot of money. While the mental representations, made conscious through the interview process, were different for each trader, they shared characteristics. They were all analogue, multi-sensory, and conformed to embodied metaphor theory, that is, as P&L increased, as the result of a successful trade, aspects of the representation moved up vertically, and or increased in size, and or changed colour and increased in intensity.

In contrast, if P&L reduced as the result of an unsuccessful trade, aspects of the representation moved down vertically, and or decreased in size, and or changed colour and decreased in intensity. As these representations changed, so did the emotional response, intensifying to the point that the traders described the emotion as “irrational”, i.e. the emotion was disproportionate to the losses which are typical and expected by even the most successful trader.

Based on these findings a proposition was developed, that is, “embodied mental representations of magnitude (P&L), and the changes thereof, cause disproportionate emotional responses to losses that result from trades”. This proposition was then tested for plausibility via a review of the literature, a review that connected theories from disparate fields of psychology.

Cognitive metaphor theory (CMT) was identified as supporting the proposition by positing abstract concepts (in this case P&L) are conceptualised in terms of “concrete”, embodied experiences/representations e.g. a pot of money (Lakoff and Johnson, 1980). Child development literature confirmed early embodied analogue representations of magnitude can cause difficulties in transitioning between forms of mathematics (Bryant and Squire, 2001). Theories of just noticeable difference from the field of psychophysics (Levine, 2000) confirmed that representations have to change by a minimum amount to be noticeable, a percentage change that significantly exceeds the percentage loss of P&L resulting from an unsuccessful trade. In addition, multiple studies from diverse fields confirmed sensory qualities (e.g. colour) of embodied metaphors correlate with affect, sensory qualities of the type identified within the traders’ embodied mental representations.

In summary, and supported by the integration of the above theories, it is proposed that when a trader makes a small loss, say 0.5% of their overall P&L, the analogue embodied mental representation, e.g. the pot, has to change by approximately 5% to be visually noticeable. Thus, the irrational emotion experienced is of a subconscious embodied 5% loss and not the rational 0.5% loss; which escalates as a series of losses are experienced as represented below in figure 1.

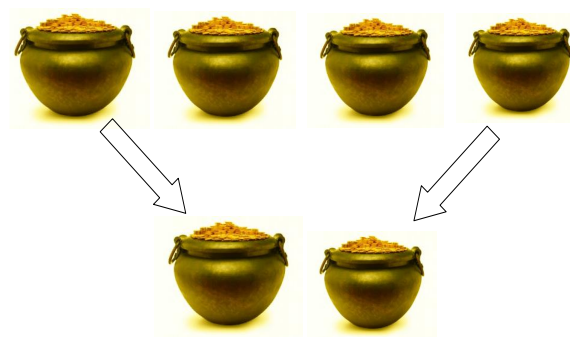


Figure 1: Minimum adjustments in trader’s analogue representation

Integration of these theories is argued to make sense of and explain the experiences of the traders; the theories themselves have been developed and supported by many lab-based empirical studies. This integration is argued to provide a unique perspective on trader behaviour, a perspective not identified within the associated psychological or practice based literature, and a perspective that also offers the possibility for new and novel interventions to address trader performance. Furthermore, it provides a different perspective on some comments made within the decision-making literature. For example, Kahneman (2003) used visual illusion as a metaphor for the stubbornness of observed bias; the conclusions from this initial study suggests that the biases may resemble the stickiness of visual illusions, because they are based, at least to some extent, in an embodied form of cognition, i.e. they are visual illusions.

The second and third study that comprise this thesis, address two questions that arise from the above.

Question 1: Are traders using conceptual metaphors beyond representations of magnitude, if so, is there evidence for the cognitive metaphors identified playing a significant role in judgment and decision-making and associated affect

Question 2: How might these findings, from a context steeped in abstract human constructs (e.g. money, markets, etc.), relate or contrast to a context, which again involves frequent risk decisions, but in which risk and consequences are ‘concrete’, physically tangible, e.g. when physical harm is produced by physical objects and events?

To address the first question, the next study in this thesis comprises a metaphor analysis of trader discourse taken from a BBC documentary. Analysis of this discourse identified frequent use of metaphor including a number of conceptual metaphors in particular; personification of markets “*the market took the view*”, of financial loss being equated to physical harm “I took a *beating*”, and of money being a physical entity that is constructed “I need to *make* more money”, and can be lost or hidden “I *lost* my week”. A review of literature relating to conceptual metaphor theory and trader psychology confirmed the possibility for such metaphors to impact the judgment and decision making of people working within the financial markets and beyond. For example, when market commentary was loaded with language associated with personification and hence agency and intention, e.g. “the price is *climbing*” the expectations of continuity of trend is greater than when neutral language is used. In keeping with the motivation of this thesis, this study addressed issues considered significant and important to practitioners (Corley and Gioia, 2011).

The final study in this thesis addresses the second question that arose from the first study. A context for the study was identified that had both the strong possibility of producing data to address the research question, and importantly, to address matters of deep concern and value for practitioners. The context selected was safety leadership in the oil and gas industry. Here risks and consequences are tangible and physical and therefore suitable for the research question, and the participating company had identified differentially high performing individuals, which if they could gain insight into and replicate, would save injury and “save lives”.

The study applies grounded theory taking Glaser’s methodological stance (Glaser, 1998) and identifies formative learning events and practices that lead to experiences of anticipated regret. Experiences of this emotion are posited by the study to increase in frequency, salience and accuracy as a result of individual and leadership practices of high performing safety leaders. As a result, the study proposes a theory of anticipated regret based safety performance, which states that increasing the frequency, salience and accuracy of anticipated regret improves safety performance and provides a source of ongoing motivation towards adaptive safe working practices.

Anticipated regret has been previously linked to safety behaviours (Koch, 2014), however not within organisational/industrial contexts. Previous research has been primarily conducted via experiments looking at single risk types, here anticipated regret is seen as a generalised cognitive and affective process that is applied as a generalised process to multiple contexts and categories of risk.

As per the first study in this thesis, mental representation/simulation is again found to play a central role. Comparative narratives are the basis for regret, and these narratives are mentally simulated. While anticipated regret related theories such as those linked counterfactual thinking (Epstude et al., 2016) include mental simulation, they do not identify the qualities of such simulations. In contrast, this study describes the simulations as specifically being embodied: that is sensory modal, with variations in qualia of embodied simulation being important. Like the first study, the qualia of mental representation/simulation are proposed to play an important role in the intensity of affect and subsequent behaviour. However, in this case the simulations are of ‘real-world’ anticipated events in contrast to the trader’s representations of magnitude which drew on real-world objects/processes as metaphoric representations. A series of 23 propositions are developed that underpin the theory of anticipated regret based safety performance, including the role and qualia of mental simulation, propositions find support by integrating theories from a broad range of fields.

The individual and leadership practices identified as contributing to the efficacy of anticipated regret in achieving safety performance are also described in a number of theories of high performing organisations in relation to safety performance, including; ‘high reliability organisations’ (Weick and Sutcliffe, 2015), ‘resilience engineering’ (Hollnagel et al., 2006), ‘situational awareness’ (Roberts et al., 2015), and ‘chronic unease’ (Fruhen et al., 2014). By introducing the concepts of anticipated regret to these theories, it is argued that important explanations, insights and distinctions are contributed that can inform refinements and additions to the methods for applying these theories to practice.

The concept of embodiment connects all three studies in this thesis, with embodiment seen as foundational in the cognition and affect of lived experience and in abstract thinking. The implications of embodied mental simulation for the efficacy of performance are different across the studies. For the traders, the embodied simulations of magnitude introduced disproportionate ‘irrational’ emotional responses to small losses that negatively impacted decision making and behaviour and in doing so negatively impacted performance. Similarly, in safety leadership, the embodied mental simulations associated with anticipated regret, intensified affect, but in contrast, improved rather than deteriorated performance. The resulting questions this raises regarding the sources and value or cost of bias in different contexts is discussed in the concluding sections of this thesis.

Ahead of presenting the three studies, the thesis begins by describing the research strategy with reference to the literature that motivated and informed it.

2. Research strategy

2.1 Motivation and philosophical position

The research underlying this thesis is part of a journey of exploration that started with, and continues to evolve from, active engagement with the field of practice. The research strategy is influenced by the author's commitment to applied research. Furthermore, by calls for increasing field-based research in psychology (Zeelenberg and Pieters, 2004) for earlier engagement with practitioners when determining research agendas (Corley and Gioia, 2011), and for field-based studies that cross theoretical boundaries to gain greater recognition for the utility associated with their contributions (Chatman and Flynn 2005).

The research objectives, topics and design described in this thesis have been influenced by the author's interest in individual and organisational transformation, and desire to contribute insight into how individual psychologies combine to form social psychologies, insight that is both actionable by practitioners and grounded in academic rigour. A personal and professional interest in understanding exceptional performance, as defined by the sustained achievement of outlying outcomes, has also influenced the research herein.

The above interests and motivations are combined with a personal philosophical stance of embodied critical realism, a philosophical position that underpins theories that the author has developed an interest in and is influenced by. Specifically, theories of grounded cognition and conceptual metaphor (Lakoff & Johnson, 1980) (Lakoff & Johnson, 2003) (Fauconnier & Turner, 2008), along with the theories of perceptual simulation and predictive processing, both of which are currently transforming cognitive science (Barsalou, 1999) (Ritchie, 2006) (Clark, 2015) (Barret, 2009). The author recognises the influence that these theories have and continue to have over what the author notices when engaged in research; in particular a focus on language, its structures, and its implications for perception, cognition and behaviour.

2.2 Research strategy principles

The research strategy follows the principles of the full-cycle research approach called for by Cialdini (1995, 2001) and echoed by Chatman and Flynn (2005), and Zeelenberg and Pieters (2004). Cialdini described an ideal social psychological research programme as a process of “continual interplay between (a) field observation of interesting phenomena, (b) theorizing about the causes of the phenomena, and (c) experimental tests of the theorizing” (Cialdini, 2001, p.33). Cialdini places importance on external as well as internal validity and sees a need for

field / natural observation to inspire and provide insight at the outset and as a way to complete a cycle of research (Cialdini 1995).

Zeelenberg and Pieters (2004, p.156) refer to Cialdini's full-cycle approach as a way of overcoming the critique "that decision research is mainly epiphenomenal and artificial". They argue that by cycling between the lab and the field theory will be enriched, as it will comprise "real-life" generalisations that have been proven in the laboratory; indeed, they refer to the value and achievement of such a cycle as a contribution in its own right.

Chatman and Flynn (2005) and Fine and Elsbach (2000) call for a move to an integrated cyclical approach from opposite positions. Whilst the former is calling from the field and the latter from the lab, they arrive at the same end game, and both describe the benefits achieved by recognising the strengths and trades offs associated with different methodological positions. Field research is described as "rich in significance and realism" but "notoriously imprecise" (Chatman and Flynn, 2005, p.434), whilst experimentation is seen as having greater control of variables but lacks the realism of the field, a juxtaposition recognised by Cameron (2010), Ritchie (2006), and Lee & Schwarz (2014). Chatman and Flynn (2005, p.435) state the obvious, that "full-cycle research is not firmly rooted in one domain or another but moves from one to the next according to its current place in the cycle". Fine and Elsbach (2000) recognise the difficult shift required in particular disciplines that have become identified with a single methodology.

There is an assumption in social psychology that a cyclical process happens as a matter of course, that discovery and insights of one scholar using one method will inform and inspire the work of another scholar working with a different methodological approach. However, Chatman and Flynn (2005, p.435) argue, "this transfer of information occurs infrequently and sporadically because it must often cross networks of scholars". They suggest that employing a full-cycle approach will ensure the benefits of multi-method do not "fall through the cracks" that appear between academic fields/disciplines.

For the researcher, there are both benefits and risks in adopting a full-cycle approach. McGrath (1982) suggests that it is important for researchers to gain expertise outside a core approach, arguing that this will ensure the weaknesses of any single methodological approach are offset. At the same time, he recognises the associated risk of being perceived as a 'jack of all trades', and as a result, may struggle to find a place within a discipline. There may also be an impact on the ability to publish; if journals have a certain epistemological stance, which in turn influences the selection of the editing board, articles based on a full-cycle approach might find it difficult

to find a home. These risks are offset by the rich perspective, insight and innovation achieved by the researcher (Cialdini 2001).

Corley & Gioia (2011, p.12) call for an orientation towards "prescience" to better fulfil the "scholarly role of facilitating organizational and societal adaptiveness". They discuss the nature of theoretical contribution and synthesis as having two dimensions – *originality* and *utility*, which are further broken down into two subdimensions – *revelatory* and *incremental* for originality, and – *practically useful* and *scientifically useful* for utility. To increase utility, they suggest that "we should become more oriented toward advancing not only the field's relevance to future scholarship but also the field's relevance to reflective practice concerning problems that matter" (p.24). Like McGrath (1982), Corley & Gioia (2011) recognise that journals may not appreciate the cross-discipline findings that can result from research focused on real-world problems and utility, and so seek to change the views of the editors.

As stated earlier, the author's motivation is to contribute to practice through the provision of academically rigorous actionable insights that make possible different outcomes. This motivation remains the primary focus and criteria and hence the adoption of the full life cycle research principles, cognisant of the above challenges and limitations.

2.3 Research Strategy

The research strategy utilised in this thesis is based on completing the first three stages of a full life cycle research program as described by Cialdini (1995), with the fourth stage specified within future research recommendations. For the purposes of this thesis Cialdini's model has been adjusted in two ways, one of which addresses the risk stated above, the risk of being seen as a jack of all trades. These adjustments are shown in Figure 2 below.

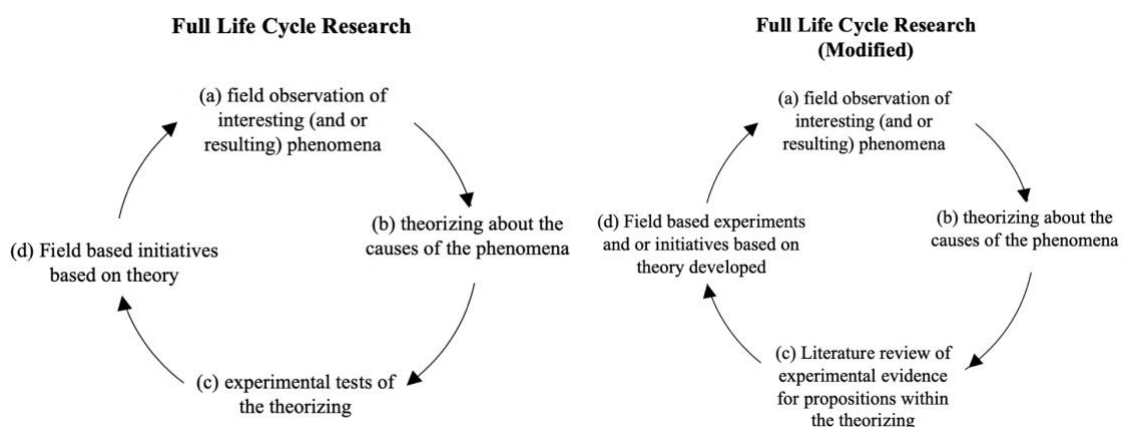


Figure 2: Modified full life cycle research strategy

The first adjustment concerns stage (c), the stage of conducting new lab/experimental studies to determine the plausibility of theories derived from field-based observations. Instead of conducting such experiments, the broad psychological literature is reviewed for lab/experimental based research that supports or challenges each proposition within the theory under review. Where there is literature in support of a proposition it is used to inform the design of field based interventions. When literature is found that challenges a proposition then field experiments would be designed to test the proposition to resolve or support the challenge, likewise if a proposition is both supported and challenged by different literature. It is, however recognised that the literature search, due its breadth and so potentially limited depth will be subject to confirmation bias, in that search terms will be based on the content of propositions developed and may therefore fail to identify contra theories / explanations for the same phenomena. To begin to address this limitation the literature search/review is focused on higher rated peer reviewed journals, with the main resolution being the Stage 4 field based experiments.

When the propositions are found plausible research proceeds to step (d) of applied research in the form of measurable organisation initiatives and or field based experiments. This thesis concludes at stage 3 in the cycle, with stage 4 specified within future research recommendations

The modified cycle in Figure 2, and applied herein, places the review of literature after field-based observation and theory development. Engagements with the field are approached with an open mind and integrate the principles of prescience with those of grounded theory as conveyed by Glaser (2012) and so with no prior propositions developed based on a prior literature review, although through a lens shaped by the philosophical position described in section 2.1, and with a focus towards matters that emerge as being important for practice.

Approaching fieldwork on this basis means the literature reviews in this thesis are presented after reporting observations and after the presentation of subsequent question/proposition/theory development. As anticipated by the protagonists of full life cycle research, these literature reviews cross and integrate research domains, domains that it is argued would not have been predicted via a prior literature review. The diversity of literature selected could be seen as arising from a confirmation biased search strategy, i.e. looking far and wide for supporting literature, indeed this is discussed in section 6.6 below. A strategy applied to partially address the risks associated with this selective literature review was a focus on higher ranking peer reviewed journals, and with reference to recognised leaders in their fields. While this still

leaves the possibility to omit research that may contradict the developed propositions, it does avoid the selection of literature that supports the propositions through inadequate methodology.

The breadth of literature reviewed can also be seen to be problematic in terms of scope i.e. it is difficult to explore every controversy in every field identified and connected. Full life cycle research anticipates this diversity and thus the final stage of field based experimentation becomes a place to test an integrated theory/set of propositions, which due to lack of context can't be resolved within lab based experiments.

The author did take time to be familiar with the JDM literature, however, based on the research strategy, it was not read for the purpose of developing specific propositions to be investigated, nor to identify gaps in the literature. Instead, the focus was understanding the perspectives and positions being taken in the field JDM and how these may relate to the provision of pragmatic insights that can address individual and organisational performance, with the purpose of informing research strategy.

Thus, the following section, that discusses JDM literature, is brief and focused on the general perspectives and positions that have informed the research strategy adopted throughout this thesis.

2.4 Positioning in JDM research

As mentioned above the purpose of this brief review of JDM literature is to position the research strategy within the JDM field. In particular contrasting perspectives as they relate to real-world decision making, that is, the literature's potential relevance to those reflectively practising in organisational contexts.

2.4.1 Utility and Bias, historic perspective

Whilst the domain of decision-making research incorporates many disciplines, "its boundaries and major theoretical concerns are all related to the historically dominant expected utility (EU) family of theories" (Hastie 2001, p.658; Weber & Johnson 2008). A family of theories centred around an ideal of rationality, with the degree of rationality being evaluated against norms where "each alternative course of action or choice option should be evaluated by weighting its global expected satisfaction-dissatisfaction with the probabilities that the component consequences will occur and be experienced" (Hastie, 2001, p.658).

This is not to say that there is broad support for expected utility theory or its derivatives, including subjective expected utility (SEU) (Savage, 1954). Indeed in their 1997 review of the field Slovic, Fischhoff and Lichtenstein (1977, p.9) (Slovic et al., 1977) remarked that “during the past 5 years, the proponents of SEU have been greatly outnumbered by its critics”. Hastie (2001) was merely pointing out that the vast majority of research has been in critical response to EU and SEU’s normative description of rational decision making.

The SEU journey is seen to originate in 1944 when Neumann and Morgenstern re-introduced and made respectable the concept of ‘utility’ in economics through their seminal book “*Theory of Games and economic Behavior*”. In addition to launching the field of game theory, they provided a normative theory of rational economic behaviour in which choices are modelled as always favouring the option with the maximum expected utility (Von Neumann and Morgenstern, 1944).

In 1954 Leonard J Savage published “*The Foundations of Statistics*”; building upon Neumann and Morgenstern’s work he proposed that subjectivity applies not only to utility but also to the probabilities associated with outcomes of choice alternatives. A standard for rational decision behaviour was therefore established in economics based on SEU (Savage, 1954).

Thanks to two pivotal publications, also published in 1954, interest in subjective expected utility quickly extended beyond economics (Gilovich and Griffin, 2002). Ward Edwards (1954) introduced the theory to psychologists through his review in the *Psychological Bulletin*. Paul Meehl’s book “*Clinical Versus Statistical Prediction*” (Meehl, 1954) challenged clinical intuitive judgment by reviewing twenty studies and concluding that simple statistical formulae consistently outperform judgments of experienced clinicians.

Simon (1955) argued that we are bounded by the limitations of the human brain; we can’t possibly consider all potential outcomes, their associated probabilities and values; therefore we have an inevitable ‘bounded’ rationality. Simon proposes that instead, we use processes that make the best possible/suboptimal approximations, that is we satisfice, with these satisfying processes referred to as heuristics. These heuristics are considered by Simon, amongst others, as compromising shortcuts against the rational ideal described by subjective expected utility theory (e.g. Kahneman & Frederick, 2005).

Additionally, psychologists were quick to reject utility theory as a description of actual decision behaviour and identifying deviations from the axioms of rationality prescribed by EU & SEU became the focus for much psychological research into decision making. In doing so, although

they rejected utility theories, these theories remained central to decision research. (Goldstein and Hogarth 1997) (Hastie 2001).

Placing utility theories at the centre of research had two pervasive effects, firstly in the methodology adopted. The concepts of subjective probability combined with monetary measures of utility led to the adoption of lab-based research on risky decision scenarios, i.e. gambles as the principle methodology. Indeed, Lopes (1983) compared the use of simple monetary gambles in decision research to that of the fruit fly in research on genetics. Secondly, a participant's responses are compared to theoretical standards of rationality e.g. bayesian rationality (Edwards et al., 2007), with deviations from the 'correct' answer demonstrating a failure or error in the participants thinking. When such errors have a degree of consistency across participant's the error is described and labelled as a category of bias, a bias that must be overcome if participants are to make effective decisions.

The notion of fallibility and bounded capacity to process decisions is repeated in dual-process theories (Evans, 2007) (Kahneman, 2011). However, others have taken a different perspective.

2.4.2 Heuristics – in context

Dietrich and Fields (1996, p.11) stated that creating a model that can replicate the “remarkable” human ability of selecting an appropriate depth of analysis for decision making and problem solving is one of “the most important problem in cognitive science”. Gabaix & Laibson (2003) pointed out that as humans we make effective everyday decisions that we cannot yet replicate in artificial intelligence even with today's supercomputers. Even today, in the era of machine learning and big data, some basic human capabilities remain a challenge to replicate e.g. natural language processing (NLP) (Zhou et al., 2020).

Gerd Gigerenzer and his colleagues at the Max Planck Institute for Human Development in Berlin have been at the centre of a different perspective on heuristics (Gigerenzer and Selten, 1999) (Gigerenzer, 2008). Placing decisions in context, they present heuristics as designed for specific context-specific goals and as fast, frugal, and computationally cheap decision-making tools; giving rise to the term fast and frugal heuristics (FFH). Like biases, heuristics are posited to be conscious and subconscious, and also ignore information; however, in FFH they are proven to be adaptively successful. In applying a toolbox metaphor, heuristics are posited as tools matched to particular environmental situations that allow agents to be ecologically rational and achieve superior results in comparison to 'rational' models (Gigerenzer and Gaissmaier, 2011).

In their review, Gigerenzer & Gaissmaier (2010, p.473) posit a “fundamental change in thinking about human and animal behavior seems to be occurring”. They reference mathematical biologists McNamara & Houston (2009) in arguing this position: “Although behavioral ecologists have built complex models of optimal behavior in simple environments, we argue that they need to focus on simple mechanisms that perform well in complex environments.”

The argument is that research needs to respect context, and that when research is conducted in context it can show us to be ecologically rational as opposed to being economically irrational, and that ecological rationality has been essential in the success of our species, has been made for some time, for example see Brunswick (1956).

Consciousness and attention research can bring weight to this criticism, for example, Christof Koch (2004) describe dual-task experiments that demonstrate focal attention is not needed to recognize the presence of one or more animals in briefly presented complex natural scenes. However, subjects fail to identify simple shapes or forms against plain backgrounds. It seems we can process mass information from our natural environment but not minimal unfamiliar out of context information.

Context is also shown to matter when looking at the processing of concepts, in particular at the processing of abstract versus concrete concepts, as in context availability theory (Paivio, 1991). Here differences in the time taken to process different types of concepts, i.e. between concrete concepts (faster) and abstract concepts (slower), as posited in context availability theory, disappear when abstract concepts are situated in their natural context (Schwanenflugel et al., 1992). As a result, Matheson & Barsalou (2018, p.358) argue that we will not understand conceptualisation unless it is studied situated in context. Furthermore, they question if it is even “possible to identify cognition that is not...embedded in a context, enacted through action, and grounded in the body, emotions, and situations”.

The references in this section are necessarily a small selection; however, they represent a growing challenge to context-independent, abstract research methodologies such as the ‘gamble’ based experiments seen in the domain of JDM. They challenge positions regarding the efficacy of heuristics from being perceived as deficient and suboptimal to being ‘smart’; they challenge the validity of some important psychological theories, and more fundamental paradigms of cognition (Matheson and Barsalou, 2018). Indeed, the absence of context is argued to be one of the causes of the replication crisis in the psychology and social sciences, see for example (Van Bavel et al. 2016).

2.4.3 Naturalistic decision making

Not all JDM research is based in the lab, Naturalistic Decision Making (NDM) is an example of decision research based in the field of practice, thus firmly placed in context. Described as “chronicling the strengths used in making difficult decisions” (Klein, 1998, p.1), NDM explores how people make decisions in demanding real-world situations; demanding in terms of time, uncertainty, significant consequences, resource/organisational constraints, and instability of conditions.

Applying a core methodology of cognitive task analysis (CTA), studies have taken place in diverse contexts including, firefighting, health service provision, military operations, aviation, sport performance, and complex engineering settings. With now nearly 30 years of research carried out in this area, a number of retrospectives and special editions have been published which consider the development of NDM methodology and its contributions to the world of JDM, e.g. Lipshitz et al. (2001), Gore et al. (2015), Hoffman and Klein (2017).

In reflecting on the history of NDM, Klein (2015) makes a series of strong claims for NDM having reshaped important core beliefs in the JDM domain; for example the use of patterns in lieu of considering options, expertise based in tacit knowledge rather learning rules and procedures, in the possibility for sound decisions in the absence of initial goals, the utilisation of mental models instead of building data and information, and the idea of reducing uncertainty without collecting more information.

There is some broad agreement that the NDM has added an important dimension in the exploration of human judgment and decision making, for example see Lipshitz, Klein, & Carroll (2006), Gore et al. (2015), Chaudet et al. (2015), Klein, (2017). However, its often cited distancing from, or even opposition to other modes of decision research has attracted criticism (Roelofsma, 2001). As has its methodologies and its reluctance to utilise lab-experiments or similar methods to get below the surface of the cognitive processes that are identified, to test validity of claims, and the generalisability of findings (Jungermann, 2001).

Most critics do not suggest a lack of value and contribution from an NDM approach, instead, they suggest that integration between approaches rather than opposition can address the benefits and limitations of each approach. This call for alignment and integration is made between the lab and the NDM (Berryman, 2008), even if the main actors may find it difficult to integrate in

their own research practice (Kahneman and Klein, 2009). There is also a call separately made for alignment between FFH and NDM (Keller et al., 2010) (Shan and Yang, 2017).

2.4.4 An integrated approach

The author proposes that a full-life cycle approach can integrate the benefits and counter the shortcoming of each of the above perspectives, associated research strategies and methodologies. Furthermore, that this integration is necessary to answer the questions Hastie (2001, p.664) believed remained open;

“how are deliberate decision-making problems represented cognitively, and what are the major determinates of the representation of situations? How do people comprehend the decision situation; in other words, how do they perceive, retrieve, or create alternative courses of action?”

Questions that once were thought to have been answered, but are now thrown open again in the light of embodied and grounded theories of cognition that challenge the traditional underlying assumptions associated with cognitivism (Matheson and Barsalou, 2018).

Hastie’s question above was the basis for shaping the research questions in this thesis, research questions that were developed in conjunction with the interests and needs of the participating organisations and decision makers to ensure they were addressing pertinent problems for practice. Thus, engaging in “prescience” Corley & Gioia (2011, p.12) i.e. establishing research topics and questions that are prescient and matter to those engaged in practice rather than simply interesting for the development of theory.

The review has been short and does not in any way, represent the richness and diversity of research within the JDM domain. Its intention is to position a full life cycle approach to research within the JDM field by characterising some of the main perspectives taken within JDM. With the intention to provide the basis for discussing and contrasting the nature of findings developed in a full-life cycle study with those that may have resulted had a single perspective been taken. Such discussion is intended to evaluate the claim for the value of a full life cycle made at the beginning of this section, and previously in section 2.3.

3. Study One: Trader Decision-Making

3.1 Introduction

As previously stated the author has an interest in individual and organisational psychology and transformation and a particular interest in decision making in high risk and uncertain contexts; and importantly in making a difference to organisational and individual performance and experience. A research context was therefore sought that had potential to be rich in experience and hence data in relation to these interests and in addressing Hastie's question regarding cognitive representation of judgments and decisions.

Foreign exchange (FX) trading was chosen as the first context for exploration as it matched the above criteria by demonstrating the following characteristics;

- Ongoing sensemaking and decision making (Oberlechner, 2004)
- Multiple sources and high levels of uncertainty (Gradojevic and Gençay, 2013)
- Significant risk and reward, both for individuals and institutions (Fenton-O'Creevy, Nicholson, et al., 2011) (Petrick, 2011)
- A tight coupling between individual psychology and organisational context (Leaver & Reader, 2016, 2019)
- Direct feedback on the outcomes from decisions made (i.e. money lost or gained, or opportunity missed, or loss avoided) (Fenton-O'Creevy, Nicholson, et al., 2011)
- Desire (from traders & organisations) for insight to address behaviours, affect and performance (Fenton-O'Creevy, Nicholson, et al., 2011)

By taking the full-life cycle approach, including the notion of 'prescience' (see section 2.2), the engagement with the traders was undertaken with an initial focus on building an understanding of their work and context and particular challenges that they would like to address, and therefore the development of a specific research question(s). As described in the next section, due to limited time and matters of confidentiality, it was important to identify an area of concern and focus to maximise the potential for depth of insight within the limited time and access available.

3.2 Methodology

Access to foreign exchange traders was enabled through a professional engagement that involved gaining insight and understanding of the experiences and challenges of trading in foreign exchange markets. This commercial project had the purpose of informing the coaching and support provided to a trader (the client) who had started to trade with their own capital and was experiencing difficulties. Four half days and one full day was spent with the client to gain an understanding of foreign exchange trading, an understanding that was supplemented through reading a book describing trading and its context (Fenton-O’Creevy et al., 2011;). During this period of observation, the client highlighted the particular patterns of decision making that they were finding particularly problematic. Problematic defined as unwanted emotional responses that led to detrimental divergence from both trading strategy and money management. Unwanted emotional responses were noted to occur outside of these criteria, i.e. the emotions were categorised by the client as unpleasant but did not lead to a break with trading strategy and money management; as such were not of immediate concern and therefore included in the scope of the project.

3.2.1 Research Questions

Based on the above observations and client priorities the following research questions were developed and agreed with the client:

1. What are the cognitive and affective patterns (heuristics) associated with judgments and decisions that diverge from trading strategy and money management? In particular when an expected/reasonable series of losses are experienced.
2. What forms of intervention may be helpful in avoiding divergence from trading strategy and money management following similar runs of losses?

Questions one is addressed within this thesis and aligns to the general question of interest inspired by from Hastie (2001, p.664): “how are deliberate decision-making problems represented cognitively, and what are the major determinates of the representation of situations”. Question two is discussed within recommendations for future research.

3.2.2 Participants and research context

To address the above questions this client made introductions to trader colleagues who were willing to assist in the study. Participating traders were engaged on the basis that no recordings

would be made, only had written notes would be taken, and the scope of enquiry would not involve trading strategy or methods of money management. Furthermore, the notes and analysis would be anonymised, and the analysis and findings would be shared with all participants, and if of interest published in a professional journal and contribute to academic studies. No fees were paid to participants, in return for their time; however, they were offered feedback on the research findings and a coaching session with regard for applying the findings if they wished.

Researching within a professional engagement has some important implications. Firstly, on the positive side, there is a natural opportunity for ‘prescience’ in accordance with the research strategy, that is, there is an anticipated resolution of a concern that matters to the client. Secondly, on the risk side, either client and or consultant preferences can mean professional engagements are not always carried out with academic rigour. This second implication/risk is addressed through the author’s professional practice and service differentiation. This differentiation is based on the contracted application of academic methods and standards of research, with findings and recommendations triangulated with academic literature.

A third implication for drawing on a commercial engagement for academic research is the opportunity for implementation. This both provides an opportunity to test validity of developed theory, and the opportunity to demonstrate a contribution to practice, through utility. As such implementations can thus be utilised as field experiments. The challenge that accompanies this opportunity is the level of control over the experimental method, as solution design and implementation often involve working with non-academic partners within an organisation e.g. learning and development, communications, technology, finance and process functions. In this study, there is a high degree of control of the design and implementation of solutions for the client, but the control varied between the participants. The consequences of which are described in section 3.5 below.

The selection of traders for the study was based on three criteria; firstly, a track record of stable performance at above the mean performance of their peers; secondly, a minimum of 10 years of trading experience; and finally, to provide a range of trading contexts, including those similar to the client’s current context. The diversity of context was included as a criterion to consider the influence of aspects of context on performance. Table 1 below identifies the organisation contexts, along with the sources of capital that are placed at risk during trading, with the latter being another potential influence over performance and affect during trading. No other information is provided regarding the participants to ensure the anonymity of individuals and organisations.

Table 1: Categories of Trader and Research Interaction

Trader	Organisation	Capital Source	Interview / Observe
1	Self Employed	Own	I & O (4 x 1 ½ hr)
2	Self Employed	Own	I & O (1/2 day)
3	Proprietary Firm	Company/Firm	I
4	Proprietary Firm	Company/Firm	O (1/4 day) & I
5	Bank	Company	I
6	Bank	Company & Client	I
7	Hedge Fund	Company & Client	I
Key: I = interview, O = observation at trading desk			

3.2.3 Research Methods

The table also shows the form of engagement with each trader during the research. All traders took part in semi-structured interviews, three were observed while trading. One was observed before the interview; two were observed post-interview. Interviews lasted between 90 and 120 minutes. Durations of observations are shown in the table.

The semi-structured interviews were exploratory, remaining open to the phenomenal experience of the traders and avoiding bringing theories or assumptions to the processes, thus taking a phenomenological approach to field study (Remenyi, Williams, Money, & Swartz, 1998) (Berglund, 2015). The interviews focused on the experience and behaviours of traders in two situations;

- When they have made four or more trades in a row that have negative outcomes
- When they have made four or more trades in a row that have positive outcomes

These are situations that the client was having difficulties with. Difficulties in maintaining trading discipline in the face of strong emotions. Discipline in terms of applying predetermined trading strategy and money management rules.

Traders were asked to contrast both situations to more typical runs (they made their own interpretation of what ‘typical’ would mean). The opening questions are presented below; further questions were asked for clarification or detail as the trader described their experiences:

Question1: Please describe your thoughts and actions during a period of trading where you have experienced a run of four or more losses.

Question 2: Please describe your thoughts and actions during a period of trading where you have experienced a run of four or more gains.

Question 3: How do the thoughts and actions you have described in relation to the first two questions compare to your experience of typical trading runs.

The periods of observation began with a request for the trader to *talk out loud* their thoughts and to describe the actions they were taking, in accordance with protocol analysis (Ericsson and Simon, 1993). As agreed with participants, answers were not recorded, hand notes were taken during both interviews and observations. Attention and follow up questions were focused on understanding and relating four types of information:

1. The decisions / actions being taken
2. The cognitive processes associated with the decision and actions
3. The affect experienced
4. Phenomenological experiences associated with the above

Information for item 1 above was typically directly declarative. Items 2 and 3 were sometimes declarative; however, their descriptions were enriched by follow up questions that were based on the linguistic intuitions of the author (Fitzgerald, 2009) in response to the utterances and gestures (McNeill, 1992) (Tomasello et al. 2019) made by the participant. Follow up questions to explore item 2, 3 and 4 were again informed by linguistic intuitions of the author based in an appreciation of embodied cognitive metaphor (Gibbs, 2005), of grounded cognition (Matheson and Barsalou, 2018), of embodied simulation and predictive processing (Barsalou, 1999)(Clark, 2015), and of the psychological construction of emotion (Barrett, 2017). The intuitions and questions thus reflect the philosophical position of the author and are reflected in the nature of observations and findings that are described in the following section.

3.3 Observations

Extensive observations were made during the interviews and periods of shadowing the traders at their trading desks. The following sections are not intended to be a report of all observed behaviours; instead they focus on patterns shared by the participants, and that were signified as important by the traders. The importance being judged by the degree of interest/motivation of the traders in gaining insight into and in changing associated thinking, affect and behaviours. Additionally, reporting herein respects the agreed scope with the traders and so does not

reference any individual trading approaches, styles or strategies, and any money management strategies.

3.3.1 Trading approach / strategy

A high degree of variability between traders was identified including; trading frequency, trade size, trading style (long v short trade preference), placing of stops, currencies traded, level of capital placed at risk, market following v contrarian, use of options as ‘insurance’, information sources used and weighting of information sources in decision making.

3.3.2 Attitudes towards risk in loss versus gain situations

In contrast to the variability in strategy, relative consistency was discovered in the trader’s attitude towards risk following a series of losses, their attitude to risk following a series of gains, and the intensity of emotions experienced when a significant gain was mitigated in part or whole by a subsequent loss. In these cases, the phenomenal experience and behaviours described or demonstrated by the traders were consistent with Kahneman and Tversky’s prospect theory (1979). Prospect theory predicts traders would be more risk-taking in a loss situation, more risk averse in a gain situation, and through the changing reference point feel a gain, with an element of fall-back, as a loss rather than a net gain (Tversky and Kahneman, 2000). The thoughts and actions of the traders matched these predictions made by prospect theory.

In the loss or gain situations described above, the traders frequently referred to the impact on their “*P&L*” (profit and loss). They were keen to “*recover their P&L*” in a loss situation often leading to over trading (increasing the frequency of trading) and eventually taking more significant risks to recover the escalating loss. On reflection, they were aware these behaviours broke their trading strategy/rules, they intellectually understood that the nature of the market would lead to a series of losses and gains. However, in the live situation, this logic would fade into the background, instead, they described their behaviours as being driven by strong “*irrational*” emotions.

In a gain situation, they often gave in to the temptation to “*lock in a gain*” even when the strategy they had when they entered the trade required them to stay in the trade with the expectation of higher gains; stated in their terms they often “*left money on the table*”. The traders expressed a belief that this behaviour was driven by the extreme negative emotion felt when they exited a trade during a fall back from a peak. If a trade were exited during a fall back

from a peak, then a gain would still induce a negative emotion, sometimes more than a straight loss. For example, if a potential gain peaked at £50k but they did not exit the trade until the gain had fallen back to £30k the negative emotion could be greater than a straight £20k loss, there would be no or little positive emotion relating to the resulting £30k gain. This was often reinforced by peer and manager feedback. This negative feeling was often projected into the future, leading to risk aversion and a failure to *'let profits run'*. However, *'leaving money on the table'* by exiting before the peak, is also a cause for negative affect that was dwelt on.

The combination of increased risk taking in a loss situation and risk aversion in a gain situation is recognised both in trading literature and by traders; both recognise the need, but difficulty, *to 'quickly cut losses but let profits run'* (Warneryd, 2001). This behaviour is predicted and described by prospect theory (Tversky & Kahneman, 2000). In trading, the phenomenon seems to be stubborn, with pre-planned exit points of a trade often ignored.

3.3.3 Affect and behaviour during a run of losses

Traders described a common experience during a run of losses, an experience that is of concern because it often led to them moving away from their pre-determined strategy and money management rules. During a sequence of relatively small losses (less than 1% of P&L in each trade) the traders described a growing pressure to make back losses within an equivalent or shorter time frame to that in which the losses had occurred. Because they had strict money management regimes, which limit the size of trades, this meant they would enter a period of over trading which often escalated the cumulative loss.

To recover a large cumulative loss the traders described a desire to look for larger payoffs for single trades. Whilst they logically know achieving large payoffs normally requires placing greater capital at risk against trades with longer odds; they described a feeling of confidence that was incommensurate with the risk involved in the long odds (low probability of success). This mismatch between the situation and their confidence levels versus risk was normally recognised in retrospect. Whilst in the situation, they perceived actions taken as reasonable, but they also described increasing stress and emotion.

While the traders recognised the randomness of the market and therefore the relatively high likelihood, indeed the normality of a run of three or four losses, this logical/rational perspective was not generally present when such a run occurred. It appears to be overruled in some way by the emotion; which logic or mindfulness was failing to overcome.

The behaviours described above are a significant issue in trading (Steenbarger, 2007). Research indicates that being made aware of them does not change behaviour. Despite this, only interventions based on making traders aware of these problems are reported in the trading and behavioural finance literature. Insight that provides a route to a more effective intervention would, therefore, provide a valuable contribution to practice.

3.3.4 Trader's mental representation of their profit and loss accounts

The above describes some of the observed problematic behavioural patterns of the traders that participated in this study, which as mentioned above, are recognised within relevant literature, along with the need to develop more effective interventions (for example, Steenbarger & Repin, 2005). However, behavioural descriptions provide limited insight into the cognitive processes that underlie these behaviours.



The interview questions used with the traders requested a sharing of their thinking, a request that was also made during trading observation periods when practical. In response, when describing their thoughts with regards to their P&L, all traders indicated a visual mental representation of their P&L. This reference was made both in language (e.g. "a pot of gold") and by somatic marking (e.g. gestures such as indicating a scale rising and falling through the vertical movement of their hand in space). Although particular forms of the representation of P&L were different between traders, all traders that participated in the study had a representation and manipulated one or two attributes/qualia of their representation in response to a loss or gain.

Two examples are presented in Table 2 below. The table includes the identifying language and somatic markers, the representation form, and the changes of the representation qualia made in response to a loss or gain. Both examples are consistent in manipulating both spatial attributes (*higher / lower* or *larger / smaller*), and in manipulating colour or the attributes of colour (*red / white* and *brightness / dullness*).

It's important to note that these representations were not always immediately presented by the participants, they were described in response to an enquiry regarding the meaning of a somatic gesture that was used when describing change in the P&L account. For example, trader B (see table below) when describing changes in their P&L was moving their hand up and down next to their head. when asked what this gesture means, the trader became aware of the representation, and described it. It could be argued that the representation was created in response to the question and not previously present subconsciously, however, the trader in this example described it as

something that they have been previously aware of and was more of a feeling now. This was replicated with the other traders; their representations were either described spontaneously i.e. without explicit request, or when an explicit request was made described the representation as something they had been previous awareness of.

Table 2: Trader's representation of profit and loss

Trader	Linguistic & (<i>Somatic Markers</i>)	Representation Form	Changes in Response to Loss or Gain
A	<p>"I see my P&L as a big pot of money" (<i>holding right hand out as if holding a pot, left hand indicates outline of the pot</i>)</p> <p>"my pot grows, its great it starts to look orangey gold" (<i>both hands cupped as if holding a ball, moving apart, left and right (horizontally)</i>)</p> <p>"my pot shrinks, it reduces down, it begins to look a sad yellow" (<i>both hands cupped as if holding a ball, moving together, left and right (horizontally)</i>)</p>	<p>Visual representation of a pot of money similar to that shown below</p> 	<p>In response to a loss the trader has a visual representation of the pot shrinking and becoming a dull yellow.</p> <p>In response to a gain the trader has the visual representation of the pot growing and becoming gold in colour.</p>
B	<p>"I'm always aware of my P&L and changes to it, I see the rolling number in my mind's eye, if I'm doing well it moves up, if I'm losing it starts to go down to here." (<i>right hand up palm facing down, thumb under as if holding something, the number?</i>)</p> <p>"My P&L number is great when its white, down here it turns an alarming red, but it shifts between these with each trade" (<i>right hand as positioned above but moves up and down as he says P&L goes up/down and colour changes</i>)</p> <p>"as it changes I hear a noise like those old airport flip over numbers</p>	<p>Visual representation of numbers like old airport signs, with supporting sounds, see below for similar picture.</p> 	<p>In response to a loss the trader has a visual representation of the number moving down in spatial position and turning redder and brighter as the loss increases.</p> <p>In response to a gain the trader has the visual representation of the number rising to just above eye level and the number turning whiter & brighter.</p>

As these representations, and changes thereof, coincided with the intensification of negative emotions, and unwelcomed trading behaviours, a question arises. Could analogue embodied mental representations of P&L accounts play a role in irrational responses to relatively small and expected runs of losses? If confirmed could provide an explanation for trader behaviour not present within the current literature, and importantly inform a new approach to intervening to address the unwelcomed emotions and associated detrimental judgments, decisions and behaviours.

The following section describes a series of propositions developed and assessed for plausibility in response to the above question.

3.4 Propositions and plausibility based in the literature

For the mental representations of P&L to play a significant role in driving the behaviours described above, it is posited they would need to explain the disproportional emotional response to a run of small losses; and for the loss versus gain variations in affect and behaviour described above predicted by prospect theory. Based on these propositions four initial propositions were developed for consideration and review in the literature;

- P1: Mental visual/spatial representations of magnitude play a significant role in cognition of abstract concepts, for example profit and loss.
- P2: Mental visual/spatial representations of magnitude are inherently inaccurate and can be problematic in supporting judgment and decision making.
- P3: The representation of small losses using visual or spatial representation is problematic and causes disproportionate responses.
- P4: The different qualia of embodied representation associated with losses versus gains support disproportional affect, for example is red for loss more emotionally salient than black for a gain?

The literature discussed below is not intended to be exhaustive nor does it aim to present arguments for and against theories presented. The primary purpose of the review is to provide some plausibility for the preliminary propositions presented above. The premise being, if plausibility is established, there is value in pursuing and refining these propositions, identifying areas of literature that warrant more detailed examination in developing refined propositions, and in selecting and developing hypotheses that can be tested in either lab or field based experiments and in this case, interventions to change the client's unwanted trading behaviours.

3.4.1 **Proposition 1**

P1: Mental visual / spatial representations of magnitude play a significant role in cognition of abstract concepts, for example profit and loss.

Gattis (2001, p.1) examines the question “Is there evidence that spatial structures impact performance on abstract tasks?” Gattis suggests that schemas aid cognition including memory, communication and reasoning, for example, spatial orientation (higher, lower) or embodied experience (warmth, cold), due to their inherent structure and our shared familiarity with such structure. Gattis points to a volume of evidence from across fields including cognitive psychology, developmental psychology, linguistics, anthropology and computer science that support the idea that schema and in particular, spatial schema, are a basis for abstract thought

Dehaene & Brannon (2011) argue there is considerable evidence that children and adults, and indeed non-humans, share an essential cognitive toolkit that integrates or at least relates representations of space and number. Cantlon et al. (2009, p.83) argue that numeric symbols used in mathematic behaviours are built “on the approximate number system which represents the number of discrete objects or events as a continuous mental magnitude”. This argument is made by drawing on “behavioral and brain signatures that are universally displayed across animal species, human cultures and development”.

The above theories have relevance to the trader’s representations and support proposition one because they refer to spatial characteristics that change e.g. dimensions (larger, smaller) and positioning (higher, lower) within the trader representation. This proposition is further supported by cognitive metaphor theory as discussed later in section 4.4. Based on the above it is posited that proposition one finds some support in the psychological literature, and the proposition of the trader’s mental representations playing a role in their disproportional emotions remains plausible at this point, or at least not detracted from.

3.4.2 Proposition 1 & 2

P1: Mental visual / spatial representations of magnitude play a role in cognition of abstract concepts, for example profit and loss.

P2: Mental visual/spatial representations of magnitude are inherently inaccurate and can be problematic in supporting judgment and decision making

Further support for the first proposition and applicable to the second is research by Bryant and Squire (2001) showing that children’s mathematical difficulties can be explained by the spatial cues that they employ when solving a range of mathematical problems. Since a child’s early experience of mathematics is via objects positioned in space, a link between spatial arrangements and mathematic concepts is seen as inevitable. They argue that in a child’s early years, height (a higher step) and length (reaching a long way) override one to one correspondence when considering the number of objects in a row or column. A longer row, or higher column, of less bricks will be seen to have more bricks than a shorter row, or lower column, of more but smaller bricks. “Their belief that longer is more numerous is hard to shake” (p.173). Bryant and Squire argue, “the evidence that spatial factors can get in the way of children’s mathematical judgments is incontrovertible” (p.173). Bryant and Squire recognise these difficulties as causing problems at certain stages of a child’s mathematic development;

however, they believe they are overcome in time. With regards to the propositions presented above this provides some support for analogue, and in particular relational spatial, cues or representations being problematic in mathematical based activity. There is no doubting that traders' have mathematical abilities that support their rationale view of their trading activity. However, could a background, unconscious analogue representations remain in play and have a causal relationship with the irrational emotion response of the traders?

Gallistel & Gelman (2000, p.59) argue that the "primitive machinery for arithmetic processing works with real numbers (magnitudes)", magnitudes in this sense being analogue representations of quantity. Furthermore, they argue that because analogue mental magnitudes have scalar variability, they are inherently "noisy" or imprecise and this has an impact on number processing for children, adults and non-humans.

Scalar variability is an interesting aspect when considering the trader's experiences, particularly Gallistel & Gelman's reference to scale and its obedience to Weber's law with regards to both size and distance effects. Weber's law states that just noticeable differences (JND) in stimulus dimension is a constant fraction of the comparison stimulus (Levine, 2000). A ratio-based representation would align to the non-linear nature of prospect theory. With regards to JND, if a trader holds a scalar representation of their profit and loss in mind, and trades are measured with adjustments to this, as suggested by the examples described in table 2, what happens if the individual absolute trade loss is less than the JND?

One possibility is that the representation is adjusted by the JND, which would represent a higher loss than actually occurred. For example, if the JND requires a 5% change in the size of representation, but the trader's loss is only 1%, the representation would be registering a loss 4% greater than that which had occurred. If the representation triggers the trader's emotions, then the emotion will be that associated with a 5% loss, not 1%. Could this, at least in part, explain the difference between the traders rational versus emotional response?

In this section of the thesis different theories, drawn from a number of different fields of psychology, have been identified that together posit analogue conceptualisations/representations of magnitude that prove to be problematic in different contexts. In addition the work reviewed shows that these representations can capture numerical change inaccurately. From this we may conclude propositions 1 & 2 find support and thus remain plausible based on the research literature.

3.4.3 Proposition 3

P3: The representation of relatively small losses using visual or spatial representation is problematic and causes disproportionate responses.

Weber's law, in particular JNDs, suggests support for the third proposition. Moyer & Landauer (1967) were the first to make a case for numbers being represented by magnitudes in the brain that obey Weber's law. Since then, there has been a significant and growing body of research supporting this law. Feigenson et al. (2004) reviewed behavioural and neuropsychological evidence for number representation resting on two core systems, one for representing large approximate numerical magnitudes and one for small numbers of individual objects. Whilst recognising evidence is yet to be definitive, Feigenson et al. (2004) relate difficulties and problems with number / mathematics to situations when both systems are required at the same time, and or, when the task goes beyond the limits of both.

Furlong & Opfer (2008) demonstrate that iterated prisoner dilemma games are impacted by the representation of the numeric value and not the economic value of rewards (e.g. £3 versus 300p). Furlong & Opfer show the impacts follow Fechner's law, which states that representations of magnitude increase logarithmically with value (Levin, 2000; Dehaene, 2003; Weber and Johnson, 2008).

Slovic et al. (2007) link proportionality with affect, referring to proportional dominance. They suggest that a proportionally evaluated option will be selected over an absolute number, for example, people are more likely to respond to an action that will save 98% of 150 lives, than the call for action to save 150 lives. People appear to find it easier, or have a preference for, decisions that include a reference point. In this example, without a reference point, how do you evaluate if saving 150 lives is a good achievement. For the traders this appears to lead to a comparison of a loss against a P&L in proportional terms using an analogue mental representation.

Interestingly, Kahneman (2003) uses visual illusion as a metaphor for decision heuristics and the stubbornness of observed bias. Two visual examples used (Kahneman, 2003) are reproduced below in Figure 3; these provide demonstrations of the issue of relativity or perception to context. In the first example, the shading of the outer square distorts the perception of the inner square, the perception of the inner square is relative to the adjacent colour. In the second example, the perceived size of the rocking horse is relative to its position in the room via

perspective. Although it is the same size on the paper, most people struggle to suppress the influence of relative size induced by perspective.



Central squares of the same shade appear to be different

The Two horses are the same size on the page

Figure 3: Visual illusion from Kahneman (2003)

Hsee (1998) demonstrated proportionality through an example based on portions of ice cream. He shows that an overfilled 5oz cup of ice cream containing 7 oz. of ice cream achieved a greater willingness to pay than an under filled 10 oz. cup with 8 oz. of ice cream (see Figure 4). The proportion of the ice cream to the cup was shown to be dominant in the evaluation of value.

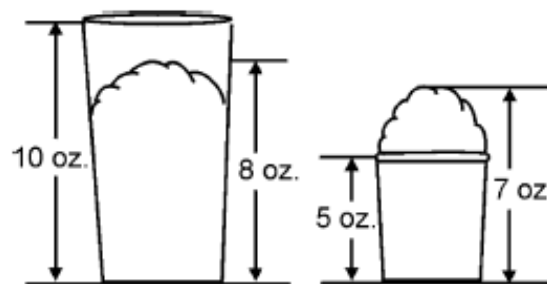


Figure 4: proportional evaluation of value from Hsee (1998)

Research drawing on or making reference to Weber's law and proportionality appears to provide support for the third proposition. If it is accepted that there is a preference for involving a comparator in decision making (proportionality), and trader's use a representation of P&L as this comparator; then according to Weber's law this representation must be adjusted by at least the JND. For example, and as represented in the figure 5 below, if the analogue representation is of a £200m P&L account, and the JND is a 5% adjustment in the representation, then the minimum loss that can be represented in the analogue representation would be £10m. This would lead to a run of four 1% losses (£7.88m) being represented as a £37.10m loss, and therefore trigger a disproportionate response.

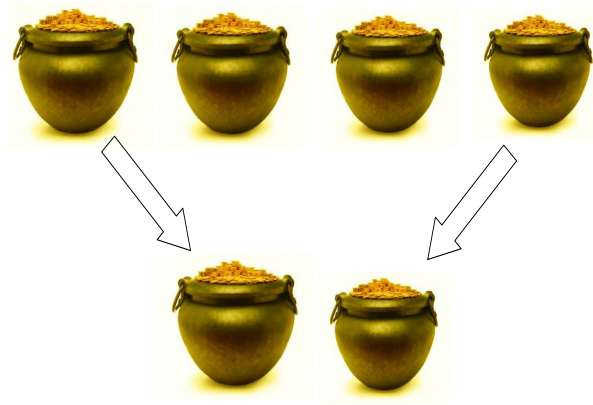


Figure 5: Incremental change in trader's analogue representation of P&L

3.4.4 Proposition 4

The different qualia of embodied representation associated with losses versus gains support disproportional affect, for example is red for loss more emotionally salient than black for a gain?

The theories from the literature associated with the first three propositions could be seen to align with prospect theory, particularly Weber's law (or related laws e.g. Fechner's or Steven's, (Levin, 2000)), but they do not explain the difference in the gradient of the curve for loss versus gain.

Is there something in the representation that supports the differential impact and risk behaviours for a loss versus a gain? From the trader interviews and observations two possibilities are considered; firstly, the JND for a gain would be larger in absolute terms than a loss, assuming the stimulus ratio is maintained, as per Weber's law. However, if the mental representation of magnitude is driving the emotional response, this would result in greater affect for a gain, and prospect theory predicts the opposite i.e. an equivalent loss would have greater impact than an equivalent gain.

A second possibility is that some other aspect of the representation is playing a differential role. Looking at example B from table 2, in addition to spatial adjustments to the mental representation, the colour of the numbers change, moving to red when losses are incurred and towards white when gains are made. Does red have a stronger emotional impact than white?

Red is consistently used in warning and danger signs, so perhaps it is not a surprise that the trader encodes loss as red. Bank accounts fall in to 'the red'; you receive a 'red' bill when you

are behind on a payment. However, this does not necessarily mean red leads to greater affect, it could just be a culturally adopted use of a colour, with loss having greater affect no matter what colour it is given within a representation.

Humphrey & Keebie (1974) ran a series of experiments with rhesus monkeys studying their visual preferences; they found strong and consistent colour preferences (Humphrey, 1976). Monkeys systematically chose to spend more time in fields of light of certain colours, ranking from most to least attractive were “blue, green, yellow, orange, red”. “When each of the colours was separately paired with a “neutral” white field, red and orange stood out as strongly aversive, blue and green as mildly attractive” (Humphrey, 1976, p.97). Humphrey & Keebie (1974) found that rhesus monkeys were reacting to red light in the same way as they react to fear, and Humphrey (1976) points to similar results with baboons and pigeons. Studies with humans (e.g. (Goldstein, 1942 ; Jacobs & Suess, 1975) have shown similar preferences i.e. red and yellow as being less pleasant, with blue and green experienced as most pleasant.

More recently Elliot et al. (2007, p.154) showed that the “brief perception of red prior to an important test (e.g. IQ test) impairs performance”, suggesting that this happens outside of conscious awareness. Conducting a variety of priming experiments that use red, green, white and black as priming colours presented briefly and incidentally, they show significant impairment in performance when red is primed, see Figure 6 below.

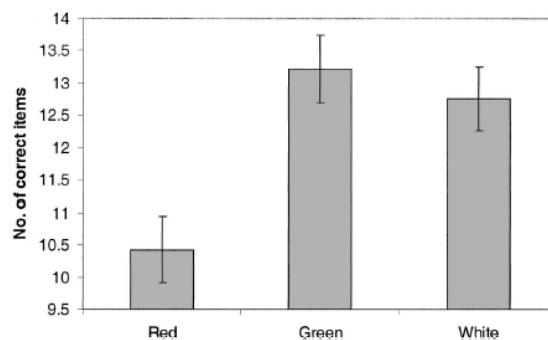


Figure 6: From Elliot (2007) The effect of colour priming on IQ test performance.

Elliot et al. (2007, p.166) also found, given the chance to choose question difficulty, those primed with red selected a greater number of easy problems, (See Figure 7 below). Taking the results across 6 different experiments, they conclude with the following comment: “We suspect that the influence of colour on psychological functioning is as pervasive as it is subtle and provocative, and we urge other researchers to join us in adding colour, literally and figuratively, to the scientific literature”. They argue that previously inconclusive findings of research in this area are due to poor experimental design.

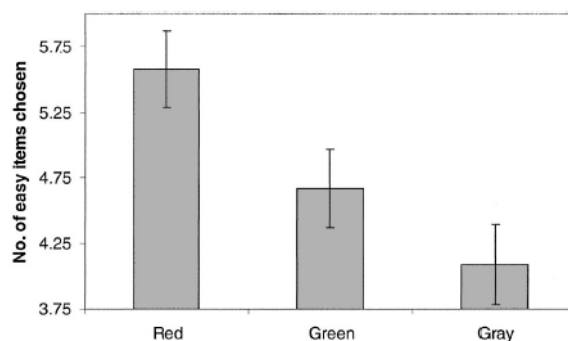


Figure 7: From Elliot (2007) The effect of colour priming on choice of question difficulty

Kuhbandner & Pekrun (2013) demonstrated that memory is improved when information is associated with induced positive or negative emotion, compared to information provided with no induced emotion. Interestingly, memory is further enhanced when the induced emotion is associated with a congruent colour, e.g. negative words with red and positive words with green. They found no impact of green for negative words or red for positive words.

Meiers et al. (2004) found people's evaluations in categorization tasks were faster and more accurate when valence matched brightness, i.e. brightness was associated with positive items and darkness associated with negative items. These findings could be seen to align to responses of trader A in table 2, where gains were coded as increases in brightness of the pot of money and losses coded as the colour becoming dull.

The above research suggests that qualia/sub-modalities (e.g. colour, brightness, hue, etc.) of the visual modality of mental representation may have some psychological impact and or alter the emotion associated with the representation. The work on primates and humans suggests red would have a greater impact in negative situations than other colours. Considering trader example B from table 2 with the encoding of losses as red and gains as white, the research referenced would suggest that the loss might have greater affect. This is argued to provide some plausibility for proposition four. However, it must also be considered that affect could be driving the encoding; when affect is negative, this results in the encoding of the representation red. Either way, the above priming based experiments indicate that there may be value in future research looking at the impact of colour on judgment and decision-making biases and heuristics.

3.5 Conclusions and implications for future research

The opening research questions in this study, developed to meet both research and client needs, were:

1. What are the cognitive and affective patterns (heuristics) associated with judgments and decisions that diverge from trading strategy and money management? In particular when an expected/reasonable series of losses are experienced.
2. What forms of intervention may be helpful in avoiding divergence from trading strategy and money management following similar runs of losses?

Analysis of observations and semi-structured interviews identified a common cognitive and affective pattern shared by the traders participating in this study. This pattern is grounded in the metaphoric mental representation of their trading P&L accounts. Mental representations that are adjusted in response to individual losses and gains resulting from individual trades. The analogue nature of the adjustments made to these abstract representations, via a series of propositions, are posited to instigate irrational levels of emotion that trigger the observed breaks from both trading strategy and money management. The propositions are therefore argued to provide a plausible but provisional answer to question 1 above, furthermore, to provide insight for question 2 to consider.

The answer is described as plausible as the propositions have been reviewed for support in a select range of psychological literature, and thus completing the third stage of the full cycle approach (see page 19). Having found both historical and contemporary research in support of all four propositions but having identified a very limited amount of literature that relates such findings within JDM research a number of directions for further research are indicated which are discussed in Section 7 of this thesis. These questions relate to a more detailed examination of the phenomena observed, and to theories and methodologies in the field judgement and decision making.

The propositions are described as provisional answers to question 1 as the propositions are yet to be tested through field or lab based experiments in the fourth and final step of the research cycle. This final stage of the cycle is to be implemented post completion of this thesis based on the following recommendations for future research.

Research exploring the relationship between emotion and trader decision making and performance has explored a variety of perspectives, for example;

- the role of more experience and assumed expertise, for example, Fenton-O’Creevy et al. (2012) in which stronger emotional regulation was observed in more experienced traders;

- the efficacy of different emotion regulation strategies, e.g. intrapersonal processes (Shalini, 2018), antecedent-focused versus response-focused strategies (Fenton-O’Creevy, et al., 2011);
- the correlation between emotion expressed in a trader’s instant messages and a trader’s profitability and actual trading behaviour (Lui et al., 2016), here high and low levels of emotion relative to baselines correlated with lower performance, while traders expressing moderate emotions made relatively profitable traders.

Research exploring causes and influences on trader’s emotions vary from the role of market volatility (Lo and Repin, 2002), to morning sunshine (Hirshleifer and Shumway, 2003), to hormones in particular testosterone and cortisol (Bose et al., 2020; Cueva et al., 2015), and beyond. However, no studies were identified that explore a trader’s mental representations of the constructs within trading, e.g. the mental representation of their P&L account, and a possible relationship with emotion and subsequent decision making.

The regulation of a trader’s emotion is argued to be essential but that it needs to be more nuanced than simple repression of emotion as emotion is an important source of information for trader decision making and higher performance (Fenton-O’Creevy, et al., 2011). Thus, it is posited that a contribution of this study, assuming the interventions described in the following section are efficacious, is the nuanced development of emotional regulation. The emotional response investigated by this study is an “irrational” unwelcomed emotion, that does not contribute information of the type described by Fenton, et al. (2011); thus the possibility to eradicate it without a generalised strategy of emotional suppression may offer an important contribution to performance.

3.5.1 Stage 4 recommendations for future research – trader interventions

The literature review relating to the traders’ mental representations of P&L suggests the analogue representations are developed during childhood as embodied conceptualisations of magnitude, thus, the representations follow the image schema of more is up or higher. Additionally, the qualia of the representations also map to metaphors that conceptualise improvement/gain and degradation/loss. Experiments that have tested the basis for conceptual metaphors playing a role in cognition (see section 4.4 below) have shown that priming metaphors in language, in the environment i.e. via sensory experience (e.g. soft versus hard chair, hot versus cold drink, bad smell etc.) alter decision making and judgements.

The following are thus considered for future research to answer the initial research question:

“What forms of intervention may be helpful in avoiding divergence from trading strategy and money management following similar runs of losses?”

Could external cue's or primes interrupt or modify the traders' mental representations of P&L and if the propositions are correct, alter the emotional response to small losses, and so prevent the triggering of errant trading behaviours. Additionally, or alternatively, deliberate attention towards these previously subconscious representations and either deliberate changes or mental suppression of the mental representations may again moderate the emotional responses to small losses.

Traders can't ignore their P&Ls, they will see the number on their screen at some point, however, they can alter the frequency and form in which it is presented and reviewed. It can be represented in numbers and or in different graphical forms, both of which can be presented in different sizes, locations, colours, brightness and contrasts. Thus, the modalities and qualia can be adjusted that either match or mismatch the subconscious representations of P&L and or prime different metaphors or aspects of image schema. For example;

- P&L account could be shown on a screen some distance from the trader in direction that represents the future (for most western cultures – far to the right) and only be shown at the end of each day. [Out of sight is out of mind, further to look/move is further into the future]
- Losses could be coloured green instead of red, or a neutral colour deemed pleasant, e.g. blue or turquoise. [Red is danger and intense emotion, turquoise is tranquillity]
- Graphs can be scaled so change in P&L is difficult to detect visually. [Too small to detect is too small to matter]
- The location of the number or graph could move higher when a loss occurs and thus confusing the verticality schema. [Interrupt less is lower, with upward movement]

Deliberate mindful changes to the mental representations is also a possible form of intervention. This can be in the form of suppressing/removing the representation, however, this is hypothesised to be difficult based on the theories associated with the embodiment of numbers/mathematics (Lakoff and Nunez, 2000). If this proves to be the case the deliberate construction of a representation that avoids the issues of weber's law and other negative qualia coding is a possible solution to be tested. For example:

- Instead of a pot of gold, a large vessel that contains grains of gold (like sand) could be represented, with a loss being processed as the removal of a grain or two of sand. This then interrupts JND of weber law. It also interrupts change in volume and intensity of colour, although colour could also be manipulated to see if it attenuates emotion. E.g. what if the representation was black and white, or of a lower intensity of light.

Again, the changes would be manipulations in accordance with culturally appropriate metaphors and image schema.

Future research is therefore recommended to comprise of a combination of external cue manipulations and coached mindful manipulations of internal representations, with the measures being the nature and intensity of emotions experienced and the degree of adherence to trading strategy and money management following a series of small losses.

3.5.2 The role of conceptual metaphor in decision making, and decision-making research

Considering the calls for greater understanding of the underlying cognitive processes of decision heuristics and biases (Weber, 2008; Hastie, 2001), study one's findings can be seen to make an initial contribution, or at least point to potentially fruitful directions of future research.

Taking a step back from the detail of study one i.e. the specific nature of the traders' representations, then another possibility for contribution and further research arises. During the field research, observations were made regarding the metaphors that traders used when describing their profit and loss, specifically in relation to gains and losses. These metaphors could have been dismissed as simply figurative language. Instead, they were investigated as part of the traders' experience with the possibility that they may have an important role in their decision behaviours and associated emotions; thus adopting a phenomenological position with regards to the experiences of the traders (Piccini, 2003).

The subsequent literature review found some support for the possibility that the metaphoric representations may indeed play a role in or point to the underlying cognitive processes involved in trader judgment and decision-making and associated emotions. The question thus arises, are there other conceptual metaphors that could underpin traders' thinking beyond representations of magnitude, conceptual metaphors that may also have significance in affect, judgment and decision-making and behaviours, and hence performance? Thus, could the analysis of metaphor arising from critical incident or similar form of research that produces

dialogue (verbal and non-verbal) provide insight into the underlying cognitive processes of judgment and decision making, and again integrate and link theories from diverse domains?

While the literature reviewed in section 3.4 was indeed drawn from diverse fields, Lakoff & Johnson (1980) was referenced as an important source and one that had important insights likely to be relevant to the concerns addressed by this thesis. In their seminal book, Lakoff & Johnson (1980, p.3) introduced conceptual metaphor theory, proposing, “our ordinary conceptual system, in terms of which we both think and act, is fundamentally metaphorical in nature.” The observations and subsequent propositions developed in relation to the traders appear to support Lakoff & Johnson’s conceptual metaphor theory and this theory provided the basis for developing the primary research questions pursued by Study 2 in this thesis:

1. Are traders using conceptual metaphors beyond representations of magnitude?
2. If so, is there evidence for the cognitive metaphors identified playing a significant role in judgment and decision-making and associated affect?

The following section describes Study 2, which seeks to address questions 1 & 2 above. It starts by describing conceptual metaphor theory (CMT) and examining current research that connects CMT with judgment and decision-making. It then reports Study 2, which comprises a detailed metaphor analysis of trader discourse. It concludes by examining the potential implications of the regularly used conceptual metaphors with reference to psychological literature.

4. STUDY 2: Trader Metaphors

4.1 Introduction

This study considers the role embodied cognitive metaphors may play in traders' judgement and decision-making, and the potential value of examining cognition through the analysis of metaphor in discourse for understanding and improving performance. In addressing the three questions below, it draws on discourse from a BBC documentary on traders, as a source of reliable and accessible data, and utilises the established standard of metaphor analysis developed and agreed by the Pragglejaz group of academics for the identification of metaphors.

1. Are traders using conceptual metaphors beyond representations of magnitude?
2. If so, is there evidence that could indicate the cognitive metaphors identified playing a significant role in judgment and decision-making and associated affect?

The chapter starts by introducing cognitive metaphor theory (CMT), placing it in the field of cognitive linguistics, and describing its emergent application in JDM research. CMT is not without controversy, and the opposing positions regarding the theory are presented in this chapter for two reasons.

Firstly; one controversy with regard to CMT relates to the criticism that the evidence used to prove metaphors' role in cognition is circular. That is, metaphors are both identified in language, and argued to play a role in cognition because they are systematically used in language; thus, identification and proof have the same source. Study one reached beyond language for evidence of the role of metaphor in cognition and thus contributes to this debate on the side of CMT, a contribution that study two may replicate.

Secondly, some argue that metaphors that may have at one time been conceptual are now 'dead' metaphors. That is to say, they become detached from their source and so become simply a turn of phrase; for example, 'spending time' no longer activates a concept that relates time to money. One aspect of this debate relates to a proposition that there is a significant difference between language examined detached from context, and the same language examined in its context of use. Again, study one, and this present study, examine the relationship between language and cognition in context and thus, have something to contribute to this debate.

4.2 A role for cognitive linguistics in JDM research

Conceptual metaphor theory sits within a specialist field of cognitive linguistics, which in turn sits within the domain of cognitive science; a domain which includes cognitive psychology, artificial intelligence, neuroscience, linguistics, and cognitive anthropology (Von Eckardt, 1995).

Cognitive linguistics (CL) is rooted in the emergence of cognitive science in the 60's and 70's, with research expanding significantly in the 90's, ultimately leading to the establishment of the International Cognitive Linguistics Society and the launch of the Journal "Cognitive Linguistics" in 1989/90 (Evans & Green, 2006).

Cognitive linguistics in itself is a wide-ranging field that involves many topics including; language in use, cognitive grammar, cognitive semantics, embodiment and conceptual structure, image schema, categorisation, metaphor and metonymy (Evans & Green, 2006; Geeraerts, 2006). It is important to recognise that CL it is not a field defined by any one theory or paradigm accepted by all across, or indeed within, its constituent disciplines. Instead, the field is defined by some key shared principles/assumptions (Evans & Green, 2006; Von Eckardt 1995). To remain relevant to the current two of the recognised principles/assumptions are focused on.

Cognitive linguistics Assumption 1:

Language reflects patterns of thought; therefore, language offers a window into cognitive function and can provide "insight into the nature, structure and organisation of thoughts and ideas" (Evans & Green, 2006, p.5)

This is an interesting assumption relating to the initial research, and if correct, could offer a significant contribution to JDM research. Recent literature reviewing the JDM field (Weber, 2008; Hastie, 2001), include calls for new methodologies and research that can provide insight into the mental/cognitive processes that underlie well-documented biases and heuristics. This insight is considered important for developing pragmatic interventions to improve judgment and decision-making in multiple contexts (Hastie, 2001).

Cognitive linguistics Assumption 2:

Language creates frames/scenes of experience, constructing context; frames invoke/bring forward knowledge/conceptual structures. (Evans & Green, 2006)

Whilst there is a considerable body of research on framing and priming reported in the JDM literature, e.g. (Levin and Schneider, 1998). When taken in conjunction with assumption 1 above, the detailed investigations and insights into the relationship between language and cognition within CL has the potential to expand the scope of JDM framing research significantly, and at the same time contribute to adding detail to descriptions of the processes implied in dual process theories within JDM (Hastie, 2001; Evans, 2007).

As the findings from study 1 were associated with conceptual metaphor theory and this study is directed towards considering the extent and implications of the role conceptual metaphors the remaining introduction and review focus on conceptual metaphor theory.

4.3 Introducing conceptual metaphor theory

Although Aristotle defined metaphor as a linguistic device for comparison and to prompt the insight into how things are similar, for much of history metaphors were seen as, or dismissed as merely stylistic, ornamental figures of speech (Landau, Meier, & Keefer, 2010). More recently, in the 70's and 80's, philosophers investigating human symbolism began to consider metaphor as an important element of human cognition utilized in understanding abstract ideas (Kovecses, 2007).

In 1980, George Lakoff and Mark Johnson published the seminal book, "Metaphors We Live By" introducing conceptual metaphor theory in which metaphor is positioned as a fundamental component of human cognition. In harmony with the broader field of cognitive linguistics, Lakoff and Johnson make reference to one of its core assumptions: "Since communication is based on the same system that we use in thinking and acting, language is an important source of evidence for what that system is like" (p.3).

The central proposition of the book is that metaphor is not just a "device of the poetic imagination and the rhetorical flourish"; rather, "metaphor is pervasive in everyday life, not just in language but in terms of thought and action. Our ordinary conceptual system, in terms of which we both think and act, is fundamentally metaphorical."(p.3) This proposition is supported by the findings from study 1 in this thesis, is still a subject of debate in cognitive linguistics.

Lakoff and Johnson (L&J) proposed that we ground our understanding of abstract domains upon conceptual structures derived from our experience of the physical. For example, the abstract *target* concept of 'love' is conceptualized in terms of the *source* experiential concept of a 'journey'. LOVE IS A JOURNEY; for example;

“Look how *far we’ve come*.
 We’re *at a crossroads*.
 We’ll just have to *go our separate ways*.
 We can’t *turn back now*.
 I don’t think this relationship is *going anywhere*.
 It’s been a *long, bumpy road*.
 We’re just *spinning our wheels*.”

Some of the above are more easily recognised as metaphor, e.g. “long, bumpy road” however some may pass us by without us recognising them as being an example of metaphor, e.g. “how far we have come”. L&J categorize the conceptual metaphor; LOVE IS A JOURNEY, as a ‘*structural metaphor*’, “where one concept is metaphorically structured in terms of another”. *Structural metaphors* are contrasted with, amongst others, ‘*orientation metaphors*’ which “instead organise a whole system of concepts with respect to one another”. Orientation metaphors are spatial, they draw on the experience of our bodies in relation to space and gravity, for example, up-down, forwards-backwards, front-back, large-small, in-out, on-off, deep-shallow etc.

Examples:

I am feeling *down* today
 I’m in *high* spirits
 I’m feeling *low*
 I need to put this *behind me*
 I am *in* trouble

L&J identify general patterns in these orientation metaphors; good is *up*, and bad is *down*. They see this pattern applying across contexts, whether we are talking about emotions, health, power, numbers, virtue, *up* or *higher* is generally good, *down* or *lower* is generally bad, hence *up-down* forming an orientation system.

It may be surprising to see ‘*in*’ in the above statement categorized as a metaphoric term. L&J argue for ‘*in*’ as a metaphor based on the *CONTAINER* conceptual metaphor, we are ‘*in*’ something or ‘*out*’ of something, for example, love, trouble or debt could take the role of container.

Identifying ‘*in*’ as a metaphoric term is maybe surprising for many outside of metaphor research, and is controversial within. Indeed, one of the issues identified in research into metaphor is the lack of consistency in the identification and acceptance of what should be or could be classified as metaphor within dialogue or any other form of communication (Cameron, 2010), including gesture (Cienki, 2010). To overcome this classification issue a group of leading researchers, known as the Pragglejazz group (Cameron & Maslen, 2010; Gibbs, 2011) have defined a process called the “metaphor identification procedure” (MIP) (Group, 2007), for categorizing a term as being metaphoric.

However, even if the processes of identification and classification of metaphor are consistent, there are competing theories regarding the role identified metaphors play in cognition with CMT often placed at the centre of the debate (Gibbs, 2011). Since Study 1 has identified conceptual metaphor theory as being particularly relevant, the following discussion outlines the debate surrounding conceptual metaphor theory.

There is however a shared view that conceptual metaphor theory has not only significantly impacted the development of linguistics research and theory (Cameron & Deignan, 2006; Fauconnier & Turner, 2008; Gibbs, 2011; Kovecses, 2011; Lakoff, 2008; McGlone, 2007; Steen, 2011), but has also become the basis for research in philosophy, artificial intelligence, cultural anthropology, literary studies, political science and religion (McGlone, 2007), in scientific discovery, design, mathematical thinking and computer interfaces (Fauconnier & Turner, 2008). Fauconnier & Turner (2008) suggest that the analysis of discourse, to gain insight into patterns of cognition and conceptual structures, continues to deliver insights and findings across multiple fields. Whilst there is a shared view of the impact of conceptual metaphor theory (CMT), there is a divergence of views concerning the validity of the theory, and the validity of the form of evidence posited to support CMT.

Lakoff (2008), continues to defend the theory with few references to the challenges to CMT; indeed he suggests that many of the results from “Metaphors We Live By” (Lakoff & Johnson, 1980) have stood the test of time, even though the time of writing, was pre the era of “brain science and neural computation”(p.17). He argues that these new sciences provide richer explanations and “changes cognitive linguistics vastly, not the analyses themselves so much, but our understanding of how metaphor systems work”(p.37). Whilst Lakoff (2008) introduces complexity, emergence and context to CMT, he continues to place great emphasis on conventional metaphors and sees complexity and novelty arising from blends of conventional metaphors, so paying less attention to other contextual issues described by, for example, Cameron & Deignan (2006).

Critics of CMT can be roughly categorized into two groups. The first group challenges the validity of both CMT, and its supporting evidence (McGlone, 2007 and Steen, 2011), sometimes suggesting alternative theory e.g. structural similarity (Murphy, 1996,1997). The second group can be seen to support the principles of CMT whilst recognising CMT has limitations and so suggest refinements/developments believed necessary for a theory of metaphor to more accurately reflect its role in both cognition and communication (Gibbs & Berg 1999, 2011; Kovecses, 2011; Fauconnier & Turner, 2008; Cameron & Deignan, 2006; Richie, 2006).

A common argument proffered by the detracting group is that CMT suffers from the problem of circularity; conceptual metaphors are identified via their systematic use in language, and the proof that these are conceptual structures that exist in mind is from their systematic presence in language; therefore, the theory and the evidence is derived from the same source (e.g. McGlone, 2007; Murphy, 1996). Murphy (1996, p.200) states, “the empirical base for the theory must be expanded beyond linguistic phenomena”. McGlone (2007) sets out a three-step test that would need to be passed to provide some validity for CMT; Step 1: Identify an abstract concept (e.g. time or love) with associated idioms used within a certain culture that suggest the presence of conceptual metaphor. Step 2: Find a different culture in with the same abstract concept but consistently uses a different conceptual metaphor in relation to the abstract concept. Step 3: Provide non-linguistic evidence that the cultures think differently in relation to the abstract domain. McGlone suggests that CMT research has not ventured past step 1. McGlone (2007, p.109) also argues that CMT has been “vigorously challenged” by research in many fields, although fails to provide references for such research.

Gibbs (2011), who is from the supporting side of the debate, strongly refutes McGlone’s arguments and makes reference to significant bodies of non-linguistic and experimental research evidence that supports CMT. Gibbs cites evidence from across academic disciplines covering non-linguistic domains that include; psychophysical judgments about time and space, gestural systems, mathematics, music, dance, advertising, architecture etc. Similar supporting evidence relating to JDM is reviewed later in this proposal. Gibbs (2011, p.556) appears to be a particularly strong supporter of CMT stating, “unlike virtually every other theory of metaphor, CMT provides important insights into the interaction of embodiment, language, thought, and culture that points to a fuller integration of metaphor studies within cognitive science.” However, Gibbs is not uncritical and acknowledges issues with CMT and the need for;

- Refining methodology due to a previous lack of consistency and transparency in how metaphors are identified and analysed, making comparison and falsification difficult.
- Enhancement of theory to recognise the complexities and dynamic nature of metaphor development and meaning.
- Enhancement of theory to account for example, inflection, singular versus plural and other lexical and grammatical constraints.
- Refinement of categories of metaphor to recognise the explanatory value of distinguishing between primary and higher-level conceptual metaphors, with primary having direct experiential/ simulation basis supported by non-linguistic evidence in experimental and social psychology.

Gibbs is not alone in recognizing the need to enhance or refine CMT. Kovecses (2011) concludes that no single theory explains everything that is taking place in the cognition associated with metaphor, instead suggesting that co-operation between complementary theories and research is required.

Fauconnier & Turner (2008), via theoretical argument illustrated with examples, propose that the stable single mappings in CMT do not reflect even simple metaphors in practice e.g. TIME IS SPACE. They argue that conceptual products are never the result of a single mapping e.g. Time and Space instead result from dynamic blending of multiple mappings. For example, even a simple statement like “time is rushing by” draws on more than space, it also maps to speed in relation to urgency or pressure. These multiple mappings are termed integration networks. Integration networks are proposed to have more fluid emergent properties that mix on the fly structures and mappings than conventional structures and mappings. They are seen as emergent due to the influence of, and integration with, other mental operations, e.g. framings, categorisation, and influenced by context, culture and agency. Furthermore, they suggest that the lack of attention towards the complexities of metaphor and language in use means “much of what is going on in (TIME IS SPACE) metaphor has gone unnoticed, and unexplained” (p.54).

Cameron & Deignan (2006, p.672) argue that CMT created problems for itself and for theory in general by dislodging attention from language in use, leading to ignorance towards “the possible explanatory power of an individual’s previous experience with language”. They argue that context and experience of the individual has a significant role in determining the meaning of a metaphor, and by focusing on the systematic use of metaphors to derive generalised mappings CMT misses these subtleties in meaning. They argue that a theory of metaphor must address these complicating factors.

With some similarity to Fauconnier & Turner (2008), except considering more factors, Cameron & Deignan (2006) propose an emergentist framework to explain what they see as a dynamic complex system of interconnected factors, i.e. linguistic, cognitive, affective, physical and cultural. Seeing language and thought as a two-way interaction, the reconnection of language in use is argued essential. They introduce the term “metaphoreme” (p.674) to replace metaphor to distinguish between the stable notion of the metaphor with the dynamic, complex, emergent and unpredictable nature of meaning. A metaphoreme recognises language experience and evolution (including culture and specific context) alongside multiple cognitive mappings, and includes the linguistic, semantic, pragmatic, and affective qualities (beliefs, attitudes, values and emotions) of metaphor in use. Cameron (2010, p.77) develops a “discourse dynamics framework for metaphor” arguing that metaphor is not reducible to its linguistic, cognitive, bodily, affective, socio-cultural components, and can only be explained through discourse dynamics, i.e. understanding how these components interact in real time.

Ritchie (2006) develops the context-limited simulation theory of metaphor, like Cameron recognising the need to enhance other approaches, Richie seeks to enrich metaphor analysis through emphasis on the nuances of perception, emotion and expression. Building on Barsalou’s (1999) perceptual simulation model, which considers the dynamic interaction between a perceptual neural system and a conceptual neural system, Richie suggests a metaphor is realised through the activation of perceptual simulators, which in turn activate schemas in the conceptual neural system, from which an expressive utterance is chosen. Interpretation of a metaphor is achieved by enhancing the activation of context-relevant perceptual simulators, whilst suppressing context-irrelevant perceptual simulators. Richie argues that context-limited simulation theory enhances current theory by identifying nuances of perception, thought, and affect voiced by a metaphor in the particular context in which was expressed. This can also explain why conceptual metaphors, removed from context, do not show anticipated effects in the lab, i.e. the metaphor is taken as literal in the lab because it is not used in a context in which it would be processed as metaphor.

The findings from the first study can be seen to support for developing/modifying CMT based on the following rationale. The refinements of CMT proposed by Cameron (2010) and Richie (2006) require contextual factors to be considered in the analysis of metaphor. This requires the researcher to go beyond identifying systematic usage of metaphor, and to recognising particular meaning in particular contexts. The refinements suggested by Fauconnier & Turner (2008) suggest the needs to consider the blending of metaphor is necessary to make sense of metaphors and understand their cognitive and embodied functioning. These are indeed the confirmed by

Study 1, in which very different metaphoric representations are connected to a shared singular concept, and thus could only be made sense of and thus be assessed in relation to their context. Furthermore, the functioning of the metaphoric representations relied on changes in qualia of representation, which in themselves are metaphoric. For example, changes in the height of the representation, with higher/lower being metaphor; thus, the meaningful functioning in this instance is from a blend of;

- the metaphoric content of the representation – a visual (flight) counter
- the metaphoric change in colour – white is good, red is alarming
- the metaphoric change in height – more is up, less is down

As previously mentioned, JDM research literature is as of yet limited in relation to the findings from study one. The following section reviews literature emanating from a new and growing interest in metaphor in relation to judgment and decision making, which is mainly published beyond the main JDM journals.. As will be seen to date, and perhaps because the research is conducted from the lab rather than in the field, the metaphors are examined in the singular rather than in blends like those discovered in study one.

4.4 CMT associated with JDM

As described above critics of CMT argue the evidence for CMT is circular, the phenomena and proof are both based in language usage. Gibbs (2011) argues that such critics have failed to review a significant body of non-linguistic evidence generated from diverse academic fields. This section reviews recent research on metaphor associated with judgment and decision-making that uses non-linguistic experiments to provide evidence for CMT demonstrating that cognition is at least in part based on metaphor.

Decision research has demonstrated that choices are influenced by moral and social considerations (Tetlock, 1997), CMT argues that the *moral* and the *social* comprise abstract domains, e.g. relationship, fairness, trust, personality etc. and as abstract domains they are conceptualised via concrete *source* concepts e.g. distance (close / distant), heat (warmth, coldness) (Lakoff & Johnson, 1980; Kovecses, 2007), with ‘*primary*’ concepts or metaphors based on bodily experiences (Lakoff & Johnson, 1980; Gibbs, 1999, 2011).

Lee & Schwarz (2014) review contemporary research that uses priming to invoke embodied (primary) metaphors (e.g. warmth) that have been related to factors (e.g. trust) known to

influence decisions. Moral behaviour is metaphorically associated with cleanliness or physical purity, e.g. “getting your hands dirty”, wash your mouth out”, “I washed my hands of that”, “dirty mouth”. Zhong & Liljenquist (2006) demonstrated asking people to recall immoral acts, or simply getting them to copy out a story of another’s immoral acts, significantly increases the appeal of cleaning products. Bilz (2012) using mock legal trials, found that participants who are required to use “dirty evidence” had a preference for a bottle of hand cleanser over a pen as a free gift. Lee & Schwarz (2014) provide examples across a range of factors; a selection is summarized in table 3 below.

Table 3: Embodied metaphors impacting mental construal and choice behaviours (Lee & Schwarz (2014))

Metaphorical cues with social meaning	Fishy and Suspicious	Introduction of a faint fish smell compared to neutral or other unpleasant odour, reduced apparent trust in trust-based game (Lee & Schwarz, 2012)
	Warm and trustworthy	Holding a warm or cold object influences the perception of personality – warm or cold person, also impacting social caring behaviour (Williams & Bargh, 2008)
		Incidental physical warmth increases trust in trust game (Kang et al., 2011)
	Hard and unyielding	Sitting on hard versus soft chair impacts how hard the participant negotiated a deal (Ackerman et al., 2010)
Sitting on a hard versus soft chair when reading crime scenarios increased severity of sentence (Cherkassiky et al., 2012)		
Metaphorical cues with Moral Meanings	Moral and physical purity	People induced to lie via voicemail preferred mouthwash over hand wash, people induced to lie via email preferred hand wash over mouthwash (Lee & Schwarz 2011)
	Walking in the light	Wearing tinted versus clear glasses induced less generous behaviours in a dictator game (Dong et al., 2015)
Other Metaphors	Heavy and important	Weight of a clipboard given to participants influenced funding judgments (Ackerman et al. 2010)
		Adding weight to a book increased perception of its importance and influence, if people had some knowledge of the book (Chandler et al., 2012)
	Washing away past good or bad luck and other residue (illusion of control)	Priming effects of recall of good or bad luck was removed by getting participants to wash their hands between activities (Xu et al., 2012)
		People who wash their hands after failing a test were shown to be more optimistic about their performance in future tests (Kaspar, 2013)
Washing away post-decisional dissonance	With variability based on measures of tolerance and anxiety, post decisional dissonance was shown to be eliminated by wiping of the hands. (De Los Reyes et al., 2012)	

Additional examples of non-linguistic evidence for CMT relating to judgment /choice / preference / attitude and attention are summarized in table 4.

Table 4: Metaphor priming experiments

Good is up / bad is down	Ratings of symptoms of depression correlate with attention to areas of vertical space. High depression ratings correlate with attention to low areas of vertical space. (Meier and Robinson, 2004)
	Crawford et al. (2006) demonstrated individuals show higher recall for items perceived as positive if they are presented in a higher position.
Greater weight, increased significance	Jostmann, Lakens, & Schubert (2009) showed that increasing weight / heaviness impacts perceptions of social significance
Morality is clean	Priming physical disgust induced harsher moral assessments / judgments (Schnall et al., 2008)
Morality is bright	Sherman & Clore (2009) demonstrated an automatic association between darkness and low morality and lightness / white with high morality
Good is bright	Meier et al. (2004) found categorisation of words was faster and more accurate when their valence was aligned i.e. white-positive, black-negative
Self-improvement and distance	Wilson & Ross (2001) showed that perceived spatial distance impacted self-evaluation following success or failure. More distance more critical of self.
Anthropomorphic representation of market	Expectations of trends to continue were shown to be greater when metaphors were used that positioned the market as an active agent, versus an inanimate object (Morris et al., 2007).
Countries are people / bodies	Landau, Sullivan, & Greenberg (2009) showed that priming individuals with the need to protect their body from contamination lead to harsher attitudes regarding immigrants entering USA.

The evidence for CMT presented above only considers one aspect of each metaphor and it does not, in general, consider the interactions of metaphors, for example, changing location, scale, distance and brightness. Lee & Schwarz (2014, p.102) draw attention to this limitation and suggests looking at the interactions between the various factors/processes would be “promising avenues for future research”. Cameron (2010) and Ritchie (2006) argue metaphors are dynamic, and their meaning and effect is subject to multiple factors. Lee & Schwarz (2014, p.91) also echo Cameron (2010), Ritchie (2006) and Landau et al. (2009) in indicating “the need to test for the robustness of metaphorical effects on decisions with varying degrees of constraint in natural contexts”.

This establishes contribution from the findings from Study 1 herein i.e. it is testing/observing metaphoric effects in natural contexts, and its looks at the interactions between factors (e.g.

movement, colour and object within the representation of P&L). The traders altered multiple factors/metaphors in their representations of their profit and loss (P&L) accounts e.g. location, size and colour. Also, one trader contrasted his representation of his P&L account between two contexts, one in which P&L was measured as an individual and one in which it was measured only as a team total. In the latter situation involving team P&L, the trader described the representation as being “foggy”, “faded” and it feeling “more distant”. Context is thus shown as important in examining the role of metaphor in cognition, affect and behaviour.

Except for one reference, the literature discussed above was reported in non-JDM journals. Indeed, database searches combining ‘conceptual metaphor theory’ and ‘decision making’ failed to produce results. A simplified search using ‘metaphor’ instead of ‘conceptual metaphor theory’ produced a list of 14 references, however, except of one reference, already reported above, the term metaphor was used incidentally with no consideration of metaphor having a role in cognition.

A search within JDM journals including, *Organisational Behaviour and Human Decision Processes*, and *Journal of Behavioural Decision Making*, for reference to conceptual metaphor theory produced limited results with the majority relating to perceptions of leadership, time or money. This suggests the application of conceptual metaphor theory within JDM is new and novel; and based on the indications above, potentially fruitful. It also reinforces the call for the fields of cognitive psychology and JDM to work more collaboratively (see Hastie 2001, Weber & Johnson 2008), indeed the *Judgment and Decision Making* journal dedicated a special issue (Vol. 3. March 2008) to encourage cross-fertilization between cognitive psychology and decision research.

The realisation that cross-fertilisation may be of value is not new; in 2001 a conference on psychology and economics was held in Brussels with the expressed goal of encouraging psychologists and behavioural economists to work together (Brocas and Carrillo, 2003). Whilst the psychologists seem to be taking an interest in decision-making; based on the review of JDM research in relation cognitive linguistic psychology, it would appear that JDM research is not pursuing insights from cognitive psychology at an equivalent rate (Newell and Broder, 2008).

Study one resulted in the integration of theories from multiple fields, such studies are therefore posited to contribute to the cross-fertilisation of fields. On the evidence of the study cross-fertilisation/integration is necessary to fully understand psychology in practice, and therefore strengthen the potential to develop efficacious solutions for performance improvement.

Study two again looks at language used in practice, in context, and thus has the potential to contribute in the manner of study one, in addition to addressing the questions previously raised:

1. Are the traders using conceptual metaphors beyond representations of magnitude?
2. If so, is there evidence that could support the proposition that the cognitive metaphors identified play a significant role in judgment and decision-making and associated affect?
3. If so, could theory and methodology from cognitive linguistics and in particular metaphor, if applied within judgment and decision-making, enable insights into the well-documented heuristics and biases?

The following sections now describe the methodology, analysis, results and implications of study two.

4.5 Methodology

The methodology is presented in three sections. Firstly, the choice of the data source to use in this study is discussed, including the benefits and limitations associated with the selection made. Secondly, the process of transcription and data preparation is described. The third section then details the methodology used to identify metaphor-based terms within the data methodologically.

4.5.1 Data source

The source data for this study is a documentary program produced by the British Broadcasting Company (BBC) titled “Traders: Millions by The Minute”. The documentary comprised two episodes, first aired in September 2014 and recorded in the same year; the first focused on professional traders, the second on amateur or independent traders. This study is based on a transcription of episode one, which includes interviews of professional traders. In addition to trader discourse the documentary includes narration and commentary from the BBC, these are not included within the study, only utterances from the traders themselves are included.

The data source was selected for the study as direct access to live traders is limited and valuable, and so was reserved for future studies directed towards intervention, rather than directed towards addressing theoretic questions as in this instance. In the absence of direct access to traders, pre-recorded video-based data was chosen as the preferred alternative. This

form of data has limitations; however, it has advantages over other potential sources of trader discourse, the limitations of which are included in table 5 below.

Table 5: Sources of discourse data and their limitations

Potential Discourse Data Source	Limitations
Magazine interviews of traders	<ul style="list-style-type: none"> • Editorial decisions unknown. • Context of interview is not fully known. • Nature of questions asked and framing not fully known. • Agenda of interviewer and interviewee no fully known. • Cannot know for certain if quotations are accurate, verbatim answers or edited to fit the report or editor's goals. • No tonality or other qualities of speech and no observable gestures
Books written about traders	<ul style="list-style-type: none"> • Editorial decisions unknown. • Context of interview is not fully known. • Nature of questions asked and framing not fully known. • Agenda of interviewer and interviewee no fully known. • Cannot know for certain if quotations are accurate, verbatim answers, or edited to fit the writer's or publisher's goals. • No tonality or other qualities of speech and no observable gestures.
Books written by traders	<ul style="list-style-type: none"> • Editorial decisions unknown. • Agenda of writer unknown, may be subject significant impression management and not be reflective of language used when trading. • Book may be written by ghost writer, so may not be reflective of trader language. • Book may be edited by publishing company therefore not reflective of trader language. • Multiple books and samples from each would be required for the study to be representative, committing considerable resource & compounding the above limitations. • No tonality or other qualities of speech and no observable gestures.
On-line trader discussion forums	<ul style="list-style-type: none"> • Public forums do not enable any differentiation between amateur traders and experienced traders • Experienced traders rarely join public forums • Forums are used by salespeople to promote trading strategies/products • Because of the above its not possible to reliably identify experienced trader dialogue from other dialogue • Dialogue forms used in short messages do not reflect the dialogue used in normal dialogue • No tonality or other qualities of speech and no observable gestures.

In comparison to the above sources of data; the visible presence of the traders in the documentary means there is reasonable certainty that the traders generate the dialogue. Additionally, the different styles of dialogue suggest that their discourse is not scripted. The documentary is, however, heavily edited. Without access to the producers, it is not possible to know if there were any specific goals or motivations associated with the editorial decisions made in the production of the final program. For example, it is not possible to rule out the

possibility that it has been edited to portray a particular stereotype of traders and the city. Even if the intention was to produce a fully balanced perspective, it will necessarily have been produced with a certain audience in mind, by people with beliefs, values and perceptions of the city and the role of traders. Therefore, the discourse may be skewed and be a limited/selective representation of the language used by traders; even in light of the BBC's principle of producing a balanced perspective (see the Royal Charter for the continuance of the British Broadcasting Corporation).

Regarding coverage of the general discourse of traders it's not possible to know;

- How many traders were filmed but not included? Therefore, it's not possible to know whether this is a fully representative sample.
- What criteria were used to select the traders to be filmed? It's not possible to know if these were chosen to be a representative sample of traders or to fit an unstated editorial objective.
- Of those that were filmed, how much of their material was left on the cutting room floor? Therefore, it's not possible to know whether this is a representative sample of the language used.

There are some indications of a desire to be representative, there is a mix of gender included in the filming, and a mix of locations (Chicago, New York, and London). Being a limited sample in terms of scope and quantity, and with the limitations highlighted above the study does not claim to be based on a full representative sample of the language used by traders, however, as described above the discourse provides a useful and accessible source answering the research question.

Considering limitations specific to metaphor analysis of discourse, it's also not possible to know the full contexts of the discourse;

- (a) Are there prior off-camera discussions with the interviewer?
- (b) Are the live trading commentaries prompted by questions that are edited out?
- (c) Are the live trading events really live or are the role played based on live or scripted events?
- (d) Are the commentaries the normal flow of behaviours and discourse or have the traders being asked to highlight certain aspects of their activities

- (e) Commentaries are sometimes made to the observer; these may deviate from the types of discourse and language that would naturally happen between traders.

Again, the above raises questions of representativeness. But also, importantly for metaphor research, it leaves open the possibility of priming by the interviewers and observers, i.e. are the interviews using clean open questions, or are they asking questions load with metaphors that the traders then utilise in their answers or comments.

Recognising the aforementioned limitations regarding representativeness, the data source was deemed suitable, particularly as the research question raised in the study could be answered even if the data was not fully representative. With the question referring to additional forms of metaphors used by traders, not by all traders, and to assess their possible implications for cognition and so affect and behaviours. This will inform the future research and strategy that may then seek a fully representative sample or alternatively may proceed case by case, on the basis of variance in contexts.

4.5.2 Transcription and preparation for metaphor analysis

The transcription and preparation process had three stages. The first stage involved editing the documentary video to only include dialogue from traders, i.e. editing out all narrator and other commentaries. Each trader included in the video was then assigned a reference label to provide unique coding for this study.

The second stage was the professional transcription and of the video file. A professional service firm was used to assist with the speed and accuracy of initial transcription, the transcriber was instructed to:

- Transcribe the video in series, i.e. as presented.
- Include the code for the specific trader against their piece of dialogue
- To mark out pauses in dialogue with three full stops “...” [Note: only pauses that could be observed. Otherwise, they may be time delays created by the editor rather than natural pauses in dialogue.]
- Where dialogue is not clear, to mark out that section, starting and ending with a “?”, signalling the start and end of the section which may be subject to transcription error based on obscure sound / poor voice quality.

Intonation coding was not requested as this would incur significant cost and would introduce subjective evaluations of the transcriber. And so, incur significant code checking, which would again be subjective, especially due to the absence of context and baseline speech data/information to know if there is any intended meaning of intonations used. After initial transcription, the data was split by intonation sections by the researcher as described in detail below.

The transcription produced by the service provider was checked by replaying the video and matching the dialogue to the transcription. Any dialogue that the author and the transcriber had different opinions on was checked the colleague used for the dual coding of the data. No data was left unresolved.

The third stage of preparation is the segmentation of the data into units suitable for metaphor identification and importantly to enable coding and referencing of the dialogue at appropriate levels of specificity. The most important criteria in segmenting the dialogue is to split the dialogue at points that maintain units of intonation or pauses therein. This is in respect to the idea that intonation units mark out different concepts held in mind. Pauses or changes in tone and or pitch are thought to indicate shifts in the concepts associated with the dialogue (Cameron & Maslen, 2010). In this study, this theory is tested by detailed metaphor analysis, i.e. the methodology is designed to identify mental concepts whether they are within, bounded by or run across intonation units. At the same time, the methodology looks for blends of metaphor, like those identified in study one, and posited by Fauconnier & Turner (2003, 2008). Additionally, looking for coherence across metaphors that indicate conceptual structure applied in a context, by individuals, and potentially as a professional group.

As the text was segmented, each segment was coded with the topic of dialogue. The topic is the subject of the utterance and so the target for any present metaphor(s). However, some segments of text contain more than one topic. Where this occurs, the segments have been kept as one segment and duplicated, rather than splitting to units by topic. This is done to assist in identifying cases where metaphors organise connections between topics.

Dual coding was utilised in this segmentation process and in subsequent metaphor identification and classification to increase the reliability of analysis. Metaphor identification has been criticised in the past due highly variable results arising from individual differences in interpretation as to what is metaphor (Steen, 2007), with reliability argue to increase through the application of multiple analysts (Patton, 1999) and through the application of a detailed identification methodology as per MPI process described below (Group, 2007). Using a second

coder who is independent of the research questions also addresses the potential for biased in metaphor identification in relation to their research aims. Segmentation into intonation units and topic coding were carried out independently by the author and one colleague. Once complete the segmentation choices and topics assigned were compared and where there were differences, they were discussed to arrive at a single agree split and topic. Topics were open to refinement during the detailed metaphor analysis phase, at this point detailed discussion and examination would take place, and time spent at this level of detail when defining topics would be redundant and duplicative.

The resulting transcript comprised 3113 words which were segmented into 261 intonation units with the Table 6 below showing the words and intonation unit number per trader included in the video and hence transcript.

Table 6: Trader word and intonation unit count

Trader #	Nationality	Gender	Words	Intonation units
1	UK	Male	621	54
2	UK	Male	779	70
3	US	Female	393	30
4	US	Female	318	24
5	US	Male	515	38
6	US	Male	487	46

As shown in the table above, airtime for traders is uneven. The editorial reasons for this are not known, however it could be assumed the skew towards UK traders is due to the program being produced in the UK. There is a clear skew towards male traders, in the numbers of traders selected and in terms of quantity of dialogue included. Again, the reason for this is not clear from the documentary. A survey conducted in 2016 should 95% of traders in the city of London were male (Bose et al., 2020). This has implications as there are differences in male and female metaphor usage (Eckert and McConnell-Ginet, 2013). This raises questions regarding influence over the metaphors used by female traders. For example, do female traders adopt male metaphors? if so, do they change their conceptualisation and so affect and behaviours when trading? These are interesting questions for future research as they can't be answered in this data set.

Having segmented the data and assigned categories of topics of which there were four; market, trading, success, and failure, the next stage of analysis was metaphor analysis, which applied the MIP process as described in the following section.

4.5.3 Metaphor Identification Process (MIP)

Distinguishing literal use of terms from metaphor use is core to metaphor research; however, inconsistencies in methods for doing so has been a source of criticism of metaphor research (Gibbs, 2011). In response to the criticisms, a group of leading researchers collectively known as the Pragglejaz group (Group, 2007) developed a four-stage process for identifying metaphor vehicle terms. This process was defined to enable consistency across metaphor research to enable theories/claims to be more reliably compared. The four-stage process is outlined below:

Metaphor Identification Process (MIP) (Group, 2007)

1. Establish a general understanding of the meaning of the discourse by reading the entire text.
2. Break the text down into lexical units (typically individual words or combination if a proper noun)
3. (a) Establish the contextual meaning of each lexical unit, considering surrounding text.
 (b) Determine if the lexical unit has a more basic meaning; more concrete, embodied, more precise, or historically older
 (c) If condition (b) is met then does the meaning of (b) relate to the concept in the current context (a) in a way that helps make sense / structure (a).
4. If the answer to (c) is yes, the lexical unit is considered and coded as metaphoric.

Some theorists (McGlone 2007, for example) argue that many conventionalised metaphors are ‘dead metaphors’, that neither the speaker nor the listener would process metaphorically, and therefore conceptually. Essentially making each of them a case of synonymy. For example, does the term “stay the course” relate to an underlying source domain of JOURNEY, as may be argued within CMT, or is it understood as an alternative synonymic term for “not changing plans” as argued by McGlone (2007). The argument being that terms lose their metaphorical status through the extended history of language development. That is to say, the original metaphoric meaning is lost over time, as new generations are exposed to the term in a natural setting.

This raises the argument about what should be coded as metaphorical and what should be coded as a dead metaphor, i.e. a term or phrase in regular usage that people adopt without any recourse to its long distant original metaphorical status.

Because the final stage of this study is to examine non-linguistic evidence for metaphor playing a role in cognition determining whether a metaphor is ‘dead’ or alive, is not prejudged in the analysis. Therefore, the Pragglejaz method is utilised with the assumption that all lexical units that meet the definition in step 3(b) are considered metaphoric, no matter how long ago in history the metaphoric mapping was established. Thus, taking the position that all metaphors are ‘alive’ in the current context. To resolve any questions of words being metaphoric, the Metaphor Map of English was consulted along with the MetaNet database.

4.5.4 Classification and description of metaphors

Having identified a lexical unit as metaphor; the metaphoric unit was then classified at two levels. Firstly, the type of conceptual metaphor was coded (Kovecses, 2007):

- *Ontological*: the representation of an abstract concept as something tangible, e.g. container, entity, or substance.
- *Orientalional*: the use of spatial relationship to represent abstract concepts, e.g. up/down, front/back, in/out, central/peripheral.
- *Structural*: a concept that has a sharply defined structure applied to describe/ conceptualise another concept, e.g. argument as war, business as sport.

Secondly, then the specific conceptual metaphor utilised was identified and coded, for example see underlined codes below;

- *Ontological*: Personification
- *Structural*: Sport
- *Structural*: War
- *Orientalional*: Verticality (higher/lower)

To support the accuracy and consistency of assigning lexical units to metaphor types and individual conceptual metaphors, both MetaNet (Berkley, 2018) and the Metaphor Map of English (Glasgow, 2020) were consulted.

For each lexical unit categorised as metaphor, as per the above, a brief description of the relationship between the metaphor source and the target was also recorded. For example;

- Ontological: Personification: market as a person [“the *market is deciding*”]
- Structural: Movement: price change as is a person/object leaving [“it’s about *to go*”]
- Structural: Harm: loss is physical damage [“I *took a beating* on that trade”]

The classification and description of the metaphors were again carried out by independent dual coding and the reconciliation of difference to provide a single list for analysis. Due to the application of the metaphor databases mentioned above, there was little disagreement between coders. With the exception of seven items, the only differences to resolve were based in the phrasing of the source/target description, which did not relate to differences in metaphors. The seven items that were not resolved, were not disagreements in interpretation, but due to lack of information from the data. Each of which could have been resolved via questioning of the subject, which is not possible. Additionally, full coding of all lexical units was not necessary to address the questions being examined by this study.

4.6 Findings

4.6.1 Metaphor density

This section seeks to contribute to answering the question, do traders use metaphors beyond the representation of their profit and loss accounts? It does so by looking at the metaphor density in the traders’ discourse. This measures the percentage of words within a discourse that can be attributed as being metaphoric. See Table 7 below for the analysis of metaphor density in the transcripts prepared from the BBC documentary.

Table 7: Metaphor density in trader discourse from BBC documentary

Trader #	Nationality	Gender	Words	Intonation units	Metaphor Words/Density(%)	Metaphor Phrase/Density (per thousand words)
1	UK	Male	621	54	122 / 20%	225
2	UK	Male	779	70	207 / 27%	295
3	US	Female	393	30	93 / 24%	310
4	US	Female	318	24	51 / 16%	213
5	US	Male	515	38	110 / 21%	289
6	US	Male	487	46	118 / 24%	256

Two densities are reported, the first counts each individual word in a phrase identified as metaphor, the second counts each phrase as a single item. This enables comparison to studies that have calculated density in either form.

The density appears to be greater in this discourse compared to general dialogue examined in other studies (Gee and Handford, 2014). However, it this could be an artefact of the BBC editing process, as studies show bias towards and benefits of discourse language that contains more metaphor, for example in conveying information, in learning and teaching, in learning, in attraction amongst others. Therefore, there may be a natural bias towards selecting dialogue from trader interviews that are heavier in metaphor density. Interestingly, trader 4 has the least dialogue in the documentary and the lowest metaphor density. The lower density maybe because there is less language and therefore less representative, or it could be that the editors were less engaged with their dialogue because it had lower metaphor density.

Metaphor density is subject to significant variability of methodology, e.g. what is counted as a metaphor versus dead metaphor, or what constitutes a phrase. However, the intention of this analysis is not to confirm exact percentages of density. The intention is to identify if there is an ongoing presence of metaphor in trader dialogue, which is confirmed by the reported densities, even allowing for significant variance in what is counted as metaphor. A proposition further confirmed by a number of other studies (Oberlechner et al., 2004). Traders have reported their use of metaphor in their own dialogue or thinking; however, such studies directly ask traders about their metaphors and therefore could be seen to prime metaphor usage. In this study the dialogue is taken from a context in which metaphor is not the subject of study or questioning. Additionally, the metaphors used by traders are similar to those identified in general economic and financial market discourse (Gibbs, 2018).

Based on the above, the first part of the question being addressed by this study is posited as being answered in the affirmative, i.e. traders do routinely utilise metaphors beyond reference to their profit and loss accounts. The following section now turns to the content of the metaphors used, and their potential for biasing the thinking, affect and behaviours of traders.

4.6.2 Conceptual metaphors and their target concepts

The target topics identified as conceptualised via metaphor are grouped into four main categories, trading, markets, success and failure are shown in Table 8 below.

Table 8: Metaphor targets in trader discourse from BBC documentary

Trading	Markets	Success	Failure
Decisions	Status/State	Profit	Loss (metaphor)
A trade	Opinion	Being right	Money
Amount	Change	Success	Failure
Character	Fairness	Money	Emotion
Difficulty	Value/Price	Emotion	Performance
Crisis	Economy	Performance	(metaphor)
Money	Effect	(metaphor)	A trade
Profit	Rates	A trade	Time
Performance		Time	Progress/Status
(metaphor)		Progress/Status	
Price			
Persevering			
Risk			
Strategy			
Resources			
Thinking			

The target concepts identified in the table above are described, and so conceptualised, using the source conceptual metaphors listed below. The table below groups the conceptual metaphors into the three types of conceptual metaphors identified by Lakoff & Johnson (1980).

Table 9: Conceptual metaphor sources in trader discourse from BBC documentary

Trading	ONTOLOGICAL	(CONTAINER) (PERSONIFICATION) (OBJECT)
	STRUCTURAL	(CONSTRUCTION / PRODUCTION) (SPORT) (TERRITORY) (GAMBLING) (PHYSICAL HARM) (TIME) (VISION) (STANDING) (TAXATION) (LOCATION)
	ORIENTATIONAL	(VERTICALITY)
Markets	ONTOLOGICAL	(CONTAINER) (PERSONIFICATION) (OBJECT)
	STRUCTURAL	(SPORT) (TERRITORY) (GAMBLING) (PHYSICAL HARM) (TIME) (CUTTING) (FORCE) (SOUND) (WIDTH) (MOVEMENT) (RELATIONSHIP) (ILLNESS/HEALTH) (MACHINES)(WAR) (PREDATORY ANIMAL) (DISTANCE)
	ORIENTATIONAL	(VERTICALITY)
Success	ONTOLOGICAL	(CONTAINER) (PERSONIFICATION)
	STRUCTURAL	(CONSTRUCTION / PRODUCTION) (SPORT) (PHYSICAL HARM) (TIME) (SOUND) (LOCATION) (MOVEMENT) (JOURNEY)
	ORIENTATIONAL	(VERTICALITY)
Failure	ONTOLOGICAL	(CONTAINER) (PERSONIFICATION) (OBJECT)
	STRUCTURAL	(FIGHTING) (PHYSICAL HARM) (COMMUNICATION) (LOCATION) (WEALTH) (HANDOVER) (PAIN) (CONSTRUCTION) (LOSS) (DEPARTURE) (STRENGTH/FRAGILITY) (BREAK) (PREY/FOOD)
	ORIENTATIONAL	(DIRECTION) (VERTICALITY)

The conceptual metaphors listed in the table above relate to individual words or phrases in the dialogue, which typically blend several conceptual metaphors, for example:

“*Twitter just fell*”: This combines the ontological conceptual metaphor of PERSONIFICATION of a company/price *twitter*, with the structural metaphor of MOVEMENT, of falling.

“*Twitter is going to hurt now*”: This combines the ontological conceptual metaphor of PERSONIFICATION of a company/price *twitter* with the structural metaphor of MOVEMENT, of *going to* a new location which equates movement to a new location to a future anticipated event; and the structural metaphor of PHYSICAL HARM of being *hurt*, representing the loss of money/value.

These examples demonstrate the blending of metaphors and also the importance of analysing language in context. In the above examples ‘*Twitter*’ has been assessed as an example of PERSONIFICATION, however based on this text alone it could equally have been attributed as an example of the ontological metaphor – OBJECT. However, because of the surrounding discourse in which the trader regularly applies personification to entities, such as the market or organisations, and not OBJECTIFICATION, it is assumed a case of PERSONIFICATION. Indeed, all other traders apply PERSONIFICATION and not OBJECTIFICATION when applying metaphor to similar targets.

As discussed later, the need to make assumptions is due to the discourse being drawn from available corpora. If an interview was conducted with the same attention paid as per study one, then such metaphors would be examined through follow up questions and therefore the ambiguity would be removed, and much more detail about the mental simulations associated with the metaphor could have been elicited.

As mentioned above PERSONIFICATION is a frequently used conceptual metaphor in the traders’ discourse, and as shown is blended with structural metaphors to form coherent representations of a concept being described and conceptualised. The following section describes a number of common/typical blends drawn from the analysis of the discourse to answer the question being addressed by this study:

- Is there evidence of the cognitive metaphors used by trader playing a significant role in judgment and decision-making and associated affect?

4.6.3 Typical / frequently used metaphor blends

This section describes typical and frequent metaphor blends identified within the trader's discourse from the documentary. Intentionally this is not an exhaustive summary of the metaphor analysis; it is sample selected for further examination via the broader psychological literature to assess the plausibility of the propositions that metaphors applied by traders to concepts, beyond P&L, influence a trader's thinking, affect and behaviours. The potential implications on a trader's thinking, affect and behaviours are raised at the end of each of the following subsections as a proposition in the form of a question.

This focus aligns to the author's interest and focus on practice and utility, i.e. while it might be academically interesting to examine each metaphor blend identified in the analysis, if it is not first shown that such metaphors may impact performance, then the utility of such findings would be in question. Additionally, as discussed below, more detailed interviewing would be necessary to design efficacious interventions (as per study one), so again questioning the utility of examining all blends with the limited levels of detail available via this discourse. Thus, what follows is directed towards exploring the plausibility of the aforementioned proposition.

Samples were selected to ensure the inclusion of two of the three ONTOLOGICAL categories of metaphor; CONTAINER and PERSONIFICATION. Each example draws on a STRUCTURAL metaphor; thus, all samples cover the first two categories of conceptual metaphor. The ORIENTATION metaphor of VERTICALITY is frequently used by trader's in the documentary; however, it is not reviewed in this study as verticality was covered in study one, in which the trader's representation of P&L moving up as value increased and down as value decreased.

The final selection of samples was also guided by triangulation to other studies of metaphor usage in associated contexts, e.g. economics, market analysis and reporting.

4.6.3.1 *Personification metaphors*

The first set of examples in this category combine the PERSONIFICATION of the foreign exchange market(s) with the metaphor of MOVEMENT or LOCATION are targeted at concepts of price change or opinion.

- “when *the Market's moving very fast*”
[quick value/price change is - a PERSON MOVING fast]

- “take a look *at where the Market is*”
[a new value/price is – a PERSON in a new LOCATION]
- “*the Market’s been moving lower*”
[reducing value/price is – a PERSON MOVING to a POSITION of lower ALTITUDE/HEIGHT]
- “*the Market’s thinking has moved on this*”
[an opinion – is a PERSON MOVING POSITION on a SURFACE]

The first three examples above conceptualise value/price as a PERSON in a LOCATION, and changes in value/price as a MOVEMENT to a new POSITION/LOCATION. Because, in this conceptualisation, MOVEMENT is made by a PERSON, such MOVEMENT has intention/agency. Indeed, when trader believe they are in control, they conceptualise this as removing such agency as in the example below:

- “*push this market around*”

In this instance the movement of the PERSONIFIED market is achieved by an application of FORCE i.e. *pushing*. Thus, agency has been taken away from the market in this case.

A question arises from these forms of conceptualisation. Could the personification of value/price, and the implicit agency of this concept, alter the way traders perceive market trends? For example, does it increase a trader’s belief that a trend will continue as it is direction is associated with intentionality/agency. Similarly, in the fourth example provided above, does the PERSONIFICATION of the market as a single person, that has intentionally MOVED LOCATION with agency, add the perception of more certainty/validity in the interpreted opinion?

In the following examples of the foreign exchange market being PERSONIFIED agency can be seen to increase with intentionality directed at inflicting PHYSICAL HARM and or PAIN on the trader.

- “*It is brutal in how financial markets can grind you down*”
[reducing conviction – is REMOVING PHYSICAL BODY in an INHUMAN way]
- “*we’re going to get thumped*”
[failure - is MOVING to a LOCATION were PHYSICAL HARM will be done]

- “*you will be chewed up and spat out*”
[failure – is being PHYSICALLY HARMED by being *chewed* by an animal, that is focused on INFLICTING HARM not satisfying hunger]
- “*Financial Markets don’t take any prisoners*”
[trading risk – is the risk of PHYSICAL HARM of serious injury or death inflicted by an enemy]
- “*you are just there for whatever the Market throws at you*”
[trading - is risking being PHYSICALLY HARMED by a PERSON *throwing* objects]
- “*continue to cut you up*”
[repeated failure – is being PHYSICALLY HARMED by a sharp implement]

The above are examples of traders conceptualising trading as an activity in which participants risk intentional PHYSICAL HARM or PAIN being inflicted by the market, which is PERSONIFIED as a person, opponent, animal, or enemy.

In relation to the research question being considered by this study, a question arises from these forms of conceptualisation. Could the mental representations/conceptualisation of potential physical harm inflicted by a personified market alter the way traders think about and experience risk and failed trades? This question is addressed in section 4.7 below.

4.6.3.2 Container metaphors

There are three main CONTAINERS found within the traders’ discourse; the first is the market, the second is a trade, and the third is profit. Each of these is reflected in an example below. Three prepositions are observed in relation to CONTAINERS, the position of being inside and or entering the CONTAINER and the position of being outside or leaving the CONTAINER:

- “Okay so I’m *out of* my trade now”
[a trade is completed – when the CONTAINER (my trade) is *exited*]
- “I got *out of* that (trade) too early”
[a less successful trade – is when the CONTAINER (my trade) is *exited* too early]
- “Don’t feel you have to *jump in* (market), and you have to trade”
[beginning trading is – entering *into* a CONTAINER (the market)]
- “Fear *in* the marketplace”
[fear (PERSONIFIED or as a SUBSTANCE) is situated *in* the CONTAINER the marketplace]

- “It’s being *in the commodity market*”
[trading is being situated *in* a CONTAINER the commodity market]

Each of the above examples are less intuitively metaphoric, indeed simple lexical items such as ‘*in*’ are examples that can sit the middle of the debate regarding conceptual metaphor, for example, (McGlone, 2007). Taking the strong position regarding the impact of conceptual metaphors this study proposes that there may be a difference between a trader ‘*entering into* a trade’ and a trader ‘*placing* a trade *on*’, with the former predicting a more associated and emotional experience. The later facilitating a sense of distance or dissociation from the trade and thus a lesser emotional experience. On the premise that emotions affect decisions the questions arising from these examples is; Could conceptualising a trade as *entering into* a trade or market, as opposed to *placing* a trade *on* differentially affect emotion and therefore judgment and decision making?

4.6.3.3 *Structural metaphors*

As seen in Table 9 above, structural metaphors are most abundant. Which can be expected when you consider the natural constraints of ontology and orientation. Two structural metaphors are selected for further review in this study, CONSTRUCTION/PRODUCTION and LOSS. These are selected as being both ubiquitous and subtle, and thus, if these can be shown to affect cognition, affect and decision-making, then the case for paying attention to metaphor in field research and in the design of interventions would be strong. Examples from the trader’s discourse follow:

- “What *I can make* on a good day”
[gaining monetary value is – producing/creating physical output/product]
- “there’s always *ways to make* your money”
[alternative was of gaining monetary value are – alternative ways of producing/creating physical output]
- “now *I make* 10% of what *I made* 5 years ago”
[comparing performance is – comparing the amount of physical product produced]
- “I could also *lose* tens of thousands of Dollars”
[reduction in an account is – the permanently misplacement of physical object(s)]
- “middle of June *I’ve lost* my year”
[reduction of value accumulated is – the misplacement of time, with time metaphorically representing to the production of money]

- “It feels very personal *when you lose* money”
[the feeling of a reduction in wealth is – the feeling of permanent misplacement of physical object(s)]
- “or the feeling of *losing* money”
[the feeling of a reduction in wealth is – the feeling of permanent misplacement of physical object(s)]

Interestingly, there are no examples of metaphor combinations that describe the *making* and *destruction* of money. If *making* money is the production of a physical object/product, then several things can happen to it to represent a total *loss* in value; for example, it could be destroyed. In general discourse, some metaphors represent the destruction of money, e.g. “*burning through my account*”; however, such metaphors are not identified in this discourse, here money is made then misplaced. Similarly, there are no examples of metaphor combinations of *finding* or *discovering* money and then *losing* it.

The absence of such combinations could be interesting to investigate in future research, for now, the questions that arise that are reviewed in the literature is; could conceptualising the accumulation of value as making physical output/product influence a trader's cognition, affect and decision making? And, could conceptualising the reduction of accumulated value as losing a personally made product influence a trader's cognition, affect and decision making?

4.7 Cognitive, affective and behavioural implications

The previous section identified a selection of conceptual metaphors from within the trader's discourse for examination via the broader psychological literature to assess the plausibility of conceptual metaphors affecting trader's cognition, affect and decision making. Furthermore, such effects result from coherent embodied mental representations.

Each section above that looked at a particular category of conceptual metaphor concluded with a question to be considered through the review of the literature. These questions are listed below and are addressed in sequence in the subsections that follow.

1. Could the personification of value/price and the implicit agency of this concept alter the way traders perceive market trends?

2. Could the mental representations/conceptualisation of potential physical harm inflicted by a personified market alter the way traders think about and experience risk and failed trades?
3. Could conceptualising a trade as *entering into* a trade or market, as opposed to *placing* a trade *on* differentially affect emotion and therefore judgment and decision making
4. Could conceptualising the accumulation of value as making physical output/product influence a traders' cognition, affect and decision making?
5. Could conceptualising the reduction of accumulated value as losing a personally made product influence a traders' cognition, affect and decision making?

4.7.1 Personification

Conceptualising the market as a living being is a frequent phenomenon in the foreign exchange profession (Oberlechner et al., 2004). As there are many types of living being, personification has the capacity to be a rich source of conceptual mappings, with each form having different and complex behaviours, social interactions and intentions.

In this section, personification, and its attributes of agency and intentionality, is considered in relation to the perception of price trends. The proposition being, when a market thus price is personified, trends are interpreted as resulting from intentional acts, and therefore, judged as more likely to continue.

Morris et al. (2007) tested this proposition by manipulating market commentary to increase or decrease the use of agentic metaphoric terms associated with personification, then observing the impacts on investor trend expectations. For example, comparing commentary that talks about a price 'climbing higher', versus, commentary that talks about a price 'being swept upward', on the basis that 'climbing' is something a living being does intentionally, whereas on object without agency is 'swept upward'. As anticipated, agentic metaphoric terms associated with personification increased expectation of a continuation of a trend, with important nuances.

Firstly, object-based metaphors were more influential in a price reduction trend, particularly a steady price reduction i.e. the natural behaviour of an object falling. This influence diminishes when a price reduction is not steady, i.e. when the fall does not resemble the natural falling of an object. Secondly, the influence of personification was found to be significantly reduced when associated price information was provided as table of data, rather than a line on a graph. It was similarly reduced when there was an incompatibility between patterns seen on a graph and

typical agentic behaviour. While the effects of incongruence, between linguistic and graphic or tabular representations are reported, the nature of the cognition that is interrupted by this incongruence, is not discussed nor identified.

If metaphoric conceptualisation is embodied in the way proposed in study one, then the patterns observed by Morris et al. could be explained by an incoherence between the modalities of embodied representations. In Morris et al.'s study, presentation of information in tabular form interrupted the impact of the embodied representation of climbing. This incompatibility was avoided by the trader's representation of P&L in study one, in which the numeric counter of P&L moved up as value increased, thus maintaining coherence with the upward trajectory of climbing.

The impact of coherence versus incoherence across modalities of embodied representation has been shown in many studies (for example (Spence, 2015)). If the above premise is valid, i.e. that such incoherence accounts for Morris et al.'s nuanced findings, then personification could be argued to be based in a form of embodied representation, as per P&L in study one. A proposition that could be investigated through the style of interviewing adopted in study one, and if appropriate subsequent experimentation or reference to literature.

4.7.2 Personification and physical harm / pain

Looking at the extended metaphor of personification, that of the agentic behaviour having the intention to inflict physical harm, further evidence of embodied multimodal representation is identified.

Firstly, Singer et al. (2004) demonstrated a difference in the experience of losing money, and experiencing negative reward, when it is interpreted as being the result of the actions of an intentional agent. Secondly, activation of the brain regions associated with physical pain is seen even when the topic is an economic game, and thus no physical pain is involved (Singer et al., 2006). Furthermore, that such activation, including actual pain perception, can be modulated by the priming of different colours (Wiercioch-Kuzianik and Babel, 2019).

The proposition of multimodal embodied representation is also supported by evidence of the insula cortex integrating sensory and affective information to generate feeling states that are proposed to "guide decision making in complex and uncertain environments" (Singer et al., 2009, p.334). The insula cortex is posited to play an essential role in empathy and integrates

signals from brain regions associated with physical pain that are activated when empathy is shown for another being treated unfairly (Decety and Lamm, 2006).

While, due to the nature of interviewing, there is no direct data in the traders' discourse to describe qualia associated with the traders' metaphors of experiencing physical harm due to the actions of the personified market. The above studies suggest the presence of multimodal embodied representations that relate to emotional states that can play a role in judgment and decision making. Thus, it would be interesting to explore through further study, particularly in relation to decision efficacy as studies have shown that language and representations that include a cue of a potential threat and have negative valence are detected and processed faster than positive cues (Öhman et al., 2001; Dijksterhuis and Aarts, 2003).

4.7.3 Entering and exiting containers

In contrast to personification, in economics, the application of the container metaphor to a market or economy is argued to take human agency and emotion out of mind (Alejo, 2010). When the market is a container, concern turns towards effects on the container, e.g. the container - being flooded, new money entering the container; or with reference to the container's walls, as a boundary, e.g. outside money entering the container.

However, this lack of personal and emotional engagement is in contrast to what is experienced when a personal associated position in relation to a metaphoric container is embodied. For example, personally entering into a container, being outside of the container, placing something into the container, pushing the container around. Each of these implies a different perspective/personal location associated with the container image schema (Lakoff & Johnson, 1980). Entering into the container is proposed to prime an associated embodied representation of being surrounded by /immersed in what the container represents. Whereas, placing something into the container is proposed to prime a perspective of being apart from what the container represents, of being an observer interacting with the container. Additionally, pushing the container around is proposed to prime an embodied representation associated with control and agency over whatever the container represents.

A considerable volume of literature describes the pervasive application of the container metaphor in multiple contexts, which could be expected of an ontological metaphor. However, literature that looks at the consequences resulting from the adoption of such metaphors, and the differing perspectives posited above, i.e. being inside versus outside the container, was not forthcoming in the literature search.

However, some theories imply the embodied representation of different perspectives / spatial positions associated with the container metaphor could lead to differing affect and judgment and decision-making.

Effective emotion regulation, through the cognitive process of psychological distancing, is shown to have linguistic signatures associated with distance; with linguistic distancing spontaneously reducing negative affect (Nook et al., 2017). Furthermore, linguistic signals have been shown to be predictive in terms of people adaptive mental and physical health outcomes (Shahane and Denny, 2019).

Construal-level theory of psychological distance, in which psychological distance can be increased in the dimensions of time, space, and social distance. The mental construal of increasing distance, via variation in qualia in representation/simulation, is claimed to involve increasing levels of abstraction, which affect prediction, preference, and action (Trope and Liberman, 2010).

The above theories deal with perspective and distance in relation to being outside a metaphoric container. Psychological studies that explore particular salient emotions and their relationships to language report strong emotional states conceptualised as being '*in*' a CONTAINER. For example, being '*in*' trauma, being '*in*' crisis, being '*in*' a depressed state; with relief being realised when there is '*distance*' from, when they have '*moved*' on. The language of '*getting past*' without being '*drawn back-in*' is also found (Lindy, 2013). When an emotional state conceptualised as being positioned in a container, the individual's sense of agency is reduced (Millar and Beck, 2004). This should be of concern when someone moves '*out of crisis*', '*into recovery*' (Costa and Steen, 2014), as this would imply a continued lower sense of agency in comparison to someone one who has '*moved on*'.

While no literature was identified that directly links the container metaphor to actual financial judgement and decision making. It is posited that the above psychological studies suggest there may be a difference in experience and affect when a trader, *places* a trade *on*, versus *enters into* a trade.

4.7.4 Crafting / producing products and then losing them

Neither term posited here as metaphor, are identified as metaphor in relation to money in the literature reviewed. Indeed, '*make/making*' is not listed as a metaphoric term in the Berkley or

Glasgow metaphor data bases (Berkley, 2018) (Glasgow, 2020). And although ‘*Loss*’ is listed as a metaphoric term; it is not listed as a metaphor in connection with money.

Is ‘*make*’ a dead metaphor or even a metaphor? Applying the MIP process of metaphor identification, a word is deemed a metaphor if it has a more basic or different historical meaning than its meaning in the current context of use. To ‘*make*’ is to “give being to, give form or character to, bring into existence, construct”. Obtaining more money from a prosperous trade does not construct or bring into existence additional money, it transfers its possession.

As this study appears to be unique in suggesting ‘*make*’ is a metaphor in this context, then even if others could be convinced of this status, *make* would most likely be considered a dead metaphor. However, could ‘*making*’ money make sense of the asymmetry of gain versus loss as per prospect theory via an attachment effect? Norton, Mochon, and Ariely (2012) have demonstrated that self-made objects are perceived as more valuable than an equivalent pre-constructed version. Is then the meaning of loss, in this situation, associated with the accidental misplacement, or the deprivation, of this self-made object? An object that gains attachment value as it is constructed, and then is lost after being imbued with endowment effect (Bruner et al., 2020), thus the asymmetry of affect between gain and loss.

It is recognised that this is a novel proposition that can’t be confirmed within the data available in this study. However, it is argued that an interview conducted in the form of study one may be able to assess the mental representations/simulations associated with ‘*making* money’ versus ‘*obtaining* money’, and if a difference is found, test interventions that prime conceptualisations of *obtaining* versus *making*.

4.8 Limitations and conclusions

This study addresses two research questions:

1. Are the traders using conceptual metaphors beyond representations of magnitude?
2. If so, is there evidence that could support the proposition that the cognitive metaphors identified play a significant role in judgment and decision-making and associated affect?

A high density of metaphor language was identified in the trader discourse examined.

Recognising that the higher than average density may be through an editorial preference for

metaphor rich dialogue (Veale, 2013) (Krennmayr, 2011), confirmation via other studies of metaphor usage in trading and other related fields confirms traders use conceptual metaphors beyond the representation of magnitude.

Utilising a sample from the numerous metaphors identified through the application of the Pragglejazz MIP process, propositions in the form of questions were developed that posit each metaphor affecting judgment and decision making. The plausibility of each proposition was then considered through selective reference to the broader psychological literature. Referencing is selective in that it sought supporting evidence/theory, rather than reviewing additional evidence that challenges the confirmatory theories identified. This selectivity is considered as the objective of the review was to assess the plausibility of the proposition rather than resolve conflicting theories. In the full cycle approach to research being applied the validity of a proposition is tested in the next phase of the cycle, phase (d) as shown below.

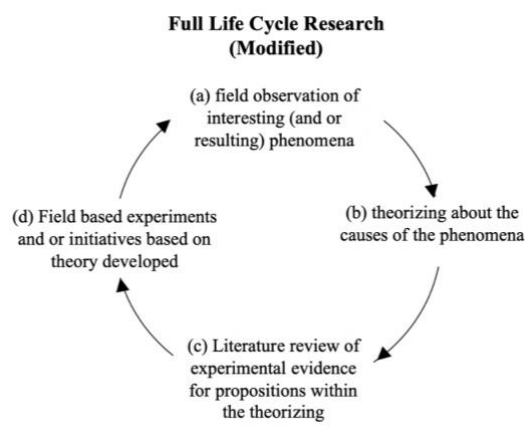


Figure 8: Full Life Cycle Research Phases

Evidence was found that could support each of the propositions raised. Therefore, answering question 2 in the affirmative; even though some of the conceptual metaphors selected were deliberately chosen to be more open to challenge with regard to their possibility for effecting cognition, affect and behaviour.

Thus, this study concludes:

- Traders routinely use conceptual metaphors beyond representations of magnitude.
- There is evidence in the psychological literature that supports the proposition that the cognitive metaphors identified can play a significant role in a trader's judgment and decision-making and associated affect.

4.8.1 Recommendations for future research

While this study has identified the presence of metaphors in trader discourse that may impact trader judgement and decision making, unlike study one, without direct interviews it is not possible to explore the any mental representations or simulations associated with these metaphors.

Therefore, the first recommendation for future research is to conduct interviews with traders to further explore the metaphors the utilise in discourse and thinking and any associated mental representations and simulations. This is proposed to be of interest from two perspectives. Firstly, to understand the nature and qualia of representations, so interventions and experiments can be accurately designed to understand any relationships between content and qualia of mental representations and their affect(s) on emotions, judgments and decisions. This is argued important noting the variations in the and qualia of the trader's mental representations in study one. Secondly, there is the possibility to contribute to metaphor research by explicating the such data as this is not typically present in discourse analysis and could provide insight into individual differences in metaphor priming effects.

The second recommendation for further research, which is discussed in more detail in section 7, is for the examination of explicit and implicit metaphors and associated content and qualia of mental representation within classic bias definitions and associated experiments. This is particularly relevant based on Kahneman's (2003) reference to bias behaving like visual illusions in terms of their intractability. Also based on the proposition that if cognition is fundamentally embodied then the underlying basis of cognitive bias will be based in embodied representations to some degree.

5. Study 3: Safety Leadership

5.1 Introduction

Like Study 1, this study seeks to explore the question posed by Hastie (2001, p.664): i.e. “how are deliberate decision-making problems represented cognitively, and what are the major determinates of the representation of situations”. Unlike Study 1, this study explores this question in circumstances characterised by *physical risks* that have *tangible consequences*. Study 1 explored Hastie’s question in circumstances characterised by *intangible risks* and *intangible consequences* based on human constructs. In this study, the consequences are physical with associated psychological harm to people; in the first study, the consequences are a reduction in a profit and loss account and its associated personal emotional responses.

Like the first study, this is a field-based study designed to develop a preliminary theory, with the theory’s constituent propositions subsequently assessed for plausibility, contribution and recommendations for future research through a review of relevant literature. Again, like the first study, a grounded theory approach is adopted as such is an open enquiry with no prior assumptions or theory being applied.

The intention of the study is twofold, firstly to contribute to theory practice within the field being studied i.e. safety practice and leadership. Secondly, to contrast findings and conclusions with the first study i.e. between contexts/roles engaged with contrasting types of risks and consequences i.e. *tangible* versus *intangible*. The first study involved frequent judgment and decision making involving intangible risk. For comparison, a context of similarly frequent judgement and decision making but involving tangible risk was sought. The complex and high risk operations of the oil and gas industry selected as context met these criteria.

An opportunity to engage with this industry originated from a professional consulting project requested by a particular oil and gas company. The company was seeking to gain new insight into how a subset of safety leaders were consistently achieving higher levels of safety performance than their peers. The company was recognised for its commitment towards safety, and the differential performance of the individuals was seen as a significant opportunity to inform new evidence based interventions to raise organisation wide safety performance.

The above project was considered an appropriate case for study, firstly because the participants were engaged in activities that require frequent judgments and decisions regarding risk. Secondly, because the enquiry was to be open i.e. the organisation was seeking a “*fresh look*” at

the phenomena. The study was directed to explore the high performing individuals' performance from an open perspective. That is without reference to existing practice or theory based on the premise that the organisation utilised safety methodologies and interventions based in contemporary thinking from within the safety field, a notion confirmed through meetings with the organisation's behavioural safety experts. This approach meets the needs of the overall thesis. Furthermore, the case met a motivation of the researcher, to develop insights that contribute to effective professional practice.

5.1.1 Research questions

The research questions that were designed to meet both the needs of the client and the thesis were thus;

1. What are the cognitive and associated behavioural patterns of consistently high performing safety leaders?
2. Can the patterns identified be used to anticipate the performance of leaders in regard to safety?
3. How do any cognitive and behavioural patterns identified contrast with those identified in Study 1 & 2?

5.1.2 Methodology

As a goal of the study is to develop new theory to explain effective safety leadership a grounded theory methodology was selected (Kempster and Parry, 2011; Cameron and Hare, 2008; Willig, 2013; Creswell, 2018; Glaser, 1998; Suddaby, 2006; Glaser et al., 2013). Effective safety leadership being defined in this research as personal and leadership action (perception, cognition and behaviour) that is directed towards and improves the immediate and long term safety and wellbeing of people.

The design of the study was influenced by the philosophical stance of embodied realism which underpins both grounded cognition and conceptual metaphor theories (Lakoff and Johnson, 1980, 2003; Fauconnier and Turner, 2008) alongside Barsalou's (Barsalou, 1999) theory of perceptual simulation (Ritchie, 2006) Consistent with this philosophical stance and the desire to develop insight and theory in relation to safety leadership, beyond behavioural descriptions and models, the study uses a grounded theory methodology (Glaser and Strauss, 1967; Charmaz, Henwood, 2017) taking Glaser's position in relation to the development of theory from data (Glaser and Strauss, 1967; Glaser, 1978, 1992, 1998).

While presentation of the study findings includes illustrative quotations and examples of participants cognition and behaviours, they are not intended to constitute a descriptive study, instead they are included to illustrate the formative theory inductively developed along with its constituent concepts. As such the study is taking Glaser's stance in relation to grounded theory. Specifically, that grounded theory is "*conceptual thus abstract of time, place and people*" (Glaser, 2003, p.1) and not the alternative constructivist perspective with regards to grounded theory's philosophical and methodological position (Glaser, 2012; Charmaz, 2017; Martin and Gynnild, 2011). Detailed methodology is described in section 5.3 below.

5.2 Study context

The organisation that is the subject of this study is one of the larger global oil and gas companies. The company carries out activities ranging from exploration through to retail of refined products on a global scale. The study draws on participants from the downstream operations of the company; however, the majority of participants had experience of the company's activities beyond this section. Downstream is defined as activities that range from the conversion of oil and gas into end products through to the retailing of such products to end customers, both business and consumer. Further information regarding the company is omitted to ensure the anonymity of both the company and participants.

As a global company, the opportunity to draw on participants from different nationalities with work experiences in different cultures was present and taken to enable generalisability of findings within this company. Furthermore, through replication with similar cross-cultural studies in other global organisations, to have the possibility to move efficiently towards the development of formal theory.

Due to the global spread of participants, and the complex procedures and training required to shadow or observe participants in their daily activities, the study has been limited to interviews with the participants, with the exception of being escorted around buildings when interviews have been arranged face to face.

5.3 Detailed Methodology

As mentioned above this study adopts a grounded theory methodology. This methodology was deemed appropriate for a number of reasons:

- Firstly, the purpose of addressing the research questions in the study is the development of a new theory of differential safety performance. It's intention is to take a "*fresh look*" at a phenomenon, therefore it seeks to develop new theory (Glaser and Strauss, 1967; Glaser, 1998; Martin and Gynnild, 2011; Dyche and Epstein, 2011).
- Secondly, the study seeks to understand the meaning, and subsequent decision making and behaviours of leaders situated in a complex physical and sociological context. As such a qualitative approach is appropriate; furthermore a qualitative approach congruent with the researcher's philosophical position (Creswell, 2018; Martin and Gynnild, 2011; Patton, 2002; Levitt et al., 2017)
- Thirdly, Glaser's criteria of good grounded theory include validity, workability and relevance (Glaser, 1998; Kempster and Parry, 2011). The intention of the study is to inform practice in an area with significant consequences for failure, therefore the validity of theory rather than description is a priority, as is the production of theory that is intelligible to practitioners that adequately accounts for the substantive area of concern.

Glaser describes grounded theory as being "based on the systematic generating of theory from data, that is systematically obtained" (Glaser, 1992, p.2). The description of methodology that follows address each part of Glaser's description, starting by describing the systematic approach to gathering data, then describing the process of developing concepts and theory from the data.

5.3.1 Data collection

5.3.1.1 Sample

A single organisation was selected for the study to control extraneous variables, in this case, organisation policies, practices and training with regard to management/leadership and more particularly safety; and also, to enable generalisation and so pragmatic testing and use of the substantive theory within the context of its discovery (Eisenhardt, 1989).

To optimise the development of theory, and its generalisation, the sample of leaders included in the study were selected to provide the strongest possibility for demonstrating the patterns of interest (Pettigrew, 1990), and cover the potential variables within the scope of the study e.g. site types, site size, local culture etc. To maximise the potential of observing key patterns associated with safety leadership, high performing safety leaders were selected for the study (Pettigrew, 1990); which additional met the organisation's purpose of discovering the factors that enable differential performance. For maximum generalisation of substantive theory, a

sample was selected to cover the broadest range of variables of the downstream organisation as pragmatically possible.

While sample size in classical grounded theory, i.e. a study that does not start with preidentified concepts or codes (Glaser, 1978), is determined by saturation (Glaser and Strauss, 1967; Glaser, 1978, 1998) and not determined at the outset; for pragmatic engagement with the organisation requires the management of logistics, expectations and confidence in the theory produced, an initial sample size was determined. For coverage of geography/culture, site types, site sizes, organisation roles and gender a sample size of 28 participants was agreed with the organisation, with the possibility to increase the number based on organisation needs and achievement of concept and theory saturation.

Theoretical sampling within grounded theory involves the joint collecting, coding and analysis of data and deciding what data to collect next (Glaser and Strauss, 1967; Glaser 1978). To this end interviews were scheduled into two phases; an initial eight interviews with a group of leaders characterised by high safety performance, diversity of current roles and extensive individual prior experience; followed by approximate 20 additional interviews, with the later determined by saturation, research strategy and participating company requirements.

Participation within the study was achieved via an invitation issued by the organisation, which specified participation as being voluntary with no requirements or reward for participation. The first 8 participants were directly invited based on optimum matching of the desired sample characteristics, the subsequent set were invited via open invitation to leaders within the organisation, with those that volunteered screened for suitability in regard to desired sample characteristics, before selection for participation.

Due to the dispersed storage of safety data across the organisation, the overhead for selecting participants via interrogation of internal information systems was determined by the organisation as prohibitive. To address this, and ensure the selection of high performing participants, a three stage process was adopted for selection of the first 8 participants. The first stage was the identification of leaders who had received outstanding scores on their leadership 360 reviews in relation to safety. The second stage was to qualify this list with the relevant safety function within the organisation, checking to see if there was knowledge of any practices or incidents that may contradict the 360 degree feedback. The third stage was to collect safety data from sites/teams covering the tenure of the short listed participants, extending to a minimum of their last three assignments. This process optimised reliable selection of high performers without incurring prohibitive costs of data assimilation for the organisation. The

feedback and data used for this process remained confidential to the organisation, in accordance to the company's policies concerning confidentiality.

The 8 participants included in the first phase included one female and seven men. Because the study was looking for diverse experience, and extended performance data, the candidate pool for the study reflects and historic gender balance of 15%, and not the present balance of 30.2% (UK).

Stage 1: 8 Participants (12.5% female)	Avg.	Min.	Max.
Age	56	45	61
Tenure at current company	21	2	40
Number of countries worked in (current organisation)	6	1	9
Number of leadership roles (current organisation)	6	1	12

Table 10: Stage 1 participant profile statistics

The selection of the second stage candidates was made based the same three type of data as stage one, however, in this case invitations were made via an open request for participant across the leadership population within the downstream business. Criteria for selection was held open until the first phase analysis was completed to allow for the possibility of including a number of candidates with lower levels of performance to test the predictability of emergent theory. See section 5.3.2.5 below for discussion on the second phase candidate final selection that included different performance levels.

Stage 2: 20 Participants (20% female)	Avg.	Min.	Max.
Age	47	40	61
Tenure at current company	21	1	37
Number of countries worked in (current organisation)	1	6	12
Number of leadership roles (current organisation)	7	1	10

Table 11: Stage 2 participant profile statistics

Data collection took place during the first quarter of 2019.

5.3.1.2 Interview Design

Glaser states a key principle for grounded theory interviewing is the creation of a setting under which the participant is able to speak about what is most important to them (Glaser, 1998). At the same time it's necessary to appreciate the aim is to conceptualise the main issue of concern

that is continually being resolved (Glaser, 1998), and so to guide the interview towards to scope of the inquiry. Additionally, application of theoretical sensitivity, means the focus of data collection can evolve as interviews and concurrent analysis progresses (Eisenhardt, 1989; Glaser, 1978).

The interview schedule for the study was thus a semi-structured design, with the structure comprising; initial opening of the interview designed to provide the opportunity to build rapport and settle the participant into the interview (Willig and Stainton-Rogers, 2008; Elmir et al., 2011); framing of the scope of the interview towards safety; and examination of critical incidents (Bott and Tourish, 2016) suitable for cognitive analysis via critical decision method (Hoffman and Lintern, 2012; Crandall et al., 2006). Deeping questions were used to obtain detail of the thinking and experience while ensuring candidates were associated back into the situations they were recounting, rather than offering commentary (Ericsson and Simon, 1993).

Initial Interview Schedule:

Context opening:

Could you please share an overview of your career within (organisation) and your current role?

Broad topic opening:

Thinking about your ongoing role when and how does safety come to your attention?

Critical Incident/Decision Elicitation

(If not provided from dialogue from opening question):

Could you share recent examples where you have taken action in relation to safety?

Or, could you share recent examples where you have intervened in relation to safety?

Can you please step back into that event and describe your experience?

Deeping Question (Examples):

(framed to support continued associated experience and not commentary)

Stepping back into that experience, what are you noticing?

When you are.....what are you paying attention to? What are you evaluating?

What's important about...? What does...mean? How do you know to...?

What is running through your mind at that/this point?

What leads to that feeling, to feeling that way? What is that feeling about?

Checking & Broadening Questions:

Is there anything about your approach and thinking we haven't covered in the conversation so far?

Has your approach and thinking about safety changed over time?

Interview Close: Description of next steps and offer to provide feedback on research results and reconfirmation of confidentiality.

In addition to the interview schedule above, interviews were opened confirming:

- the purpose of the interview
- confidentiality of the interview and resulting data
- permission to record the interview and treatment of the recordings and resulting data
- the option to withdraw from the process at any point in time

Following early constant comparison analysis of initial interviews, the interview schedule was amended with the following opening question:

If you reflect on your career to date, are there any particular trainings, experiences or events that have shaped/informed the way you currently think about or approach safety?

The introduction of this question was based on:

- the spontaneous and universal presentation of formative experiences in response to either the opening question or within critical incident elicitation, in addition to responses to the explicit question asked about changes in the participant's approaches to safety.
- the degree of change described and the strong relationship between the formative experiences and participants' ongoing practice.
- the subsequent effect on the participants' ability to associate into and describe retrospective safety related decisions and behaviours

The new opening question included the prompt for the consideration of multiple sources of influence over the participants approach to safety, although at this point all participants had referred to learning from formative events, and not particular initiatives or training. This was included because there remained the possibility that the higher performing safety leaders were simply, or in part, more adept at implementing particular organisational safety initiatives, or at applying learning from particular training programs. Therefore, understanding the basis / source of the participants practice was deemed important to collect, as this would inform the design of subsequent field experiments and organisational initiatives, particularly if success was found to be based on nuanced implementation of prior organisational initiatives.

The revised interview schedule was applied to the last 4 of the first stage interviews and all stage 2 interviews. In accordance with critical decision making methodology (Hoffman and Lintern, 2012; Crandall et al., 2006) a secondary non-lead interviewer was used utilised in the interviews, to track and maintain the flow of the interview, in particular the flow between in depth questions and the return to the macros structure of the interview. The second interviewer was also present due to the project being a professional client engagement as previously stated.

In consideration of building rapport, the organisation dress code of business casual clothing was matched by the interviewers as was the culture of personal introductions ahead of engagement in the interview process. This culture was observed during the initial engagement with the organisation. The potential for power imbalance affecting the interview process was considered minimal as the participants were all senior managers with significant experience and the interviewer were of a similar age with experience working within global organisations in addition to consultancy. Based on the open responses of participants these preparations and expectations were validated.

As participants were drawn from across a global company, the potential for a language barrier was considered, however the company's business language was English, and all participants were fluent in listening and conversing in this language.

5.3.1.3 Data recording

As identified in the first study within this thesis, participant gestures can provide important indicators of mental representations and cognitive processes. Furthermore, visual indicators of state and emotion supplement changes in voice quality and can provide indicators of congruence in participant responses (Aucouturier et al., 2016). For these reasons' and supporting the building of rapport all interviews were arranged such that the participants and interviewers could see each other during the interviews, either through being face-to-face, or conducted via video conference, or finally through a web based video channel. With all interviews being video recorded.

The benefits of collecting and recording data in the form was evaluated against the potential for video recording to influence a participants responses during the interview process (Bourgeault et al., 2013). Participants were informed at the point of invitation that the interviews would be video recorded, therefore had prior opportunity to decline if they felt uncomfortable with this form of recording. The organisation also confirmed that the practice of recording senior managers interviews for research and internal communications was common practice. On this

basis the benefits were considered to outweigh potential risk. Furthermore, candidates were given the opportunity to decline recording in either mode (audio or visual) at the beginning of each interview. To minimise any potential intrusion of recording equipment, recordings were made using an iPad and iPhone. No participant declined any form of recording or expressed any reluctance or concern, either verbally or non-verbally.

To ensure maintenance of anonymity all participants were informed that the video records would be deleted as soon as the interview data was coded in accordance with the methodology. Additionally, that all audio recordings would similarly be deleted following transcription and coding, and transcripts would have names and information removed which may enable themselves or the company to be identified. Finally, all interview notes were destroyed once pertinent notes were transferred to memo's and coded again in a form that avoided the potential for participant or company identification.

At all stages all data was held on password protected encrypted devices and storage facilities and treated in accordance with permissions received from participants and with ethical approval granted by Leeds University (ref. LTLUBS-278)

5.3.2 Data analysis

5.3.2.1 Introduction

Whilst grounded theory has the benefits of creating new theories that can provide understanding phenomena not yet or fully explained by existing theories and paradigms, of providing a rigorous process of data collection and analysis, and of fostering creativity and critical thinking (Nicolini, 2009); it does by its nature rely on significant commitment, skill, creativity, critical thinking and reflexivity of the researcher to avoid researcher bias, and to avoid superficial coding applied to the significant amounts of data the methodology produces (Glaser, 1978, 1998; Glaser and Holton, 2005; Charmaz and Henwood, 2017).

Furthermore, Charmaz and Henwood (Charmaz and Henwood, 2017, p.242) recognise many studies that reference grounded theory fall short of developing theory. Thus they remain descriptive, with most qualitative coding remaining “topical, descriptive and general”. In response Charmaz and Henwood emphasise the importance of achieving and intimate familiarity with the phenomenon being studied, and in iteratively moving between collecting data, and refining abstract categories, and thus move towards the development of theory.

The steps of analysis shortly to be described were therefore designed to be rigorous in the application of the methodology of classical grounded theory in particular that defined by the writings of Glaser, and to draw on skills and experience from 20 years of professional applied research and consultancy. Additionally, based on the nature of insights developed in the first two studies in this thesis, the analysis methodology was design to integration analysis of participant gestures and discourse based on the theory of embodied cognition.

In accordance with theoretical sensitivity in grounded theory methodology the steps below, up to theoretical sorting, were carried out on a continuous basis i.e. as interviews were progressing. Overall during ongoing open coding/constant comparison, three stages of theoretical coding / core category identification were completed (see 5.3.2.4 below), one after the first stage interviews approached saturation (after 3 interviews), again when all 8 stage 1 interviews were completed, and then on completion of all stage 2 interviews.

Coding and analysis were completed by the author alone, in accordance with Glaser's strong recommendation, "*the analyst must do his own coding*" (Glaser, 1978, p.58). Glaser argues against the using prior or preliminarily developed codes, which is argued necessary for efficient dual-coding the high volume of data to be processed. Additionally, arguing that grounded theory involves the constant stimulation of ideas, which inform new perspectives on, and interpretations of, the data. Thus, it would be highly problematic to decide when and how often to compare coding; because sensemaking is ongoing, a meeting to share and align ideas can be redundant as ideas can diverge again as the very next line of transcript is explored. Glaser makes the exception to this argument for dual authored studies in which all parties are fully invested in the end to end study and in the authorship of the findings, which is problematic in the context of a PhD thesis.

5.3.2.2 *Immersion and familiarisation in the data*

Although transcription provides familiarisation with an interview, it requires split attention between listening and transcription, and so compromises the essential immersing oneself within the phenomena (Charmaz, 2017). On this basis and given the volume of interview recordings the initial transcription of interviews was outsourced to a transcription service.

Familiarisation with the data began with watching the video recording of an interview and reviewing notes made at the time of the interview. Memos were made of any reactions, thoughts, categorisation or questions that arose while watching the recording of each interview

(Charmaz, 2017). This process was then repeated whilst reading the draft transcript with two objectives, firstly to edit the transcript for accuracy; and secondly to record descriptions of visual observations alongside relevant discourse in the interview focusing on gestures and physiological indications of emotion (e.g. changes in voice tone). Further memos were made during this process.

This process was repeated for each interview typically within 4 days of the interview taking place.

5.3.2.3 *Open Coding*

The objective of open coding is to develop an emergent set of categories and properties thereof, that fit the data and may be integrated into theory. The analyst codes incidents into categories holding the following questions in mind (Glaser, 1978, p.57):

“what is this data a study of?”

“what category does this incident indicate?”

“what is actually happening in the data?”

“what is the basic social psychological process?”

“what is the basic social psychological problem faced by the participant?”

Open coding was applied through constant comparison of incidents within the data (Glaser, 1978). Coding proceeded with each incident being assigned its own code either drawn from the data or assigned by the analyst appropriate to the incident’s category. As each incident was coded it was compared with prior incidents and codes to determine if it represents a new category or a property of a previously defined category. Memos defining each new category were made as coding progressed which were updated as new incidents were assigned to the existing category and thus indicated a property of that category. Although this stage is prior to theoretical sorting, memos were made to record any thoughts and ideas with regards to potential relationships between categories that emerged during the open coding process.

Once the data was coded in the manner described above the categories developed were compared with incidents to check if any fit within multiple codes/categories. A multiple fitting incident indicating the categories into which it fits that may actually be different properties within a common category. When such cases were identified codes were merged into a single category with its definition amended.

As coding progressed across interviews, verification of categories increased and saturation was approached (Glaser, 1978). Saturation was approached after the first three interviews were analysed, i.e. no or very few additional codes or categories were being produced through analysis. With the achievement of saturation and verification, the categories that “can handle the data theoretically” are learned (Glaser, 1978, p.56) and so analysis moves to theoretical coding and identifying core categories.

5.3.2.4 Conceptualising, theoretical coding and identifying a core category(s)

Having established categories with associated codes and memo’s, three analytical processes were applied in conjunction; conceptualising, theoretical coding and identification of core categories (Glaser, 1978). This comprises asking three questions of each category:

- Question 1: *What is the code/category an example of? or What higher level category can fit this?*
Leading to: Clustering of categories (conceptualising) into higher level categories or concepts with properties defined by the its constituent sub-categories
- Question 2: *What is this code/category a type of?*
Leading to: Assignment of a theoretical code e.g. from one of the 6 C’s: Causes, Contexts, Contingencies, Consequences, Covariance and Conditions
- Question 3: *What is this code/category part of? (asked of the outputs of question 1&2)*
Leading to: the identification of a core category

For example, applying the questions to the following categories – ‘Lived lives’ and ‘Family/Relationships’ (from section 5.4.3) leads to the following answers.

Question 1: “life”

Question 2: “consequence” (theoretical code)

Question 3: “mental simulation”

Question 3: what is “mental simulation” part of? = “anticipating regret”

Question 3: what is “anticipating regret” part of? = “personal practice” (core category)

Application of this process for the first three interviews revealed the core categories, ‘formative events’, ‘personal practice’, ‘cultural leadership’, ‘regret’ and ‘anticipating regret’. Based on these early results the interview schedule for the next five interviews was modified to begin with identifying and examining participants’ formative experiences.

At the end of the all eight stage 1 interviews the above process was re-run with focus on categories that had been refined through open coding of the additional data. The core categories, concepts and theoretical codes were confirmed, with refined descriptions, see sections 5.4.2, 5.4.3 and 5.4.4.

Because the study seeks to develop theory that explains differential performance and does not seek to be fully representative and descriptive of all participants cognitive and behavioural patterns, only those that contribute to concepts shared by the majority of high performing participants are retained within the end analysis. This is on the premise that those held in common have the highest potential for explanatory power (Glaser, 1978). That is not to say that idiosyncratic patterns do not contribute to performance, indeed they are retained for review during the literature review and for potential inclusion within future research using alternative methodologies. The final step in this stage of analysis was thus to put aside concepts that are not shared by more than 70% of participants. Filtering of concepts on this basis identified only two idiosyncratic patterns/basic concepts within the initial 8 interviews, with omission of neither effecting higher level concepts, core categories and theoretical codes.

5.3.2.5 *Stage 2 Interviews, testing and refining categories and theory*

With saturation and stability of core categories and theoretical coding, the strategy for sample selection for stage 2 interviews was developed to achieve two objectives. The first objective being to extend the coverage of organisational contexts to ensure generalisability of resulting theory. The second objective was to conduct preliminary prediction reliability of the emergent theory with regard to safety leadership performance.

To achieve the first objective the organisation sent an open request for participation across the leadership population within the downstream business, and screened responses to ensure broad coverage and gender mix. To achieve the second objective the organisation screened for good performers, very strong performers and included a small number of weak performers. The performance ratings of the sample were held in confidence by the organisation and not shared for review until coding and ranking of interviewees had been completed. As such coding would be conducted blind to participants performance ratings.

Preliminary prediction reliability being assessed by comparison of predicted rankings from interview analysis with the organisation's actual performance ratings. With the premise that strong relationship between the interview based ratings and actual performance would provide

preliminary indication that the emergent theory may account, at least in part, for differential performance and therefore may have the possibility to inform the development of predictive assessment tools.

To avoid the potential to influence the organisations perception of participants performance based on an emergent theory with prepositions yet to be defined and tested, it was agreed that results of the analysis would not identify individuals, instead a percentage fit would be shared. With this approach the organisation would not know which ratings had been matched or mismatched.

On the basis the sample would include mixed and unknown capabilities the analysis process described needed to be modified. The first 8 interviews had produced theory based on universal contribution to each concept, that is, the patterns/concepts identified in the theory were present within each and every participants interview. Assuming the emergent theory is predictive, then based on the premise that the very stronger performers would again have all concepts present in their data, that the good performers may have weakness in or an omission of a concept, and that weaker performers may be missing a number of concepts, then the participants could be ranked on their degree of match to the concepts within the theory.

However, the above assumes all concepts are equal in their contribution to performance, could the omission of one have limited impact while the omission of another have significant impact on performance? Could strength in one outweigh the absence of others? Additionally, evaluation of the emerging theory in this way also heavily rests on the reliability of the performance rating provided by the organisation.

Cognisant of the limitations of this form of testing but also its potential to inform the review against literature and future research the coding of the stage 2 interviews was modified from stage 1 in the following ways:

- A. each interview was open coded against the concepts developed in stage 1
- B. incidents that did not fit stage 1 concepts were recorded as a new category and annotated in the interview transcript
- C. concepts from stage 1 that were not used in open coding in analysis of an interview were noted

- D. concepts from interview that matched those from stage 1 and had the potential contributed to the definition of its properties were noted and annotated in the interview transcript

Utilising the above steps:

- A participant was anticipated to be a strong performer when:
 - no concepts were omitted i.e. when no concepts were noted against point 'C' above, and
 - the data from the interview had the potential to enrich multiple definitions from stage 1 as per point 'D' above, and
 - incidents against point 'B' did not contradict any existing concepts from stage 1
- A participant was anticipated to be a good performer when:
 - no concepts were omitted i.e. when no concepts were noted against point 'C' above, and
 - the data from the interview had the potential to enrich a limited number of definitions from stage 1 as per point 'D' above, and
 - incidents against point 'B' did not contradict any existing concepts from stage 1
- A participant was anticipated to be a weaker performer when:
 - one or more concepts were noted against point 'C', and or
 - incidents against point 'B' contradicted an existing concept from stage 1 e.g. qualifying actions and mitigating regret via reference to accountability or agency (note this is a purely instructive example and not taken from any interview)

Cognisant of the aforementioned limitations three propositions were considered:

P1: The concepts within the emergent theory differentiate high safety performers

P2: The concepts within the emergent theory reflect the practices of the organisation and will not differentiate between candidates, with all candidates similarly rated via the above methodology.

P3: The concepts have no relationship with performance, with mismatches between organisational ratings and those produced via the above methodology.

Following open coding of the stage 2 interviews and analysis against points A-D above, 6 participants were identified as strong performers, 12 were identified as good/average performers and one as a weaker performer.

Comparison to the organisation's ratings were as follows:

- Five strong performers had been identified by the organisation, all five were included in within the group anticipated as such through analysis. The one additional participant anticipated to be strong was included in the sample by the organisation but without a rating through lack of performance data, therefore is inconclusive.
- The 12 anticipated good performers from analysis all matched the organisations ratings of performance.
- Only one weak performer had been included in the sample by the organisation, this matched the participant anticipated to be weakest from analysis. The participant identified as potentially weaker as they did not demonstrate all concepts but did not contradict any.

Through the limitations of the approach, the above results could not be considered as a validation of the emerging theory, however they provide some initial support for proposition P1 above, ahead of the literature review and more robust testing of proposition that result from the final stage of analysis i.e. theoretical sorting, as described in the following section. Based on the ratings information provided by the organisation, and the above results, all data from the strong and good performing candidates were subsequently incorporated into the analysis.

5.3.2.6 *Theoretical sorting*

The penultimate stage in the grounded theory methodology applied in this study is of theoretical sorting, which is the process of integrating and relating ideas into a theory which accounts for the processing of a problem (Glaser, 1978, p.177). "it produces a generalised, integrated model...since it forces connections between categories...it generates a dense, complex theory...it justifies the arbitrariness of theory generation by showing how the theory works and why each idea was placed as it is."

Glaser provides a set of analytical rules for the development of theory via theoretical sorting, which are a mix of criteria to be met and of advice towards the process of sorting, an example of the latter being to start, “anywhere, the important thing is to start” (Glaser, 1978, p.121).

Criteria provided, and used to evaluate the completion of this stage of the methodology, are:

- *Integrative fit*: Do all ideas fit in somewhere?
- *Theoretical completeness*: Does it explain with the fewest possible concepts the behaviour and problem under study?
- *Scholarly completeness*: Is the contribution integrative and recognitive? (noting that this criterion is met in conjunction with the literature review)

In combination, the three core categories of ‘formative events’, ‘personal practice’ and ‘cultural leadership’ comprised all concepts identified, therefore, to meet the first criteria the sorting process worked on the integration of these concepts. This process of integration started with identification of candidate common social/psychological processes (Glaser 1978).

Regret/anticipated regret was identified and selected as the core concepts, as the theoretical codes of all other concepts relate them to these processes.

The process of sorting then proceeded by iteratively asking the following questions of each concept:

1. *What is the code/category an example of? What higher level category can fit this?*
2. *What is this code/category a type of? What is its role in relationship with other concepts?*
What concepts might be affected by its absence? What are the consequences or effects of this concept on other concepts?
3. *What is this code/category part of?*

The three sets of questions prompt the clustering/categorisation of concepts based on properties and effects and the defining of relationships between concepts in their role in the identified core processes, i.e. regret and anticipated regret. This was an iterative and “*paced*” process (Glaser 1978, p.127), and utilised the presentation of emerging ideas to colleagues, with the process of developing a logical presentation exposing gaps in logic and unexpressed propositions. Each iteration was challenged with the above criteria and the following questions:

- Are all concepts and their contribution included in the theory?
- Is there anything in the data that contradicts the theory, are there counter examples?
- Does the theory include variables that identify higher performers in the sample?
- Does the theory contain variables irrelevant to performance?

The theory was repeatedly refined and tested until the first three questions were answered in the affirmative and the last in the negative, and the prior criteria had been satisfied. This process identified the key concepts and relationships in the theory under development. Having defined each concept and its relationship(s) to others, the propositions necessary for each concept to be valid were developed through the process of abduction, that is the development of the logical inferences of each concept. The objective of the propositions being to provide a basis for validating the theory via literature review, and future research.

5.3.3 Conducting the literature review

There are opposing views concerning the position of the literature review within a grounded theory study. Some argue for the review to be completed ahead of entering the field, for example Strauss and Corbin (1990) while Glaser in particular strongly argues for the literature to be addressed in the final stage of theory development i.e. the writing of the theory (Glaser 1978). The core of the argument is essentially a trade-off between the risk of redundancy, versus the possibility of biasing observation and theory development (Willig et al., 2017).

It is argued that most fields have been subjected to substantial research and therefore the space for new theory will be niche and to find such a niche knowledge of the literature relating to the field of study is required, else one risks, or is almost certain to face redundancy of contribution. Moreover, that the process of reflecting on prior knowledge to address and reduce its potential for bias can equally be applied to knowledge developed through a literature review conducted ahead of entering the field (Dunne, 2011).

In contrast Glaser argues that prior literature review does inevitably bias the process of familiarisation and immersion in the field (Glaser 1978) and also risks a different type of redundancy, that is the redundancy of literature reviewed. Glaser argues that the theory that emerges through the process of grounded theory can point to a different body of literature than that anticipated at the outset, thus significant time and effort can be wasted (Glaser 1978). This gives rise to the potential for another bias, that of sunk cost; research shows that people can find

it hard to let go of prior effortful production and so may seek evidence associated with prior costly commitments.

It is also argued that the principle objective of grounded theory is the development of new theory, and immersion into the literature associated with the context to be investigated leads to a testing and refining of existing theory, rather than the production of novel perspectives; and so the risk of redundancy, if indeed the proposition of this risk is accepted, may be worthwhile in this respect (Suddaby, 2006).

Looking at the first study in this thesis it is posited that there would have been little chance of predicting the literature that would be of interest and relevance ahead of visiting the field, e.g. literature on number line, literature on psychophysics, on priming effects of colour, on metaphor, on childhood developmental psychology, amongst others. Indeed, it can be argued that the contribution of that study and so the value of grounded theory methodology is the connection of theories from across disciplines.

On the basis of study one, the literature review was conducted as theoretical sorting progressed, the prudence of this decision, in light of the above arguments, is evaluated in the conclusions and limitations section associated with this study (see section 0).

5.3.4 Methodology summary

In summary the stages of this grounded theory study were as follows:

1. Selection of organisation and context to study
2. Sample selection, invitation & consent
3. Interview design (initial)
4. Video recorded interviews of stage one participants (sub-sample of 8 high performers)
5. Open coding, and initial theoretical coding and core category identification
6. Revised interview design based on theoretical sampling
7. Sample screening against performance levels (by organisation, blind to researcher)
8. Video recorded interviews of stage two participants (sub-sample of 20 high performers)
9. Open coding and comparison/rating of participants against initial concepts/theory
10. Comparison or research based performance rankings against organisation ratings
11. Integration of good and high performing participant data into theory development
12. Theoretical sorting
13. Proposition development for each concept
14. Literature review

The results of which are presented in the following section.

5.4 Results

5.4.1 Introduction

Grounded theory based analysis resulted in the identification of three core categories. Firstly, *Formative Events*. *Formative events* are experiences that have significantly shaped the participants' perception, cognition, and behaviours in relation to safety. The learning arising from formative events and prior experience was identified as being deployed in participants practices in both personal safety and in safety leadership. These two areas of practice comprise the second and third core categories, *Personal Intervening* and *Cultural Leadership*. Theoretical sorting across the three core categories resulted in the development of a theory of safety performance.

The following subsections describe each core category in turn, describing its constituent concepts with reference to illustrative quotations from participant interviews. The final subsection introduces the theory of anticipated regret based safety performance, defining its supporting propositions that are assessed via the literature review, which is reported in the following main section.

Participant quotations are used throughout to help illustrate concepts being described/discussed. Each quotation has an alpha numeric reference. "a" signifies the quotation is from a stage 1 participant, "b" signifies the quotation is from a stage 2 participant. The numeric reference signifies a particular participant within a stage.

5.4.2 Formative Events (Structuring Regret)

The purpose of this chapter is to describe the core category – formative events (structuring regret) – which explicates events that facilitate learning proposed as significant in developing the safety practices of the participants in this study.

The chapter begins by defining the core category, explaining how it emerged during comparative analysis of stage one interviews and subsequently informed second stage interviews applying theoretical sampling. The chapter proceeds by introducing the component

concepts of the core category with reference to the role each concept plays in the experiences of, and insights into, the emotion of regret, with regret having been identified as a factor held in common across participants and events.

After introducing the component concepts and their role in the emotion of regret, a description of each concept is provided with reference to illustrative quotations drawn from participant interviews. The chapter closes by introducing the proposed relationships between ‘formative events’ and the participants’ ongoing practice in relation to safety leadership.

5.4.2.1 Definition

The term ‘formative events’ in this context refers to an experience that changes a participant’s *perceptual, cognitive* and *affective* patterns and so their resulting *judgements, decisions* and *behaviours*; each of which is defined as follows;

Perceptual: How participants pay attention to particular aspects of the contexts in which they find themselves.

Cognitive: The scope and complexity of their causal thinking; the content, structure and qualities of their mental simulations; and their perceptions of event probabilities.

Affective: The construction, experience and categorisation of their emotions.

Which in combination changes their;

Judgements about what constitutes a risk they need to address.

Decisions about where, how and when to intervene.

Behaviours utilised in safety interventions and leadership.

These changes, initiated by formative events, are posited to be a basis for differential performance concerning safety vigilance, intervention and leadership.

5.4.2.2 Identification of the ‘formative events’ core category

The company has a strong reputation for focusing on safety, from staff induction through to ongoing training, policy and practices, a reputation that is confirmed by the study participants. The high quality and consistency of focus on safety was highlighted by those participants with experience gained within other organisations in the same or tangential industries. Participants contrasted their experiences with prior employers with the company, with the company

consistently being regarded as exemplarily in terms of the safety focus and culture. For example:

“I came from [industry] and [industry]. And then when I came to [company] [#] years ago, I was actually quite impressed with the way that [company] really lives safety. In fact, my first meeting, the leadership meeting, I was amazed ...the time we spent talking about safety then to find that this is normal here. I worked with four [different blue-chip international companies,] but, I never saw commitment like here” [b25]

Although participants were complimentary about the organisation’s safety focus and practices, when participants were questioned about the origins of their current thinking, beliefs and practices in relation to safety, they universally referred back to significant events that had changed the way they think and act. The thinking and behaviours they shared throughout their interviews related to these significant events and not the formal learning and policies of the organisation. The participants perceived these events, and subsequent reflections, as having shaped and *formed* their thinking and behaviours, and therefore the core category has been labelled as ‘*formative events*’.

These events were identified during early analysis of stage one interviews conducted with participants identified as high performers by the company. The events were identified as significant due to the;

- universal referencing of such events by participants interviewed
- degree of change/learning described by the participants from such events

“It completely changed me and the way I think, no way back” [b21]

“I will never again...and I haven’t” [a2]

“You can’t look at the world again in the same way, after...” [a4]

- nature of the metaphors used to describe the depth of learning;

“it re-shaped me” [b7], “made a deep impact” [a6], “that will never leave me” [a8] “it has stayed with me” [b12], “I will never let that go” [b23]

In accordance with the theoretical sampling methodology of grounded theory, (Glaser, 1978) subsequent interviews were adapted to further explore how ‘formative events’ inform participants current practice. As described in the methodology section second stage interviews included the following question:

Question: If you reflect on your career to date, are there any particular trainings, experiences or events that have shaped/informed the way you currently think about or approach safety?

The responses to this question were consistent with stage one interviews and further confirmed the importance of such events in shaping participants approaches to safety.

5.4.2.3 *Building regret*

As described above, participants consistently referred to learning derived from experiencing and reflecting on particular events as being significant in forming their current safety thinking and behaviours:

“I’ve never let that go. I’m talking 2009 probably, so this is 10 years ago” [b12]

“That element in [country] has really shaped me...I will never again...” [b1]

All participants readily identified 3 to 5 pivotal events that had shaped their current professional and personal approaches to safety. A key and unifying feature of these events is the construction and experience of the emotion of regret.

Whilst the label ‘regret’ is only explicitly used in a number of interviews, experience of regret is consistently recounted in accordance with the definitions of the emotion of regret below.

“A feeling of sadness, repentance, or disappointment over an occurrence or something that one has done or failed to do” (Oxford English Dictionary)

“Regret is experienced when we realize or imagine that our present situation would have been better had we made different decisions” (Zeelenberg & Pieters, 2006, p.418).

For example, from participant interviews:

Explicitly Labelled Regret: *“It’s something I regret” [b18], “I don’t want to experience regret like that ever again” [b12], “I don’t want people to go through the regret I lived with, still live with” [b11]*

Experiences Matching the Definition of Regret: “*I wish I had...it could have a different outcome...*” [b14], “*we could have known, but we didn’t and the result no one wants*”, “*what’s the hope for their family now, If I had just...it would be different*” [b23]

Regret as per the above examples and definitions involves the comparison of two outcomes, the outcome that actually happened and an imagined outcome that would have been preferred, with the latter outcome assumed possible through different prior decisions and actions.

Figure 9 below illustrates the relationships between the concepts developed from analysis of interviews that comprise the ‘formative events’ core category and play a role in constructing the emotion of regret.

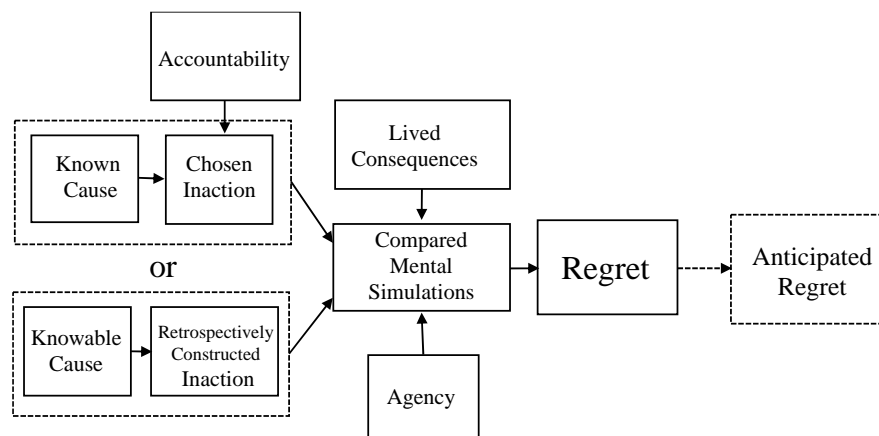


Figure 9: ‘Formative Events’ – concept relationships

The model proposes knowledge of *causes* (*known* and *knowable*) of incidents, and knowledge of actions/interventions are the basis for constructing comparison of mental simulations/narratives that lead to the experience of regret. Comparison between a simulation of an incident that occurred and its undesirable consequences, against a simulation of timely intervention(s) being carried out or instigated by the participant that avoids the incident or reduces its consequences. With this comparison resulting in the experience of regret. The comparative simulations require an assumption of agency (the capability, capacity and authority to have intervened successfully) to establish regret, an emotion which is intensified by including the mental simulation of the ongoing life consequences for the individuals involved directly and indirectly in the incident.

Beginning with ‘Known or knowable causes’, section 5.4.2.4 below introduces each concept within the formative events core category, with reference to the roles they play in the proposed comparative mental simulations, and therefore in experience of regret. Sections 5.4.2.5 - 5.4.2.11 then define each concept in detail with illustrative examples from participant interviews.

5.4.2.4 *Introducing the concepts within the ‘formative events’ core category*

‘Known or knowable causes’ in the model refers to an identifiable current or potential state of an object, system or circumstance that can be anticipated as having the potential to instigate or contribute an unintended incident.

Knowledge of cause is posited to be fundamental for the comparative mental simulations / narratives that construct regret, based on the argument that if no cause can be determined then it’s not possible to develop a reasonable simulation of an intervention leading to a different result? If no cause is identifiable an incident could be seen as a tragic accident, and an individual may wish it hadn’t happened and simulate alternative narratives like “what if they had left home 5 minutes earlier, they wouldn’t have been in that location”, such narratives lack the possibility of anticipatory intervention. Whilst it is possible to create some sense of regret in this situation, e.g. “if I had just called them like I had intended, they would have left later and so not been there” this falls short of the construct of anticipated regret, as you could not anticipate the specific cause effects or the right action? For example, in a future scenario, you might make the call, that could delay someone, so they are in the wrong place at the wrong time. Without known or knowable cause effects it is proposed that the emotion of regret is unreasonable and can only be retrospective, not anticipatory, due to the lack of possibility to have reasonably affected a different outcome.

There are two forms of ‘inaction’ within the above model which align with the timing of the becoming aware of, gaining knowledge of, a cause of an incident. There is a timing in which a cause that is noticed/known before an incident takes place, e.g. a cable on the ground that could be tripped over that is noticed but left in place i.e. inaction is chosen. There is also a timing in which the cause is found later, after the incident, but that could have been identified prior to the incident and acted upon e.g. “I didn’t know there was a cable on the floor, if I had have known it was there, I could have removed or covered it” i.e. inaction is retrospectively identified in relation to a cause that was possible to know in advance. Both forms of inaction facilitate comparative mental simulations, a simulation of negative consequences occurring through

inaction with a simulation in which action taken avoids or reduces the consequences of an incident, with the comparison resulting in the experience of the emotion of regret.

There is third form of 'inaction' in the model, inaction resulting from a sense of '*bounded accountability*' with '*bounded accountability*' referring to a restricted scope of contexts in which accountability for safety is assumed. In this concept inaction is chosen due to the absence of felt accountability, e.g. "I noticed the cable on the floor in the training room, but I was a delegate, so left it for the organiser to fix". When an incident then occurs, e.g. someone trips over the cable and injures themselves and possibly others, two mental simulations are constructed and compared, one simulation of negative consequences occurring through inaction driven by an absence of accountability and one simulation where action taken avoids or reduces the consequences of an incident, with the comparison resulting in the experience of the emotion of regret.

The concept of 'lived consequences' in the model refers to narratives of the consequences of an incident to someone's initial and ongoing experiences of life inside and outside of work, extending to their interactions with, and experience of, family, friends and colleagues. When such narratives are included in the comparative mental simulations of regret, they have the effect of significantly intensifying the emotion of regret experienced. By extending mentally simulated narratives of incidents in this way, the consequences are "*made real*", *making real* in this context is proposed to refer to creating an associated and more vivid mental representation of an event, with the impacts for a person in the foreground rather than a simulation focused on the mechanics of the event. The increased intensity of the emotion is sometimes further enhanced through personalisation, i.e. comparison to a one's own life, "what if that was my daughter that was in that incident", "what if my children no longer had a father". This is described as the incident being "*brought home*", with this form of association to one's own life adding an additional mental simulation, a simulation of an incident and the lived consequences happening to themselves and or people that are personally close to. With increased contrast between mental simulations, simulations of the event occurring versus being avoided, an even greater sense of regret is experienced.

Agency in the context of the model means a personally derived authority to act and the capacity and capability to make a difference to the outcome. Participants never personally questioned their authority or the possibility to intervene within their assumed sphere of accountability (see bounded accountability above), they did however describe its potential absence as a risk to motivation towards safety vigilance and intervention. Based on the participants intuitive descriptions, the absence or reduction of the sense of agency is posited to remove or moderate

the emotion of regret by *negating* or *altering* the mental simulation of potential intervention narratives. ‘*Negating*’, meaning the dismissal or non-construction of the mental simulation due to the intervention not being perceived as possible due to lack of authority, capability or capacity. ‘*Altering*’, meaning the construction of a mental simulation of a narrative where the intervention is attempted but fails, due to lack of sufficient capability or capacity to competently execute the intervention and or rejection of the intervention by someone in authority.

In the model ‘*comparative mental simulations*’ refers to the mental representation of contrasting narratives; contrasting a mental representation of a narrative of an incident that has occurred compared with a narrative of the incident being avoided or the consequences being reduced. The form of these mental representations is posited as being embodied. Embodied meaning the mental representations are sensory re-imaginings / constructions of the narratives with the simulations being visual recreations or constructions of events and their consequences.

Furthermore, it is proposed that these simulations are experienced from one or more of three perspectives. A perspective of observing the events from outside, like watching a movie; a 1st person associated perspective essentially experiencing the scene of the visualisation by being in it as oneself, like being in a virtual reality scene; and a 2nd person associated perspective, being someone else in the visualisation, experiencing events as another character in a virtual reality scene. The term embodied is used because the perspectives, in particular the latter two, can include the reconstruction of other senses. e.g. “the heat from the fire was intense, I could smell the...and hear the metal creaking as it...”, “my breathing was rapid and shallow’.

In addition to variation through different perspectives, embodied simulations can vary in relation to the qualities of each sensory channel, e.g. the volume of sound, or the scope of frame, vividness and saturation of visualisation. Mental representations within formative events are proposed to be embodied and not abstract, i.e. not of changes to schema / intermediate representations, e.g. the change in a number, a graph, a drawing or a chart. While it is possible to regret an increase of the *number* of safety incidents, the formative events reported by the effective participants were universally embodied representations of particular incidents.

‘Constructing regret’ has been introduced above, ‘*anticipated regret*’ is discussed in detail in sections 5.4.3, 5.4.4 and 5.4.5. ‘Anticipated regret’ refers to the mental strategy developed and applied in order to avoid actually experiencing regret in the future. Each formative event contains the experience of regret, which is expressed as a significantly aversive emotion, it is an unpleasant feeling that participants do not want to repeat. To avoid actual regret in the future participants are motivated to apply anticipatory planning strategies and to take actions to ensure

negative outcomes are avoided; strategies applied and actions taken can be grouped into two categories, those applied in a participant's personal safety practice and those applied in creating an effective safety culture.

Having introduced each of the concepts that form the core category of 'formative events' with reference to how each contributes to experiencing the emotion of regret. Sections 5.4.2.5 - 5.4.2.11 now describe each concept in detail with illustrative examples from participant interviews, in advance Table 12 below shows each concept's conceptual codes and a summary description.

Table 12: Formative events core concepts

Core Category	Concepts	Conceptual Codes	Description
Formative Events (Structuring Regret)	Known/Knowable Cause	Could see. Noticed. Caught attention. Could lead to. Did lead to. Thought later. In reality. On front line. On the ground. Normalisation	A risk that is the actual or potential cause of an incident that leads to or could lead to harm, that is known or could have been known.
	Inaction (chosen, retrospective)	Could have acted. Didn't act. If only. Should have.	The absence of an action that could have addressed a risk/cause, i.e. avoided the actual or imagined consequences of the cause coming into effect.
	Lived consequences	Lived lives. Family. My Family. Not numbers.	Experience or awareness of the life impacts of incidents, of the impacts on the quality of life for individuals and their families. With comparison / association to own family.
	Bounded Accountability	My Business. 24/7. On guard.	Reduced accountability for intervening in contexts outside of work to help people to be safe.
	Agency	Could have. Should have. If I had. Choice.	Having the self-derived authority and possibility to make a difference through personal choice and action.
	Contrasting Mental Simulations	Seeing. In Mind. Imagined. Story. Narrative. Not abstract. Associated, Perceptual positions	Mentally simulation and comparison of two or more narratives; one if action was or had have been taken, one of the full consequences of inaction.
	Constructed Regret	Motivating negative emotion.	Strong motivating emotion experienced when describing/reliving the actual or imagined narrative created by inaction.

5.4.2.5 *Known/Knowable Cause*

As described above, regret is experienced by comparing the mental simulations of two events, one that occurred with an undesired outcome, and a preferable outcome that could have occurred if alternative decisions / actions had been taken. As untaken action relates to a cause, or causes, that ultimately lead to undesired consequences, ‘knowledge of cause’ is argued to be a pre-requisite for regret. The timing of the ‘Knowledge of cause’ distinguishes two types of formative events described by the participants:

Known Cause:

A cause/risk was present and identified but not acted upon.

Knowable Cause:

A cause/risk was present but not identified (but could have been identified), leading to inaction.

5.4.2.5.1 *Knowable Cause*

Figure 10 below depicts the process of experiencing regret in relation to an incident, when the cause of the incident is identified subsequently to the incident occurring. The risk/cause of the incident, by definition, exists before the incident takes place, but there is a form of *barrier* that prevents its prior identification by an observer. As the cause is not identified, *inaction* transpires. Subsequent to the incident occurring, the prior risk/cause is identified, and an end-to-end mental simulation is constructed, a simulation that runs from initial cause through to extended consequences to people’s lives. A second simulation is constructed in parallel. In this simulation, the cause is acted upon and the incident and or its effects are avoided. Comparison between these two simulations constructing the experience of regret.

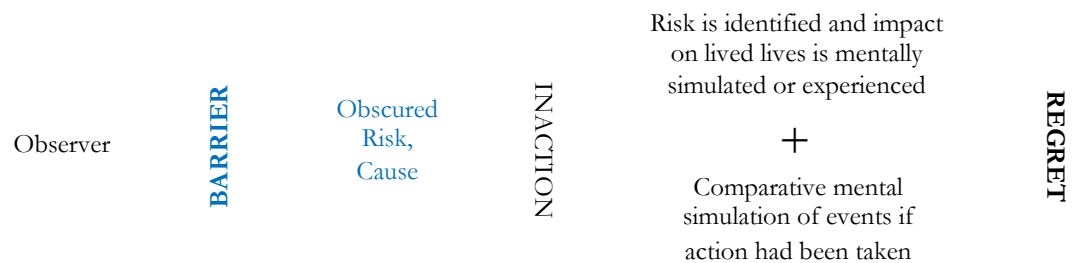


Figure 10: Knowable cause Leading to Regret

There are two types of ‘knowable cause’ identified in formative events. These types are differentiated by the nature of the *barrier* that obscures the potential causes of incidents from awareness. One type of barrier leading to a focus on the concept of ‘*grounding*’, and the second type of barrier leading to a focus on the concept of ‘*risk is never zero*’, both of which of manifest in personal practice.

5.4.2.5.1.1 Knowable Cause (Leading to the practice of ‘grounding’)

The first type of barrier that obscures a cause is exemplified by the metaphor used by one participant - “*seeing beyond the paper*”:

“I was seen as a bright young thing and a high performer, I was confident and diligent in my work, at least I thought I was, until I learnt I was not seeing beyond the paper”
[a5]

“*Not seeing beyond the paper*” refers to a reliance on intermediate representations (drawings, schematics, graphs, tables, statistics etc) of the status of the physical site, its associated systems and operators. Plus, reliance on the policies and procedures that are also based on the assumption that these intermediate representations are accurate and appropriate for developing plans and for making decisions.

The ‘*formative event*’ that instigated this realisation for this participant involved the participant presenting a certificate of authorisation to begin work, to a welder. The welder’s task was to use an oxy-acetylene torch (acetylene can burn at up to 3,160°C) to cut a hole in a section of pipe that normally carries flammable liquids or explosive mixtures of gases. The participant confidently presented the authorisation certificate to the welder, confidently because from their perspective they had done everything necessary, they had checked the drawings, and they had followed the procedures in accordance with the checklists. As the participant began to walk away something unexpected happened, the welder said;

“where do you think you’re going, if I’m going to cut this pipe, that your piece of paper is telling me is safe, then you’re going to be standing next to me as I light the torch and start cutting, now again, tell me we are ok to start”[a5]

The participant described an important realisation.

“I realised this was the first time I was looking at the real pipe, the reality of its place in a living and complex site, all I knew was I had diligently followed a procedure, I had no way of knowing if it reflected the reality of what was happening or recently happened on site” [a5]

The participant then mentally simulated the potential consequences of being wrong, of their being dangerous gases or liquid in the pipe, to the lives of both of them, and then rapidly considered all the times they had handed over an authorisation certificate without being ‘grounded’ in the reality of the site.

“I felt a sudden horror...” “...I imagined someone telling the welders family what had happened, how he died, how it was my fault...and how my family would feel” “I recalled all the times I had followed the procedures and felt sick” [a5]

The participant went on to describe the nature of this type of barrier, of not *seeing past the paper*, and how it functioned to obscure risk or potential causes of incidents.

“paper is, and drawings are static, they are abstract representation, they are not the reality on the ground, sites are living systems, it’s like looking at a menu or recipe and assuming you know what’s going on in the kitchen, you’re blind to what’s really going on, you have to be on the ground to know” [a5]

These learning events cause the participants to change personal and leadership practices. They endeavour to ensure they “*understand the site*”, and to ensure their and their team’s “*understanding*” is current and “*grounded*” when planning and executing activity, recognising that a site is a live environment and so always subject to change.

Not being close to the reality of the current status of the site, not being “*grounded*”, can have significant consequences, and so create vivid and highly emotional formative events:

“sorry I can’t talk about this without becoming emotional...there was a mix up where ultimately we were doing work on a unit that was still live...one line was still in service and there was a mistake and mislabelling...they were never able to return to work...they were never the same...neither am I...You learn about how you can think that things are in control, but they’re not in control. You just assume they are, because you have the drawings and they’re highlighted and there’s a tag...” [b12]

The above examples refer to a physical site; of not having accurate knowledge of the physical status of the site and its systems. In addition, accurate knowledge can be lacking about how people are thinking and behaving as individuals in a specific local culture. In these cases risks are obscured by erroneous assumptions about other people and cultures. The formative events reported by participants include the pattern of realising that individuals do unsafe things for reasons that may appear to be completely rational to those individuals in their local culture. Different cultures can have very different responses to events. For some participants, their formative events have led to the realisation that different cultures respond differently to risks, for example, a formative event comprised hearing about an incident at another company in a different country:

“there was a lorry carrying fuel that went off the road, if you think about seeing a fuel lorry turn over and you see fuel leaking out, what would your first instinct be, to run to stay away? but in this country, unbelievably people ran towards it instead, for the fuel, it caught light and people died or got badly burnt. It’s horrifying and it shows you can’t make assumptions you have to be there and know the culture.” [b1]

Also:

“we issued PPE to all staff and contractors to make sure everyone had the proper equipment, but when I got to site I saw people in sandals, I heard the staff really appreciated the high value gifts and wanted to make sure they were kept in good order. I learned then you have to really understand your people and their cultures” [a6]

These formative learning events cause participants to change personal and leadership practices to ensure they and their teams “*understand the site*”, to a striving to understand how people think on site, achieved through contact and questions, to become ‘*grounded*’ in the local culture and how people are thinking.

5.4.2.5.1.2 Knowable Cause (Leading to the belief/practice – risk is never zero)

The prior barrier, that can obscure a source of risk, is overcome by engaging in experiencing the reality of site operations, being “*on the ground*”. In contrast, this barrier obscures a knowable cause through a process of familiarisation with the *reality* of operations, resulting in a set of assumptions about what is present in a familiar situation, what activities typically take place and how events typically unfold. Referred to as *normalisation*, this process of familiarisation results in the switching off of attention towards routine risks, plus the failure to notice changes in a familiar environment with people seeing what they expect to see.

“how do I get people to stop switching off to risks that are everyday” [a1]

“because nothing’s happened people switch off, I can find myself switching off” [b3]

“why hold the handrail if you’ve never fallen or seen anyone fall?” [b9]

“if you step over a trip hazard every day, it stops being a trip hazard in people’s minds” [b22]

“people stop seeing what’s right in front of them, I’m no different, I have to create a trigger to make me look afresh each time” [b16]

“it’s that last mile of the drive when everything is familiar you switch to autopilot; it’s where crashes happen, I shudder when I can’t remember looking at that last junction, did I?” [b23]

As can be seen from the above examples, normalisation can create two *barriers* that may prevent a participant from identifying potential causes of incidents. It can impact a participant’s own perception of risks, and it can prevent others from identifying and reporting potential risk to a participant.

Two forms of formative events are described as *“interrupting”*, *“overcoming”* or *“preventing”* normalisation. The first being the observation of extreme normalisation (not necessarily within their own company) causing a personal re-evaluation of everyday familiar environments and actions:

“I couldn’t believe my eyes, he was bouncing his ladder across the wall three stories up instead of climbing down, and why wasn’t someone holding it anyway, made me wonder when and where do I metaphorically bounce the ladder” [b4]

“when you see people doing strange and dangerous things, that obviously don’t register that way for them... I took a step back and looked at what routine things I do from the outside, that I don’t register” [b1]

“what they were doing was crazy in my mind, but then we drive cars at 60 mph in opposite direction with just a white line to protect us!” [b7]

The second being the observation and or experience of a *“small”*, *“trivial”*, *“inconsequential”* cause having *“massive”*, *“devastating”*, *“life changing”* consequences.

“they were only going down three steps, now they are in a wheelchair for life”

“for the sake of not just..., they never returned to work, they were ever the same again, and in fact neither was I” [b23]

“the omission of such small things can have devastating consequences, the fire brigade brought this literally and metaphorically home, when they shared what they see, the devastation to lives, for the sake of a battery in a smoke detector, or a phone left charging overnight on the carpet...” [a2]

“it really hits home” [b25], “brings it home” [b8], “made it real and relevant” [a2]

These events have a significant emotional impact, as registered in the terminology used to describe how they and others feel when they hear or retell these events, and in the variations in voice and posture. Voices stutter, slow down, change tone, and have irregular pauses in conjunction with skin tone changes, postures losing height and becoming rounded, and eyes welling up, all indicating intense affect.

These examples of *‘formative events’* include the story of the lived life impacts of the incidents along with the thought *that could have been me, someone I love*. The significance of the inclusion of the life impact is discussed in Section 5.4.3.8.

As described in detail in Section 5.4.3.6 participants report that both types of formative events motivate the search for a personal method of reinforcing and triggering a state of vigilance, of seeing a familiar context afresh, they endeavour to develop a method beyond regular company safety policies and practices. They also seek ways to maintain vigilance within the organisation’s culture as described in Section 5.4.4

5.4.2.5.2 *Known Cause*

The prior section described formative events in which action was not taken to avoid an incident because of a failure to identify an identifiable risk/cause. In this section, formative events comprise a decision not to take action even though a potential cause of an incident has been identified.

Inaction being the chosen in response to an identified/known cause is an infrequent occurrence in terms of the formative events reported by the participants. However, instances of inaction were identified that created specific learning and change, the change being the extending of the boundary of personal accountability for safety.

5.4.2.5.2.1 *Known Cause – Altering Accountability:*

Figure 11 below depicts the process of experiencing regret when a risk is identified but not acted upon, a risk that later causes an incident in which harm is done to a person/people that impacts lives. In this form of ‘*formative event*’ a participant notices or knows the presence of a risk, considers the impact it may have to those involved at the workplace but chooses not to act. Because the risk is observed in a context outside of the participants workplace or personal space, accountability is not assumed, and no action is taken.

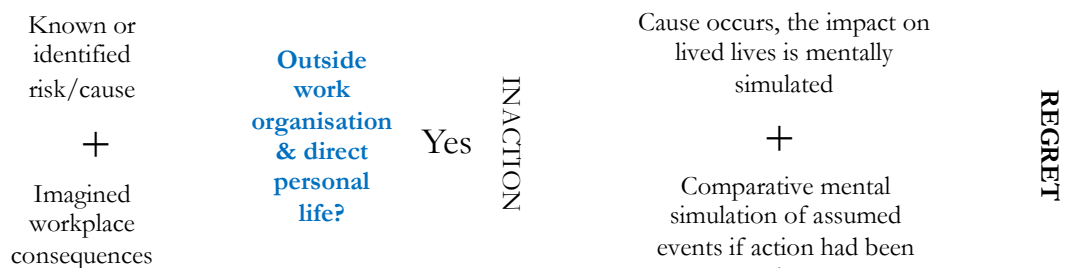


Figure 11: *Known Cause – Altering Accountability*

Subsequently, the risk becomes the cause of an incident. The participant then mentally simulates the incident, from the risk becoming a cause through to the life consequences for those impacted. The participant then compares this to a simulation of what could have happened if they had of intervened, this comparison leading to experiencing regret.

These instances of inaction relate to the identification of causes that are situated in a context outside the individual’s formal and personally assumed accountability for safety. In these instances, ‘outside the individual’s formal accountability for safety’ means outside of their company.

The below being a typical example:

“When I was driving to (destination), I saw an unsafe behaviour around the side of the road where people were working on electrical wires. Because there was a traffic jam, I looked out of the window and I could see this work ongoing. I thought to myself in the car, I really wonder if they have actually done the proper checks upfront and there is no power on these cables etc? Why did I think that? This wasn't (my company), it was just infrastructure project from, I guess, the Government. The people weren't wearing the

proper PPE. You could just see the way it was organised, this was really, really poorly organised and managed” [b23]

Before the actual consequences of inaction are known, the participant justifies their decision not to intervene by considering how an **outside** intervention may be perceived, and how intervening would interrupt activities and create cost within their **own domain** of activities, i.e. catching their flight. The participant describes this as “*minding my own business*”.

“The other thought was, hey, I'm in a taxi. Can I actually ask the taxi to stop? What will I do with my flight? Should I mind my own business? The other element is you are an expat an outsider, I guess, in a country. Do you want to intervene there, or could you be seen as a bit of a colonialist there?” [b23]

Once the participant learns of the incident and imagines the lived consequences (see section 5.4.2.7), the participant expresses regret, and states “*I will never again mind my own business*”. This phrase describes extending the scope of their accountability in terms of the domains/contexts in which they both identify and intervene in matters of safety:

“I do not want that to happen again. I've now been confronted with an action I didn't take; I could have taken, and I didn't take. I know what the results are, the disastrous results that there have been. I will never again mind my own business even if it is not my own business.” [b23]

Indeed, as a result of this learning, this participant describes an extreme example of intervening outside their work domain. This intervention carried out outside of their formal accountability is later reinforced by the hierarchy of the organisation::

“the GM at that time, he said, "Well I would have done the same thing regardless of..." [b23]

In each case of an identified risk not being acted upon reported, the associated emotion is regret. The retrospective comparative mental simulation being of the participant taking action, of taking accountability and choosing to intervene, resulting in a preferred outcome, a perceived possible outcome that they regret not having brought into being. In no cases reported, did the participant simulate action being taken by the person who was formally accountable in the context. When participants were questioned about why they felt regret about their own inaction

rather than anger towards the officially accountable person, the following represents a typical response.

“I’m not a leader in their organisation, so I can’t affect how their leaders act, but I can make difference to that incident, and perhaps that does make a difference, I hope they might pay it forward, they may help someone in a similar situation.” [b23]

This response links to the concept of ‘agency’ discussed later in this chapter, with the participant believing they can make a difference to an outcome, and so a difference not made leaving the participant with a sense of regret. Indeed, intervening outside of organisational and direct personal context is a typical pattern seen across the higher-performing participants.

In this and the prior section, the role ‘knowledge of cause’ plays in ‘formative events’ and establishing regret has been described. The following section describes forms of inaction (omitted intervention) related to when a cause is identified.

- chosen inaction when a cause is identified before an incident occurs
- retrospective inaction when a cause wasn’t identified before an incident

5.4.2.6 Omitted Intervention

Figure 12 depicts the role inaction plays in the construction and experience of regret. ‘Chosen inaction’ follows the identification of a risk, then post incident comparison of contrasting mental simulations leads to regret. ‘Retrospectively constructed inaction’ follows an incident and post incident awareness of the risk that became the cause of the incident. Actions that could have addressed the cause and so avoided the incident are mentally simulated, leading to regret for those actions not being taken.

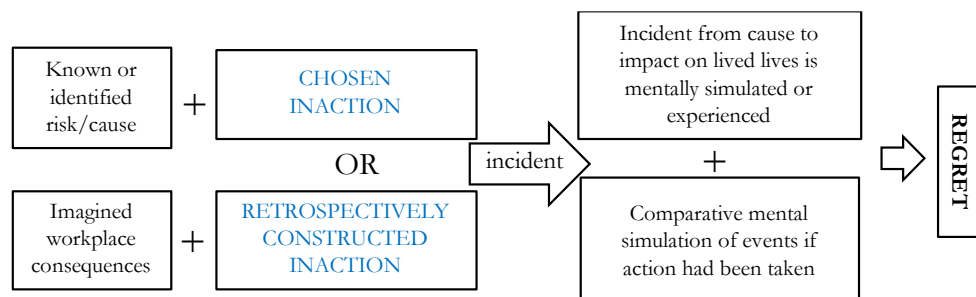


Figure 12: Omitted intervention

5.4.2.6.1 *Chosen Inaction*

As already mentioned, choosing not to act, not to intervene, is a rare '*formative event*' within the interviewed population. The only times chosen inaction occurs is when the intervention is outside of the accountability of the individual, as previously described, or when the risk created by intervening greatly outweighs the possible benefits of the intervention. An example of the later;

"I wouldn't run across a busy road without a crossing to catch up with someone who's about to go out of sight and has a shoelace undone, I would be creating more risk for more people than I would be resolving... but I still worry a bit... but it's about balancing things against each other" [b21]

In this type of event, the compared mental simulations both construct regret. The simulation of the person stepping on their lace and falling over, compared to the simulation of being run down or causing a traffic accident. The decision of inaction is then based on the minimisation of potential/anticipated regret for harm that may be done, along with its probability. But because both simulations involve regret there can be residual affect – *"I still worry a bit"*.

In the majority of cases inaction is temporary, if taking action is thought to increase overall risk / potential harm then a search for a better solution is instigated;

"I saw some people in trouble in some big waves at the shore, being dragged out and under, I went run in, but realised I would just be another person to save, putting others at risk to save me as well, so I found some things I could use to reach them without making the whole things worse" [b23]

In this type of event, again the compared mental simulations both construct regret and lead to inaction, however, in this case, temporary inaction. The two regretful simulations motivate the search for a solution that reduces risk and can achieve a positive outcome. In the example above, the imagined consequences of not acting, *"I couldn't do nothing and see people drowning"* is regretful and, is compared to the imagined consequences of running in, *"I would just be another person to save"*, also regretful. This comparison of unsatisfactory, regretful outcomes causes the search for a solution, in this case finding something to reach the swimmers with.

The participant described this process as “*looking*” at the alternative. When asked what they mean by looking they responded with, “*you really quickly run them through your mind, seeing what will or could happen, some of them you don’t want to see*”. This process of developing and comparing mental simulations is then essentially a process of reducing or avoiding regret that is anticipated.

5.4.2.6.2 *Retrospectively Constructed Inaction*

‘*Retrospectively constructed inaction*’ refers to an incident occurring and then an individual imagining actions that they could have been taken to address post incident identified causes, that may have prevented the incident, or at least reduced the harm to people.

“when I found out...I thought I could have” [b23]

“when you hear about...I think about how it could have been avoided...what could I have done” [b2]

“no matter how remote from what happened I think about what I could have done to make things different, to change thinking or culture” [a3]

“why didn’t I...” [b7]

“what if I had...” [a4]

In these cases, the inaction is due to an identifiable risk that is the cause of an incident, remaining unidentified. Retrospectively constructed inaction thus relates to the concept of knowable cause as described in section 5.4.2.5.1.

Again, regret is experienced via comparative mental simulations, one of what happened i.e. a negative outcome, in comparison to the outcome that is believed could have happened if the cause had been identified and appropriate action taken.

“they would still be able to....” [b23]

“no-one would be...” [b11]

“they would have been on their way home at the end of the day instead of...” [b8]

“there would be... instead of...” [a7]

The mental simulation that incorporates the retrospectively constructed action, necessarily includes a retrospectively identified cause of the incident. The regret experienced therefore motivates the search for improvements in their own and others vigilance and ability to identify potential causes for incidents as described in section 5.4.3.4.

5.4.2.7 *Lived consequences*

‘*Lived consequences*’ is the concept of imagining or observing the consequences of an incident on the ongoing lives of those directly affected by and incident and by those connected with them, in particular their families. Which, when added to and incorporated into the previously described comparative mental simulations, significantly intensify the emotion of regret.

“it still lives with me, going to the hospital and meeting the family of a colleague who was injured, seeing and feeling their distress and emotions, both about the what had happened and what this meant for their lives going forward” [a3]

“I met with the parents of one of the children that died, that has always sat with me, it sits with me...” [b11]

“it’s not about lost time, it’s just the wrong way to think, I used to think about the numbers, but when you see first-hand the changes that happen to a whole family’s life, the numbers take on a whole different meaning” [b25]

“At one site, there’s a memorial. Their story becomes people that you knew, and their families. It certainly triggers, really understanding the potential consequence, it’s not just conceptual or a high-level discussion, it really translates into seeing and feeling those outcomes” [b8]

In the first three examples above the formative events comprise direct experiences of seeing a family’s distress. These are emotional experiences that retain an emotional impact when they are recalled as indicated by the participants’ physiological changes when talking about them, e.g. speech changes tone and breaks rhythm, head lowers and changes angle, eyes look down and well. As this intense emotion is attached to an outcome that is perceived to have been avoidable, it significantly increases regret.

The fourth example is one of learning from a story that is symbolically represented by a memorial and not direct experience. While the event represented by the memorial was not directly experienced, engagement with it still results in the mental simulation of the narrative *“it really translates into seeing and feeling those outcomes”*, and based on the participant’s physiological changes during retelling, clearly retains a strong emotional impact.

The above examples extend the content of the compared mental simulations involved in developing regret. They add the content of the consequences of the incident, a narrative of life

after the event comprising the immediate reactions to news of the incident through to the ongoing impacts on quality of life.

In addition to adding content participants report a change in the way they perceive an incident.

“You see the whole thing differently when it’s someone you know; you go beyond the mechanics of the incident”. “the people and what’s happening to them comes into focus”. [b8]

The above examples describe the qualities of the mental simulation of the incident changing. Knowing a person, or thinking about a person’s life, appears to bring the impacts and experiences of people more prominent in the representation of the incident. When incidents are associated with a person in this way, the emotions described at the time of the incident, and demonstrated in recounting it, are much stronger, with regret heightened.

Regret is also heightened by participants by a further processing the mental simulations, participants describe a proactive transformation of content through a process which has been labelled herein as personalisation.

“that could be my son or daughter” [b25]

“what if it was my children that no longer had a father” [b23]

“I have children the same age, makes you think, about...” [b11]

This form of transformation of content is performed in two situations. It’s primarily reported in incidents where the participant doesn’t know a person’s life circumstances, in which case the participants own, or a familiar person’s life circumstances are used to facilitate simulation of life impacts. Their own or a known person’s life acts as a prototype that is used to generate the lived consequences content for the mental simulation, and so enhance regret.

Personalisation is also sometime reported to occur when there is a perceived similarity between the affected person's life and a participant's own life or the life of someone they are close to. In these instances, two regretful simulations are constructed, a simulation of the life consequences for the person involved in the incident and a simulation of the life consequences as if experienced by themselves or a person they know well. Both simulations increasing the sense of regret, *“at that time their children ages were close to mine...what if...” [b11]*.

The formative events that involve ‘lived consequences’ initiate a change in the way safety incidents and risks are thought about;

“the numbers take on a whole different meaning” [b16]

” you have to imagine the impact that can have on someone life” [b25]

Rather than simply attending to an abstract representation of safety performance such as a graph or numbers, the numbers are translated into imagined or recalled impacts on real people, i.e. a mental simulation of the narrative that includes changes to the qualities of life of those directly and indirectly impacted.

This connection to a lived life is also made when thinking about safety performance in general, and not with reference to a particular incident. For example, one participant described translating a small incident rate into a mental simulation that creates emotion. This was achieved by relating a ratio e.g. 1 in 100k, to a population that would be familiar to a person, e.g. the streets in which they live, and then suggesting that they have to knock on a door a select the person who will come to harm. In the words of the participant *“it can be rewarding for someone to think they have reduced the number of incidents by half, you can’t regret that, but the remaining half is still real people, and I don’t want to choose the door to knock on, do you?” [b16]*

The creation and strengthening of the emotion of regret and anticipated regret within personal and leadership practice is an implicit strategy deployed by the high performing participants in this study. Core to this strategy is the personalisation of workers and the associated development of concern for impacts felt beyond the workplace, the ‘lived consequences’.

5.4.2.8 Bounded to Extended Accountability

There are two patterns of ‘*bounded-extended accountability*’ identified across the participant interviews. One pattern of ‘*bounded to extended accountability*’ has been given in section 5.4.2.5.2, when not acting because of a perceived boundary of accountability, caused regret that led to the person extending their accountabilities.

“I will never again mind my own business even if it is not my own business.”

[b23]

The example below exemplifies the second identified pattern of ‘*bounded-extended accountability*’. Again, participants extend the contexts and time frames in which they feel personally accountable for safety, however, in this case potential regret is anticipated rather than experienced. This is a pattern of being influenced to change through role modelling, with future practice being influenced by observing the behaviours of someone they held in respect.

“it really hit home to me when I saw [him] strimming the edge of his garden wearing safety shoes and glasses, small causes can have big effects 24/7, not just in work” [b21]

As per the example above, seeing this type behaviour in someone that is respected triggers a process of sensemaking incorporating a simulation of potential consequences from the risk that is being taken care of, including impact on the associated lived lives, e.g. *if this person is wearing safety glasses there must be a real material risk, clearly there is, it would be easy for the strimmer to flick something at high speed into their eye, they could be blinded, their family would experience the accident first hand, and what about the long term consequences of sight loss, why wouldn’t you wear glasses, I regret putting my family at risk like this in the past and will not any longer.*

The anticipated regret described above causes the participant to extend the contexts in which they apply their safety vigilance and propensity to intervene, extending the sense of personal accountability for safety. Extending the context of accountability is seen as indicator of a change in safety mindset, indeed as an indicator of safety practice based in following rules versus mindful practice, as demonstrated in the quote below.

“if your leaving this thinking at the gate then you’re just complying, it’s not part of who you are” [b21]

Perhaps explaining why intervening outside of organisational and direct personal context is a common pattern seen across the higher performing participant.

“I’m always on guard... train station, hotel everywhere” [b23]

“My friends and family humour me, they know I’m always thinking this way, they try to tell me to relax, but I relax when I’ve taken care of the risks, wherever” [b23]

“you have to be on guard all of the time, it doesn’t mean you can’t have fun, but you can reduce risk all of the time, and if you can you owe it to....” [b23]

As such the personal extending of accountability across contexts and time is a consistent pattern applied in both personal practice in is targeted in cultural leadership as described in sections 5.4.3 and 5.4.4 respectively.

5.4.2.9 Agency

Although agency was not something participants described as being the result of a formative event, ‘agency’ as a concept is included as it is a concept that was found to be common across the formative events described by participants. Here the term agency has two factors, the capacity and capability to affect change, to be at cause and so make a difference in outcomes.

Agency was consistently described across participant interviews with the possibility to have an effect never being questioned. There was a consistent belief that they could make or could have made a difference to an outcome.

“If I had of, it would have been different” [b7]

“It’s difficult but there has to be a way of ... and I...” [b18]

“I could have...and then...” [b15]

“It was complex, but I should have...If I had of...” [b12]

“At the end of the day I have choice, I can’t blame...or stand behind the procedures...” [a3]

Although participants never personally questioned the possibility to intervene within their assumed sphere of accountability, they did, however, describe its potential absence as a risk to motivation towards safety vigilance and actions. Based on the participant's theoretical descriptions, the absence or reduction of the sense of agency is proposed to remove or moderate the emotion of regret by *negating* or *altering* the mental simulation of potential intervention narratives.

‘*Negating*’ meaning the dismissal or non-construction of the mental simulation due to the intervention not being perceived as possible due to lack, capability or capacity. e.g.

‘I would have but it was not allowed for me to...’

‘I didn’t know how to...so I could step in to...’

‘I can’t be everywhere’

‘*Altering*’ meaning the construction of a mental simulation of a narrative where the intervention is attempted but fails due to rejection based on the lack of authority, or through lack of capability or capacity to competently and successfully execute the intervention.

‘I would have but it was not allowed for me to...’

‘It wouldn’t be possible for me to have done...it’s beyond my skill to have...’

‘I don’t have the time to be everywhere, I couldn’t have been there even if...’

By reducing a sense of agency, it might therefore be possible to mitigate regret. This suggests having agency is important for events to be formative, however, testing this is not possible within the current data as its presence was consistent. The participants’ intuition regarding the importance of agency is confirmed through their actions taken in developing a strong safety culture, they target developing agency in others, and so is included as a concept in this core category.

5.4.2.10 *Contrasting Mental Simulations*

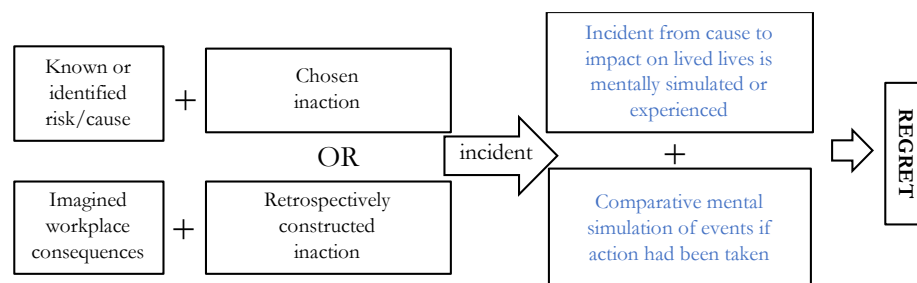


Figure 13: *Contrasting mental simulations*

The boxes above containing blue text in Figure 13 above depict the mental simulations that are constructed following an incident in which appropriate action wasn’t taken to address a risk. Comparison between contrasting mental simulations is identified through the analysis as the cognitive basis for the emotion experienced and labelled by the participants’ as regret. With regret being postulated as being a key factor in an event being formative, the concept of mental simulation is, therefore, fundamental to this and the other core categories developed in this study.

The concept of mental simulation refers to the mental representation of narratives, with the form of these mental representations posited as being embodied. Embodied meaning the mental

representations are sensory re-imaginings / constructions of the narratives, primarily visual, but sometimes with associated sensory signals, as evidenced in the language and gestures of the participants.

Visualisation:

“it translates in to seeing and feeling those outcomes, they become real” [b16]
“what happens if someone goes there, you can see what might happen” [b11]
“I see the alternative in my mind’s eye, I am running, cycling through them” [a2]
*“It has stayed with me; I can see the whole thing happening
as if I was there again” [b7]*
*“when you know the person involved you see it differently, it makes a
different impact” [b18]*
“it’s about bringing a number to life, seeing what it means in...” [b13]
*“and if somebody would have bypassed and not intervened,
how would I look at that” [b21]*
“you can see the coffee would go everywhere, not just on themselves” [a6]
*“ I think I ... run in my head ... I visualise what happened, and I can think through these
scenarios and I can see the ultimate end results” [b1]*

Kinaesthetic / feeling:

“imagining the burn from that coffee on those people, why wouldn’t you...” [a6]
“when you think about the weight of the equipment, how it feels moving...” [a2]
“the heat from the fire was intense” [b7]

Olfactory:

“I can still smell the...when I think about” [b12]
*“The smell of...takes me back there...when I think about the possibility of...it comes
back” [b7]*

The proposition that the above language, used when recounting narratives, signifies an embodied mental representation is supported by their congruence with gestures used when participants are describing both experienced events and potential alternative outcomes. For example, when describing a control room, the participant would look in the direction of various panels as they described them, gesturing with their arm and hand in the direction of the alarm; in another example a participant looked up towards a platform they were describing and down to where an object fell. Gestures were sometimes subtle but were universally consistent with the content of the narrative being described.

A combination of gesture and language indicated that three perspectives were experienced during the mental simulation of events, in both describing experienced events and in describing constructed alternative narratives.

The first perspective being that of observing the events from outside, like watching a movie e.g. *"I imagine seeing the various scenarios playing out"* [b1], *"I see what I could have done, if I would..."* [a4] combined with hand gestures pointing to their relative position to the incident i.e. pointing to a virtual self as if a movie was being played in front of them.

The second perspective being a 1st person associated perspective essentially experiencing the scene of the visualisation by being in it as oneself, like being in a virtual reality scene, e.g. *"I play through the various..."* [b1], *"I rehearse the plan and ensure my family does the same"* [b23], *"they were standing behind the screen"* [b7], *"the panel is right here on the left"* [b12] combined with head, body, arm and hand gestures made as if they are in the narrative, e.g. turning their head a looking in the direction of the panel, gesturing to the location of the screen, gesturing and looking towards the location of the fire exit .

The third perspective being a 2nd person associated perspective, being someone else in the visualisation, experiencing events as another character in a virtual reality scene. This is similar to the prior perspective however in this case the participant is stepping into the perspective of another party in the incident, e.g. *"when you see it from their perspective"* [b21], *"when you think what it would be like seeing that happening around you"* [b12], *"when you put yourself in their shoes, in that situation"* [b8] combined with gestures as per a 1st person perspective.

In formative events the simulations in the form of mental representations as described above are of contrasting narratives, at least two narratives but often multiple. There are a number of variations in the types of narratives in terms of direct versus indirect experience of actual events, and of actual versus constructed scenarios as listed below:

Actual Events

- narrative of the direct experience of an event
- narrative of a directly experienced event that combines direct experience with one or more constructed narratives of what lead to the event, of what was happening elsewhere at the time, and the subsequent consequences
- narrative of an event not directly experienced

Imagined Scenario Events

- constructed narrative of what could have happened or might happen
- constructed narrative of scenarios of what could have happened or might happen, drawing on prior direct experience of a similar event

Each of the above narratives can be mental represented from any combination of the three perspectives described above, i.e. observer, 1st person associated, 2nd person associated.

Formative events were found to comprise various combinations of types of narratives:

- an actual event with a negative outcome compared to a constructed preferred narrative.
“If only I had taken those two minutes to...the outcome would have been...” [b23]
- an actual event with a positive outcome compared to a constructed narrative of what could have happened if a risk had materialised into a cause.
“it’s only by chance we didn’t...it could have been so different...I shudder, people would be...” [b12]
- a constructed narrative of a negative outcome compared to a constructed narrative of a preferred outcome based on different decisions or actions being taken.
“he was wearing safety glasses cutting the lawn...I realised the risks I have been taking, what can happen, what that would mean...compared to just wearing the glasses...why wouldn’t you” [b21]

As previously mentioned comparing mental simulations of alternative narratives is posited as the basis for experiencing the emotion of regret. Which in turn is posited as motivating formation of new behaviours which incorporate the cognitive strategy of anticipating regret as the basis for maintaining motivation and attention towards the safety practices described in Sections 5.4.3 and 5.4.4.

5.4.2.11 Regret

The comparison of narratives described in section 5.4.2.10 above results in the experience of ‘regret’ in various forms, actual ‘regret’, imagined ‘regret’ and anticipated ‘regret’.

Actual ‘*regret*’ is experienced when the comparison is between a real negative outcome with a constructed preferred narrative, “*If I could go back...I regret..., If I had of just...*” [b12].

Imagined ‘*regret*’ is experienced when a good outcome occurs but it could have turned out differently and the negative outcome is constructed, “*it could have been so different, how would I have lived with that?*” [b3]

Anticipated ‘*regret*’ is experienced when two future outcomes are compared, a negative outcome resulting from inaction towards a risk, compared to a positive outcome resulting from taking action towards a risk. “*If I don’t do...then...[incident]...might happen...I would struggle with that, knowing I could have done something to prevent it*” [b22].

As seen in the quotes above, the term ‘*regret*’ is sometimes used to label the emotion experienced, in others examples the structure of ‘*regret*’ is described without use of the explicit label, with the structure described fitting with the following definition – ‘Regret is experienced when people realize or imagine that their present situation would have been better had they decided differently in the past’ (Zeelenberg & Pieters, 2006, p. 418).

In each ‘*formative event*’ presented by participants, regardless of whether the ‘*regret*’ was real, imagined or anticipated, emotion was observed through changes in voice quality, skin tone, posture, gesture, facial expression and eye moisture, sometimes more subtle but universally present. As such regret was not expressed as an abstract concept but as an embodied emotion that motivates changes in behaviour. The motivation being to avoid future experiences of the unpleasant emotion and its associated thoughts.

Even when describing outstandingly positive events, regret was expressed. For example, when describing extremely positive results from a leadership intervention in which a disillusioned and disengaged workforce became highly engaged, motivated and high performing in general terms and in particular in safety performance, a participant expressed regret for the time the workforce had been experiencing the prior state. This regret was expressed when there was no possible accountability for the prior culture.

In each case there is a comparison of outcomes and associated narratives, in the above example, a comparison between the actual timing of the improved culture, to this improvement being achieved earlier and so experienced by the workforce sooner and longer. The question arises,

why create the comparison as it leads to an unpleasant emotion – regret? It’s clearly a motivating emotion, in that it motivates its avoidance in future, however this could be avoided by not constructing the contrasting simulation e.g. don’t simulate the culture improving sooner, just be proud and satisfied in the change made.

Based on the analysis there is a universal experience of ‘*regret*’ across ‘*formative events*’, and the concepts that construct its experience have been identified. What motivates the engagement and application of cognitive strategies to create ‘*regret*’ rather than avoid or reduce ‘*regret*’ is not determinable from the data and analysis, however this is discussed in the review section 5.5 with reference to relevant literature. Addressing this question along with the details of how the experience of regret leads to the application of anticipated ‘*regret*’ in personal and leadership practice is a subject for future research.

For now the analysis shows participants relate ‘*formative events*’ and their associated regret to their current practice as safety leaders, practice that intentionally and or intuitively facilitate the experience of anticipated regret for themselves and for others, as introduced in section 5.4.2.12 below, and then in detail in sections 5.4.3 and 5.4.4.

5.4.2.12 Practicing Regret

This chapter has reported the results of the analysis associated with the events that participants identified as formative in the development of their practice as safety leaders. While different concepts were learnt during each event, all concepts were connected by their role in constructing the emotion of regret, a strong negative emotion that cements the learning related to each concept.

The learning related to each concept is carried forward into practice by the participants with the purpose of ensuring the regret experienced during learning is not experienced again. Although the avoidance of regret is identified as a core motivation for the application of learning, paradoxically it is the repeated imagined experience of regret, specifically the anticipation of regret, that motivates the ongoing application of the learning.

As such the individual and leadership-based safety practices described in chapters 5.4.3 and 5.4.4 are essentially based on the practice of constructing and experiencing regret.

5.4.3 Personal Intervening (Anticipating Regret)

5.4.3.1 Introduction

The ‘*formative events*’ core category described significant learning events that have shaped participants’ ongoing judgments, decisions and behaviours in relation to safety. The purpose of this chapter is to describe application of this learning in safety practices applied as an individual actor; specifically, the identification of risks, the formulation and taking of appropriate actions to prevent risks becoming causes of incidents, and or ensuring incidents have no human consequences.

As seen in Figure 14 below, the application of learning from the ‘*formative events*’ leads to the proactive construction and experience of anticipated regret. A process that defines the intervention necessary to address an identified risk and while also providing motivation to act.

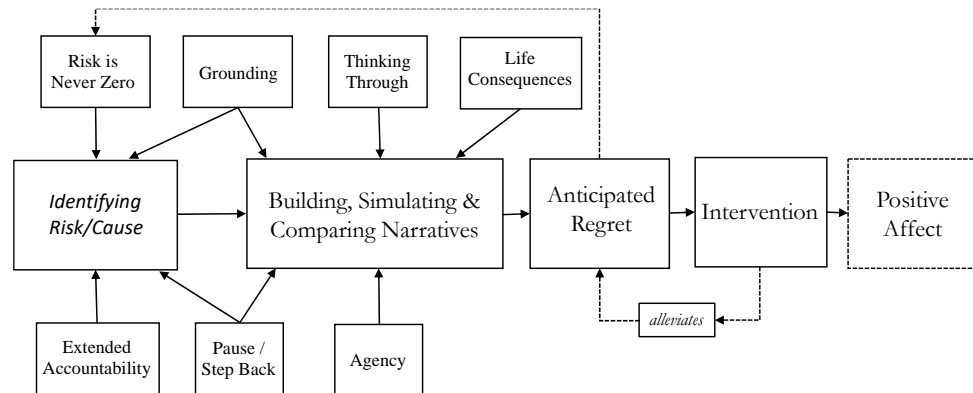


Figure 14: ‘Personal intervening’ – concept relationships

In the model above, the process of building anticipated regret starts with the identification of a risk that can be the cause of an incident, identification achieved through high vigilance motivated by the belief that ‘*risk is never zero*’. The process of ‘*pausing and stepping back*’ provides the space and time for risk identification and for building narratives that may ensue from identified risks. The concepts of ‘*thinking through*’ and ‘*grounding*’ then provide and refine the content of potential future narratives; a narrative of a risk causing an incident through lack of intervention, and a narrative in which selected interventions (for which there is ‘*agency*’) prevent the risk causing an incident, and or prevent an incident from causing harm. With the first narrative extended in content by considering potential ‘*life consequences*’ of harm that may ensue from inaction, which increases negative affect of ‘*anticipated regret*’. With ‘*anticipated regret*’ constructed by a comparison of narratives, comparison conducted via mental simulations in the form of embodied mental representations. ‘Embodied’ meaning the mental representation are sensory based representations of the narratives, primarily dynamic visual representations.

Table 13: Personal intervening core concepts

Core Category	Conceptual Categories	Conceptual Codes	Description
Personal Intervening - Anticipating Regret	Agency	I can. At Cause.	The belief that you can contribute to improved safety in any situation.
	Extended Accountability	My Business, 24/7, Scope, Context,	Recognising many of the same risks are present in many non work contexts, creating risk for lived lives, and so applying the same mental process of anticipated regret.
	Risk is never zero (vigilance)	Change, Normalisation, Small Causes Big Effects.	The realisation you never step into the room/place twice so always re-assess. Being vigilant to normalisation by recounting small and rare causes having big life effects. Biasing perceived probability.
	Grounding in Reality	In reality. On the ground. Capability, Housekeeping, Managed, Organised, Beyond drawing/paper, Cultural lens	Being aware of assumptions through distance and abstract representations (drawings, numbers etc.) ensuring decisions are fully informed by the current physical and cultural realities of the site/situation.
	Pausing /Stepping Back	Pause. Step back. Mindful.	The habit of pausing when entering context, assuming change. Also, when something is noticed, so potential risk can be thought through, and actions are assessed balancing resolution versus increased exposure.
	Thinking Through	Cause Effect. Check the box. Step back. Chasing through. Worst case. Understand.	Thinking through with reference to the site reality combinations of all the potential scenarios and risks associated with a plan/activity. Assuming potential effects of all risks becoming a reality, imagining the worst-case consequences.
	Life Consequences	Lived lives, Family/Relationships. Associated. Care. Not a number.	Associated visualising (mental simulation) of the potential impact to a person's life and their family, their quality of life. Associated with own family - What if it is/was my daughter? Creating a full narrative behind a number (<i>what does x% mean for someone's son?</i>).
	Contrasting Mental Simulations	In/through mind. Imagined story/narrative. Associated perceptual positions.	The mental simulation of alternative narratives running through from risk identification, intervention and lived consequences. Associated, as if present, plus taking the perceptual positions of other people impacted.
	Anticipated Regret	Emotion to avoid. Relief. Satisfaction.	The strong negative emotion generated by the mental simulation of not identifying a risk, of not intervening, and the consequences to a lived life. The satisfaction and or relief felt after taking action and so prevent imagined consequences.

Table 13 above provides brief descriptions of each concept within the model and core category of – personal intervening (anticipating regret) – along with the conceptual codes developed during analysis. Sections 5.4.3.2 to 5.4.3.10 below now describe each concept in more detail in conjunction with illustrative quotations from participant interviews. They also postulate their impact on ‘anticipated regret’ against three categories; the frequency of experience, the precision of the experience, and the intensity of the experience. The definition and rationale for these categories presented in section 5.4.3.11 below.

5.4.3.2 Agency

The concept of ‘agency’ refers to possessing the capacity, capability and self-determined authority to take appropriate action. In terms of contributing to anticipated regret, the concept of ‘agency’ is seen as a prerequisite, it was present in every case offered during participant interviews; as such, instead of increasing the frequency of anticipated regret, the absence or reduction of ‘agency’ is proposed to reduce its frequency or intensity.

If a person doesn’t believe they can take effective action, how can they regret not taking it? Instead, an emotion of sadness or grief may be more appropriate? A person may regret not having the capability or capacity to act, but this is a different time frame and scope for regret, a difference that possibly alters the nature and intensity of the emotion experienced, assumingly lessening the emotion through distance effect. The data from the interviews does not provide the basis to test these propositions, and so they remain subject to future research. However, ensuring a sense agency is a practice identified in safety leadership, see section 5.4.4.8, and so is included as a concept in this core category.

The concept of agency has two factors. Firstly, the capability and capacity to affect change, to be at cause and so make a difference in outcomes. Secondly, a self-derived authority to take action. Although it is accepted that you can’t reduce risk to zero, the possibility and drive to remove harm resulting from a risk is consistently seen.

“accepting that risks are always there and so some incidents will happen is not acceptable, yes there are risks but we have to ensure they don’t cause incidents” [b16]

“you can’t remove every risk, but you can prevent it creating harm, I have to define the barriers” [b25]

“accepting one incident feels like a failure to me, it must be possible to...” [b2]

“zero is not a target, because that means it’s ok to get close, and it’s not” [b24]

Agency and possibility to make a difference is reflected in the high usage of modal operators of possibility;

“I should have...”

“I could have and then...”

“If I had done...”

“If I would have...”

Each of the above terms presupposes a different outcome resulting from an action that could be taken by the participant. Indeed, in the examples of interventions provided across the interviews, the possibility to act and have effect is never raised or questioned, it is presupposed, and when questioned e.g. “how would you feel if it was not possible to act?” the response is initial puzzlement and then rejection of presupposition in the question i.e. the impossibility of making a difference. As will be seen in the descriptions of the remaining concepts, the possibility to identify a risk and to appropriately intervene is always presupposed.

As a proposed pre-requisite for anticipated regret, understanding how the participants have developed a strong sense of agency is proposed as a future research topic. Within this study, the actions the participants take towards developing agency in others is described in section 5.4.4.8. These descriptions may provide some insight into how agency was developed by the participants, in that they may be replicating their own learning process as their method for developing agency in others, this is untested and will be the subject of future research.

5.4.3.3 *Extended Accountability*

‘*Accountability*’ refers to the scope of contexts in which participants apply their safety mindset, and in which they will take responsibility, and take action. ‘*Extended*’ refers to an increase of scope of context in which participants assume accountability. Extending contexts of accountability has the impact of increasing the frequency of anticipated regret as by definition there are more opportunities in which to identify risks and so intervene.

Learning from formative events is assumed limited in relation to this concept, only two examples were provided in which a participant regretted the consequences of inaction due to a lack of accountability, i.e. the exceptions reported in section 5.4.2.5.2.1 and 5.4.2.8.

Indeed many examples were provided during the interviews of running the perceptual and cognitive patterns described in the sections that follow in contexts other than work, including

but not limited to; driving, catching a train, planning travel, gardening, attending a party, a school event, cycling with family, running as a hobby, getting something from the lost, painting a house, staying in a hotel with family. In all of these examples the same perceptual and cognitive patterns were applied. Although the participants did refer to a factor that made them distinct.

In contexts beyond work, when identifying and acting to address a risk, they anticipated that people would see their interventions as atypical and so anticipate a range of reactions from gratitude, gratitude with some amusement, through to aggressive responses:

“my friends often chuckle when I intervene, they put it down to me working at [company]” [b23]

“I’ve had someone shout out me, really in my face” [b22]

“they told me I should keep my nose out”

“who do you think you are getting in the way of...” [b21]

“when they realised what could have happened, they were really thankful” [b11]

“they were relieved that someone had noticed, but that wasn’t their first reaction”

“you have to accept people may not like you not minding your own business” [b23]

“I remember the first time I introduced that to my wife, and she looked at me like I was crazy. And I’m sitting there thinking, no, you’re the one who’s crazy, cause you...” [b24]

In the cases associated with the above quotes, the emotion generated through ‘*anticipated regret*’ in relation to a potential incident seems to outweigh the anticipation of a negative response from parties involved:

“when I compare it to what might have happened, what’s a little ribbing or even and angry response, those I can live with, not doing something and someone coming to harm, no” [b23]

“at the end of the day it’s about doing the right thing no matter...” [b21]

“it’s for a greater good...” [a3]

Constructing a mental simulation that creates a feeling of ‘*anticipated regret*’ associated with inaction that is greater than the *anticipated negative reactions* of parties involved draws upon the concepts presented in the following sections, in particular the concepts that increase intensity of the emotion. This results in the ‘*anticipated regret*’ having the intensity to outweigh the anticipated emotion associated with anticipated responses from other involved parties. In

such cases participants described the comparative emotion as either a lesser level of regret or a different emotion, e.g. “*embarrassed*”, “*fear*”, “*self-conscious*”, or “*awkward*”.

The consistent application of the participants safety practice across contexts appears to suggest that the perceptual, thinking and behavioural patterns are habitual, however, participants did describe having to engage strategies/effort to remain mindful to ensure they consistently apply their safety practice in all contexts;

“sometimes it’s easy to switch off in very familiar environments, I have to sometimes remind myself that the same risks are present, not just at work” [b11]

“I’m not as vigilant at home, as I know I should be, but I’m getting more consistent, it’s becoming more natural” [a8]

Consistency was also identified by participants as important in relation to their roles as leaders; it was also recognised that as a leader your behaviours are on show all the time, (see section 5.4.4);

“what if I run across a busy road full of traffic on the way into work, if someone sees me can they take me seriously when I ask them to hold the rail on the stairs?” [b21]

In summary, extending accountability increases the frequency of ‘*anticipated regret*’ and therefore increases instances of safety practice, provided the concepts that generate intensity of ‘*anticipated regret*’ are sufficiently engaged to create an imbalance between the regret of inaction and of negative reactions from “*not minding my own business*” [b23].

5.4.3.4 Risk is never zero (vigilance)

The belief, that risk is never zero, is based on holding two assumptions in mind, firstly that things continue to change therefore you can’t rely on past experience of a context, secondly that small risks can have big effects. The first assumption relates to being present/mindful in the moment and actively looking/scanning the context for potential risks, the second assumption provides the emotional drive for this activity i.e. the ‘*anticipated regret*’ of not finding something that eventually causes significant harm.

The concept of ‘*risk is never zero*’ increases the frequency of ‘*anticipated regret*’; experienced. Operating out of the belief that ‘*risk is never zero*’ contributes to the drive to remain vigilance in all contexts, greater vigilance leading to more opportunities to experience anticipated regret.

Participants described two main strategies from maintaining vigilance:

Remembering

This refers to recalling/reimagining past experiences of two types. One of being surprised in a familiar context, e.g. “*a sharp knife that was in the wrong draw*”, “*a line that is not normally used for...*” [a2], “*a valve that is always off, wasn't this time*” [b12]. The second, of recalling examples of small causes having life changing effect. As discussed later in section 5.5.1.15, the act of remembering and reliving examples of experiences can create a biased sense of probability, a recall bias which is reinforced by qualities of the visualisation of the experiences, leading to the perception of events being significantly more probable. This bias in probability is then associated with the potential lived consequences, the impact of which is discussed in section 5.4.3.8.

Triggering

This refers to the establishing a personal strategy for triggering the state of vigilance in contexts where distractions may occur, e.g. in a familiar environment, or when other things can be on their mind e.g. when walking back from a meeting that was difficult. Several triggering strategies were described using contextual or behavioural markers e.g. “*when I walk out of my office*”, “*when I pick up the radio or my phone to go somewhere*” [b11]. These triggers would prompt a mental note or phrase associated with being vigilant e.g. “*let's see what's changed*” or “*on guard*”. “*I say to myself, 'pause', as I enter each environment, for me this means taking time to take things in to actually look rather than assume*” [b11]

‘How you create that muscle memory. So, it's not like, let me check the box, it just becomes a routine, you start by creating a conscious routine’ [b11]

Participants develop a habit of vigilance but recognise it's a habit that needs to be maintained, otherwise it's possible to become normalised to the risk present in regularly experienced contexts. They recognise the need to continually nurture this way of perceiving and thinking for themselves, using the strategies described above, and in the wider culture using strategies described in section 5.4.4. The process of *remembering* recreates experiences of regret similar to those in formative events and when combined with the process of *triggering* vigilance provides the motivation to maintain the habit, through a form of operant conditioning, “*when I forget to pause, to look properly, I think what I could have missed and what might have happened, not a conscious thing just a feeling a bit like dread, it triggers me to be more*

vigilant, more present”, “*it’s like when you get home and can’t remember looking at the last junction, did I, what if I didn’t, what might...*” [b11]

When applied the concept of *risk is never zero* primes a state of mindful presence of looking a fresh, a focus in the moment rather than dual processing, “*it’s like when I walk with a camera, when I’m looking for a unique picture, I see things I would have walked past, I have walked past many times without noticing*” [b1]. As items in the scene/context are identified the possibility of them to be the cause of an incident is rapidly considered, and if they could be, the possible consequences are also rapidly simulated, creating a mental representation of a scene/outcome that would be regretted, and so motivating action to address the risk. For example, “*when I see some paper on the pavement, I think someone can slip on that, could be an old lady, could break a hip, just pick it up, otherwise I feel bad*” [b24]. Such experiences are described a fleeting, with the feeling being the noticeable conscious prime to act, “*now you ask I can notice the thinking, but it’s so fast it’s the feeling I’m aware of, that causes me to...*” [b24].

This regular mental simulation of incidents is proposed to build and maintain the belief that incidents can and do happen, by building bias (see section 5.4.3.4) which motivates vigilance. If this proposition is correct it suggests an important difference in comparison versus compliance-based actions. With reference to the above example it’s possible to pick up litter because it’s a requirement to keep the garage forecourt clean and litter free, and so pick the piece of paper without ever simulating the incident it may cause and its consequences. With the absence of regular mental simulation of an incident and the associated regret, then both the belief that incidents can and do happen and motivation to take action will need to be provided through regular external intervention, e.g. communications of incidents and incentives to maintain compliance.

Similarly, the application of the concept of ‘*risk is never zero*’ is proposed to counteract the process of normalisation. Participants describe normalisation as becoming complacent through the lack of perceived incidents associated with a risk that is regularly encountered, e.g. not holding the handrail when walking down a flight of stairs, driving too close to a car in front etc. In contrast the application of ‘*risk is never zero*’, leads to a rapid mental simulation of an incident on a frequent basis when encountering a regular risk, interrupting the process of normalisation. This is particularly powerful when associated with a real and relevant incident.

As can be seen from the above this concept draws upon and relates to the concepts of *pause/stepping back, mental simulation, life consequences* and *anticipated regret*:

- **Pause/Stepping Back:** Application of the strategy of triggering, and of mindful attention in the moment increasing the number of risks identified, reinforcing the believe that risk are always present
- **Mental Simulation:** Simulating potential causes and consequences of incidents positively biasing the perception of probability of incidents occurring
- **Anticipated Regret:** The motivation to remain vigilant to identify more risks, and so reinforce the belief as more risks are identified.

5.4.3.5 *Grounding in Reality*

As described in section 5.4.2.5.1.1, ‘*grounding*’ is the processes of familiarisation with the “*real*” site, not the one represented on paper or assumed to be current through past visits. It refers to the physical site and the culture i.e. the nature of the thinking, assumptions, values and behaviours that prevail. In relation to anticipated regret it is proposed that ‘*grounding in reality*’ improves the accuracy of anticipated regret and increase the frequency of its experience.

In relation to personal intervention grounding is described by the participants as a practice of preparation. Vigilance as described in ‘*risk is never zero*’ is the sensitivity to visibly identifiable risk in a live situation, in contrast ‘*grounding*’ is building an accurate set of expectations and mental representations of the site/location and its culture before arrival, as such it is a process of preparation.

Two examples that illustrate this form of preparation as described by participants;

“I know I’m going to board a barge in a few days time and I’m unfamiliar with the vessel and so what to expect. I know the safety rules and practices around boats and ships, however for me I need to know what specifically to expect... by this I mean I need to be able to picture it, to know what the specific risks are and importantly what these may look like...I will always try to speak to someone with experience so they can paint the picture for me.” [a2]

“if your travelling abroad to a new place, you need to do your homework. The information we get here is great, but I want to know in my minds eye how things will look and what behaviours might I expect, what to be comfortable with, but more importantly what to look out for. When you’re not surprised by what you see you appear confident and that can be important. It’s about small things like, what do the

official licenced taxi's look like, how can you tell them apart and so on. Also, if you have been there before check with the most recent visitor, things change" [b7]

As the examples above demonstrate, the concept of 'grounding' in the context of personal intervention is about building a mental representation of the site/location, of typical and atypical behaviours in accordance with local culture and of all the associated risks. This means going beyond knowing the recommended sets of instructions or policies, it's bringing them to life, it's "seeing past the paper" as described in section 5.4.2.5.1.1. In pre-thinking through the risks in connection with their potential consequences the mental simulation associated with anticipated regret is generated, e.g. "what might happen if I get into the wrong car, with the wrong person" [b7], "I would not have known that the anchor rope could do that, I could have easily been injured if I was in the wrong place" [a2]. The repeated mental simulation of incidents and their possible consequences is proposed to bias the sense of probability (see section 5.5.1.15) of an incident occurring. The biased sense of probability when combined with the feeling of 'anticipated regret' motivating positive safety practice in terms of preparation and vigilance.

In terms of accuracy/precision of 'anticipated regret', with reference to the two examples above; in the former instead of being aware of a general risk on a foredeck associated with the operation of an anchor and mooring ropes, the participant learnt about specific risks associated with a particular barge, which resulted in them avoiding areas they would have assumed safe to access. In relation to the second example, the advice is to use only licenced transport is clear, however the process of 'grounding' leads to learning about how unlicensed taxi's mimic licenced taxi's specifically in a locality and with just the general guidance it would have been easy to make a mistake. In both cases the motivation is present from general risk, e.g. it's possible to simulate the consequences of getting into the wrong car, and so 'anticipate regret', however 'grounding' provides the accuracy of the regret that leads to improved safety.

The participant in the second example above also mentioned the benefit of being more confident in the future situation. Other participants mentioned that this form of preparation allowed them to be more vigilant as they were not busy trying to figure out what or where things are. It's proposed that this form of preparation may provide more cognitive capacity for attending to present risks and thus enhancing 'risk is never zero' based vigilance.

In addition to the personal benefit of applying the concept of 'grounding in reality', it was also recognised that the process informs and role models behaviours for others. For example, the research undertaken by asking others about their experiences of the site/location role models safety practice and focus, it helps facilitate that person's thinking and reflection on risk in that

environment that they may have normalised, and it demonstrates openness to learn. These benefits are further discussed in section 5.4.4.12.

The concept of ‘*grounding in reality*’ draws upon and relates to the concepts of, *risk is never zero*, *mental simulation*, *thinking through*, *life consequences* and *anticipated regret*:

- Risk is never zero: The expectation of risk and therefore the need to prepare for the experience of the site/situation.
- Mental Simulation: Building an accurate mental representation of the environment that will be engaged with and simulating specific potential risk and possible consequences of incidents.
- Thinking Through: Constructing the chain of cause effect leading to consequences that would be regretted, and the interventions/actions to prevent a risk becoming a cause.
- Anticipated Regret: The emotional motivation to prepare ahead of entering an environment, anticipated regret of coming to harm through lack of preparation/knowledge

5.4.3.6 Pausing /Stepping Back

The concept of “*pausing*” or “*stepping back*” refers to a process operated by the participants in two situations.

Firstly, when entering a new situation there is a deliberate space created for perception and analysis in terms of change and risk. This increases the frequency of anticipated regret, as pausing provides the time to notice risk and to address them.

“it’s easy to get carried away in thought or in getting to where your heading, so switch off to what’s around you, like getting off the lift at the wrong floor, by pausing as a habit I have chance to engage with where I am and what’s around” [b11]

This relates to and can supplement the *triggering* strategy for vigilance described in section 5.4.3.4. In this concept the difference is the deliberate taking of time, it may only be short, but it's a difference to proceeding as normal.

“taking those few moments makes a difference, it can be noticing versus not noticing that a cover is off a sump... particularly if it’s somewhere familiar” [b11]

Secondly, when considering making an intervention, taking a moment of time to consider the implications of the possible intervention, checking to see if it's reducing or increasing exposure, to see if there is a better option. This relates to improving accuracy of anticipated regret.

“hang on, what would happen if I...” [b23]

“step back for a moment, see what I might be missing, seeing a safer solution, by thinking through” [b23]

This appears to be an important strategy for balancing the emotional drive to act developed by ‘*anticipated regret*’. One participant described not rushing into the sea to save some people caught in big shore break, acting against their first instinct to rush in by momentary ‘*pausing*’ and realising that they would just become another person to save. The increased exposure that would have occurred by rushing into the sea, would create additional potential negative consequences and so a greater anticipated regret. This mental simulation takes a moment of time to run, and it's the deliberate creation of this short time that is described by participants. In the case above, resulting in taking alternative action, i.e. quickly identifying something to use to rescue the people without having to enter the sea.

The concept of ‘*pausing/stepping back*’ was also applied by participants in non-urgent or unpressured activities, but where there is a temptation to take a short cut or not fully prepare a workspace or task. Some examples provided; using a tool that is at hand rather than the proper tool for a job that would take time to retrieve; crossing busy junction when the pedestrian crossing is 10 meters away; moving onto the next task without clearing up around you.

“And a lot of times, the injuries you see are just those moments when people have a lapse and take a little shortcut or not paying attention” [b19]

“I was more focused on the problem and getting the work done than getting the work done safely” [b2]

In these instances, ‘*pausing*’ provides the time to run the mental simulation of the potential consequences of the short cut, in comparison to the relatively small inconvenience of not taking the short cut solution. Taking the above examples; the tool slipping and causing serious injury to a hand; being run down by a unseen motor bike leading to two people injured and lives distributed or worse; slipping or tripping hurting self and damaging the work completed. This comparison is significantly different to the one ‘*pausing*’ interrupts, the comparison doing a

simple thing like reaching out for the tool versus having to get up and walk over to a toolbox the other side of the workshop.

Acting based on this cognitive process is proposed to be significantly different to simply complying with a directive, e.g. to only use official crossing points on site roads. Following a directive may involve '*anticipated regret*' e.g. the avoidance of punishment for not following the directive, however the absence of the mental simulation of an incident and its consequences means that external pressure will be needed on an ongoing basis, else as soon as short cuts do not have punitive consequences applied they can become normal practice as there is no regret to anticipate. In contrast the repeated mental simulation of an incident and its consequences builds a bias in probability of an incident and conditions a negative emotion to be associated with the short cut. This creates a self-sustaining motivation.

"It's important to build the habit of thought, that way it never makes sense to take the quick way as it is always connected to seeing a bad outcome" [b11]

"its not that the handrail is always there to hold, its thinking that the stairs are always there to fall down, so you hold the rail" [a2]

"pausing give me time to think what-if" [b21]

The concept of '*pausing/stepping back*' relates to the concepts of, *risk is never zero*, *thinking through mental simulation*, *life consequences* and *anticipated regret*:

- Risk is never zero: The expectation of risk and therefore the need to stop and look, to see short cuts as inherently risky
- Thinking through: Constructing the cause effect of short cuts, or missed risks
- Mental Simulation: Simulating identified risks and possible consequences of incidents, including from taking short cuts.
- Anticipated Regret: The emotional motivation to take time, the anticipated regret of not taking time to identify risks, of not taking specific actions, and for taking short cuts.

5.4.3.7 Thinking Through

'*Thinking through*' is described by the participants as a cognitive process that follows vigilance and pausing. The concept of thinking through refers to the mental playing forward of risks becoming causes of events with consequences. The mental simulation of a series of cause effects results in the construction of potential narratives, the construction of intentionally worse

case narratives. This concept results in improved accuracy and increased intensity of anticipated regret.

“you can see the hoses aren’t on the racks, they are there to be stepped over by anyone that comes into that area, it’s not highly trafficked, but someone can come to real harm” [b11]

“I run through what’s the worst thing that can happen, because it can...” [b12]

“you have to think worse case” [b25]

“it’s worst case imagining, is chasing through possible consequences and the impacts of barriers we can use to keep people safe” [a8]

“it comes into your brain, and it is the “what if?” element comes in. So, “Hey, what if somebody actually goes there?” [b22]

A key aspect of thinking through is the avoidance of assumptions of continuity, and instead of thinking through from first principles. This means not assuming,

“because something hasn’t happened before doesn’t mean it won’t, or can’t” [b2]

“if something has been working for some time, it can’t be assumed it will continue, it’s assuming the opposite to that, it’s overdue to happen” [a5]

“you have to think about what might? not what has?” [a4]

Instead, it means thinking about the different characteristics an object has and how these may give rise to risk in a particular context from first principles. An example of piece of paper was given. Paper is not inherently a risk, but if it’s on a carpet, or there are multiple pieces on the floor it can be a slip hazard. It’s light and can easily be blown around and may be blown into some vent or machinery, it flammable so is it near a heat source? etc.

Thinking through then is the playing forward of potential narratives based on the characteristics and potential interactions of elements present within a context. On a site this also includes the different states a system may be in which may alter the risk potential. It then gives rise to the questions; how can I be certain of the status of the system? what are the consequences of getting the status wrong for a particular piece of work being carried out? and how do I mitigate for the possibility of being wrong, as errors do occur?

“Have we taken all the right steps to protect the people working? How do we know we have? How can we be sure? How do we know that valve will be/is turned off? Know

that pipe will be/is empty? And then, how do we ensure that they understand the risk and manage those risks as they need to be managed?" [b12]

"You have to take that practical approach to it. It says, "Okay, I've got a meeting today, and it's raining. Do I need to allocate more time?" If I think about my route, if there's a construction, do I go a different route? Or if I'm going on a new route, do I look at that before I get on the GPS to make sure I'm aware of a new highway, or new road that I may be encountering"[b24]

Because the process of thinking through starts from first principles (characteristics of objects and interactions in systems) and considers and simulates the potential risk consequences it contributes to the avoidance of normalisation and contributes to a bias towards the increased expectation of events to happen (see section 5.4.4.6).

'Thinking through' from first principles was seen to apply at different scales. Earlier the example of a risk is considered from a single object, a sheet of paper, participants also described the same process of 'thinking through' involving more complex narratives. For example, after an incident that involved working at height on a retail canopy, there was a decision made to install an anchor point on every canopy so workers could attach to when working at height. On the face of it, this seemed a sensible intervention, a safety barrier would be in place at every site that would avoid the risk of a fall from height. However, when the participant applied the concept of 'thinking through' to this decision, the decision was changed.

"Have you thought about if you do a separate project, the exposure we create, in driving to 3 000 service stations, and you know the exposure you create by just doing the anchor point. You climb up there, and even if you do everything H&S complied and everything, you still create exposure" [b1]

"We need to put anchor points in there but let's see whether we do have a project touching these sites anyways and in the process of this also put the anchor up on it." [b1]

The participant mentally simulated the process of implementing the original decision. When describing driving to 3000 service stations they gestured as if steering a car, when talking about fixing the anchor points, they looked up and gestured with their hand as if showing the location of someone climbing and fixing an anchor point of a canopy. This form of 'thinking through' was absent in the other team members, but when the narrative was shared the decision changed. The process of 'thinking through' "brings the decision into life" [b1], in this sense it brings forward the concept of seeing past the paper, of thinking about an anchor point as part of a

narrative rather an important item on drawing. A narrative that starts with getting the anchor point to site, through to its usage by future workers. Three opportunities for ‘*anticipated regret*’ arise from simulating the full narrative, one of incidents occurring during the drive 3000 drives to site, one of incidents occurring when installing the anchor point, and finally working without an anchor point. The reduction of ‘*anticipated regret*’ leads to the solution of installing the anchor point at the point in time when it will be first used. This reduces three exposures to one. In this case ‘*thinking through*’ increases the frequency of ‘*anticipated regret*’ in addition to improving accuracy and intensity.

‘Thinking through’ can also include the mental simulation / rehearsal of actions to be taken should a risk be realised, e.g. a disruptive event in a relatively unsecure country as per the following example;

“...also, it may sound silly, but as a family member you're in Nigeria, we also rehearsed if things were to happen, what would we do? So, what would my wife do with the kids? What would I do? Where would we meet? Who would take what? If the phone channels were broken, where would we meet? What would we do? So, we had that all laid out. We also had that discussion with the kids, the ones that were old enough to understand that, what would we do? So, these are the type of things that we prepare for...” [b23]

The concept of ‘*thinking through*’ relates to the concepts of, *mental simulation*, *life consequences* and *anticipated regret*:

- Life Consequences: This forms the final part of the narrative that is *thought through*, the impact to people’s lives, creating a more intense feeling of anticipated regret
- Mental Simulation: The embodied mental representation of the narrative being *thought through*.
- Anticipated Regret: Of not identifying and addressing the potential outcomes of risks and decisions, through lack of ‘*thinking through*’

5.4.3.8 *Life Consequences*

Mentally simulating the consequences to real lives is a strategy used by the participants to maintain motivation and focus on safety. The participants habitually mentally simulate the potential consequences of a potential incident to the lives of people. *Lives of people* meaning their full lives, including the life outside of work, e.g. with their families, doing their hobbies,

and encompassing the changed life experiences of their family, friends and colleagues. This mental simulation significantly intensifies the emotion of ‘*anticipated regret*’ as demonstrated in changes in voice quality and other physical emotional signals of participants when describing examples of this strategy in action.

“it would be life changing, they could no longer...” [b12]

“I imagine the empty chair at the school play, the parent that can no longer be there” [a3]

“I always recall what happened to.....their life was never the same after...” [a4]

“what does this mean for the possibilities for their family now?” [b23]

Participants describe the automatic experience of feeling really uncomfortable, bad, anxious or even sick when they recognise the potential of an incident occurring. These feelings are described as motivating attention and action so as to reduce or remove them. They are not always conscious of the process that leads to these feelings, but in reflection, describe it as the seeing the consequences for those involved, and or triggering a memory of past bad consequences for people’s lives and the associated emotions.

“Whenever I see something, I get the feeling I had when...so I have to do something”

“I get a horrible feeling, instantly, reflecting on why that happens, it’s about what might happen to people, their lives” [b16]

While in some instances the process of simulating the consequences to people’s lives can be fast and fleeting, participants also describe deliberate and intentional simulation of these types of consequences in order to maintain self-motivation for safety vigilance and intervention.

“when I’m tempted to walk past something outside of work, I know it’s because I’ve have not thought about the consequences in a real way, to a person like me or my family, as soon I think how would I feel if someone walked past someone I loved and didn’t act, than I have to” [b23]

“they might be a lorry driver but they also a father, a brother, as son”, “It’s knowing this that matters about taking care”. [b25]

Mental simulation incorporating consequences to real lives is also applied when faced with “*de-humanisation*” by numbers with the strategy of bringing numbers and statistics to “*life*”. A prototypical example was provided by one participant who described a thought experiment that leads to them seeing that there is no acceptable number of incidents, and that reduction by a

percentage is not enough. They described a comparison to their local community, the area they live in, and asked if you would be willing to choose from those families which person will lose a finger, a limb or even die this month, explaining this is what the numbers mean, there is an equal number of people in that community to a particular site, and so this is an equivalent decision.

The personal practice of considering the impact to a person's life was also described by a number of participants as being deliberate applied when they are involved in an incident review. This is a purposeful application utilised in order to counteract the purely technical considerations in such reviews.

“We sanitise the information, we take the person out of it and do a great and thorough job of understanding the technical nature of the incident, we might consider how a person might have been thinking in the situation, but it's abstract”. [a5]

'Sanitation' is described as positive in terms of creating clarity of process, but at the risk of loosing the emotion motivation for ongoing vigilance, through “care”, “bringing in the person changes the emotion and motivation, it can never happen again, it sticks in your mind”. [a5]

There were consistent and clear signals of emotion when participants described the application of the concept of 'life consequences. Voice qualities, skin tone, and posture all changed congruently with the emotions described. Their gestures suggesting that they were describing the narratives from an associated perspective as either themselves as an observer or taking the position of one of the people impacted by the incident, e.g. they would gesture towards objects or places in the scenario as if they were present. This associated perspective appeared to heighten the emotions experiences as demonstrated in the emotional signals as described above.

The notion of “it sticks in your mind” suggests that connection to a life, and or the level of emotion experienced impacts the memory and the application of the learning/thinking.

“it stayed with me...I always...” [b14]

“it made a real impression on me...now I...” [b11]

“that event shaped me...I can never...” [b7]

“I see handrails differently after that...” [b23]

“when you think about it like that...why wouldn't you...I have to” [a6]

By improving the recall of memories of regret with their associated emotions, ‘*anticipated regret*’ appears to be a more frequent and more intensely experienced due to the memory(s) being triggered for recall when similar circumstances are encountered. “*they are in a wheelchair for life for the sake of not holding a handrail...a sense of that comes to mind every time I now see a rail, I hold it*” [b23].

The concept of ‘*life consequences*’ relates to the concepts of, *mental simulation*, and *anticipated regret*:

- Mental Simulation: The embodied mental representation of the narrative of life impacts.
- Anticipated Regret: Of not acting to prevent the consequences to a person’s life.
-

5.4.3.9 *Contrasting Mental Simulations*

Mental simulation has been described in detail in section 5.4.2.10 and is further discussed later in section 5.4.5.4. The application of mental simulation in personal practice has seen in the concepts of ‘*extended accountability*’, ‘*risk is never zero*’, ‘*thinking through*’, ‘*grounding*’, ‘*pausing*’ and ‘*life consequences*’. The concept of ‘*contrasting mental simulations*’ refers to the application mental simulations in decision making regarding whether to act, and if so, with what action.

There are three types of contrasts of simulation identified within the interviews;

- the removal of a mental simulation by taking action (simulation – no simulation)
- the replacement of a negative mental simulation with a positive simulation through action
(simulation of harm – simulation of preventing harm)
- the comparison between alternative forms of action and their different consequences
(simulations of contrasting levels of intervention risk/harm)

The first form is one in which the potential negative consequences of inaction are simulated, e.g. If I don’t cover the cable on the floor someone may trip and do harm to themselves. The longer the inaction the more the simulation of someone coming to harm is run, escalating the negative emotion of seeing harm that could be prevented. Taking action to cover the cable and so remove the risk stops the simulation and removes the negative emotion.

“I get a sense of relief when I have pushed the draw in, and I no longer Imagine anyone bashing their shins on it” [a2]

“I get a cover put on the sump and I stop worrying about what might happen” [b8]

The second form is similar to the first but in this case the simulation of someone successfully walking over the protected cable is simulated creating a sense of satisfaction from seeing a person going about their work and life with good health.

“It’s a good feeling when I think about someone now safely walking past...” [b22]

“I know they will be leaving for home unharmed and able to enjoy...because I...” [b25]

These two forms of comparison may point to different motivational strategies, one where a person is motivated by the avoidance of negative affect, one where a person is motivated by both avoidance of negative affect and the seeking the positive affect of taking action. There may also be different consequences for anxiety/stress and mental health, i.e. between experiencing negative emotions and then their absence, versus experiencing negative emotions and then positive affect from simulating the benefits of acting.

The third form of comparison is between potential actions, comparing the exposure for each possible intervention with the anticipated outcomes and consequences for those impacted directly and indirectly. This was described as a cycling between options, searching for the one that keeps people safe. This can be a very fast in the moment process with the evaluation being a feeling;

“It’s almost a gut feel when you finally get to what you think will be the best solution, it’s a sense of relief, it’s uneasy until then” [b1]

Or given the time, this can be a deliberate conscious process, although the mental simulation of consequences that leads to the emotion of ‘*anticipated regret*’ discussed in the next section can still be less conscious;

“now you ask, what I think stopped me rushing in was the fleeting thought about my family finding out that I had also drowned, I wasn’t really aware of that at the time, but relieved that I saved them, but also I was safe, so it makes sense” [b23]

As described in section 5.4.2.10 three perspectives described when experiencing mental simulations of events and their consequences. An observer perspective, a 1st person associated

perspective, and a 2nd person associated perspective with emotions. The observer perspective is one of viewing the incident as an observer, not at the imagined site of the incident, but as an observers or director of a movie. The 1st person perspective is experiencing the simulation as oneself, through one's own eyes as if there in the situation. The 2nd person perspective is experiencing the simulation as another person who is involved simulated incident, looking through their eyes as if there in the situation. Based on the observation of emotion during the interviews, the intensity of emotion appears to increase as the 1st and 2nd person perspectives are described, intensity which further increases when the content of the simulation includes the consequences to the 2nd person's life.

Mental simulation appears to be an important differentiator in the nature of decisions made by the high performing safety leaders, in that it significantly shift's decisions from an economic perspective to a human perspective;

“the costs can be big in terms of time and money, if you shut down, but if you see it as putting someone you love in that situation, would you accept even the smallest chance of something going wrong’, clearly no” [b25]

“it changes from a numbers decision, when I think this way, that's the risk of numbers” [b16]

The comparisons being made are not abstract concepts or numbers of a typical business case, but between embodied simulated narratives that include the risks, exposure and potential harm to individuals, with the examples above and below demonstrating this realisation and shift in thinking.

“you really understand what the potential consequence is, and it's not just conceptual or a high-level discussion, it really translates into seeing and feeling those outcomes, you have to see what to do instead” [b16]

Mental simulation was seen as a core concept in formative events and is seen through the analysis as core to personal practice, indeed it relates to every other concept included. As described in the next section the contrasting of mental simulations is the process that generates the emotion of anticipated regret.

5.4.3.10 Anticipated Regret

‘*Anticipated regret*’ is the emotional that results from the application of the other concepts described in the core category of - personal practice (anticipating regret), and based on analysis, is the basis for motivating the practice of the other concepts in this category, and ultimately the motivation for taking action and intervening to improve safety.

‘*Anticipated regret*’ is described as an aversive emotion. It is an emotion that is generated by a person by determining plausible narratives of the future that would lead to the feeling of *regret*. By mentally simulating such narratives of the future, *regret* is felt in the present, as this an unpleasant feeling participant’s seeks to avoid it becoming a real experience by determining and taking appropriate action.

“when you think about in those terms, it’s not something I ever want to experience” [b8]

“the emotion of thinking what if that will be my daughter put there, means there is no right level of risk to take, no-one should experience...” [b25]

“I couldn’t live with the regret I would feel if...” [b23]

Anticipated regret is applied to future scenarios, e.g. *“when I’m planning to do an extreme endurance run I consider the consequences of not hydrating properly of not planning for and knowing when and where water is available, not something I want to experience, that way I always prepare properly” [b2]*. It is also seen to be applied to near misses associated past events, a form of retrospectively ‘*anticipated regret*’, e.g. *“it was by chance no one was injured, it could have been different, imagine if it had of happened when...” [b16]*. In this case, though retrospective, a different set of circumstances are thought about and their consequences anticipated. This creates regret for a past potential incident.

‘*Anticipated regret*’ is an emotion that is universally present in the examples provided by participants and is therefore seen as essential in the practice of effective safety leadership. Indeed, each of the concepts was seen to achieve one or more of the following with regards to ‘*anticipated regret*’; increasing its frequency, improving its precision/accuracy and or increasing its intensity.

Table 14 below summarises the relationships between the other concepts in this core category with the concept of ‘*anticipated regret*’.

Table 14: Concept Relationships with Anticipated Regret

Concept	Relationship to Anticipated Regret
Agency	Agency to take action to avoid an undesired outcome is necessary for the emotion experienced to meet the definition of regret.
Extended Accountability	Expands the scope and contexts in which anticipated regret is experienced.
Risk is never zero (vigilance)	The belief that risk is never zero increases vigilance and the frequency of identification of risk and so the subsequent experience of anticipated regret. The increased frequency of experience of anticipated regret confirming the belief.
Grounding in Reality	Enables the basis of anticipated regret to be specific and relevant to a particular situation at a point of time, increasing precision and plausibility of the representation, increasing the sense of probability of experiencing regret, so motivating action.
Pausing /Stepping Back	Provides the opportunity/cognitive capacity to perceive risks and process them into narratives that lead to negative outcomes, and to determine actions that can avoid them, i.e. time for developing the content of anticipated regret.
Thinking Through	Building the narratives of identified risks/causes occurring and the cause effects leading to consequences, plus the alternative narratives possible through intervention, i.e. producing the content for anticipated regret.
Life Consequences	Extending the above narratives to include the potential impact to a person's life including their families, friends and colleagues; intensifying the experience of anticipated regret.
Contrasting Mental Simulations	Simulations of compared alternative narratives. Embodied mental representations that construct simulated experiences that lead to the emotion of anticipated regret. Experiencing an incident versus an incident avoided.

5.4.3.11 Summary

The objective of this chapter was to describe the system of concepts that underpin the personal safety practices of the participants in this study, practice influenced by the learning derived from their '*formative events*.'

In combination these concepts are seen to construct and enhance the process of experiencing '*anticipated regret*', a process which defines the action to be taken to address a risk to safety and provides the motivation to take that action (see Figure 14 below).

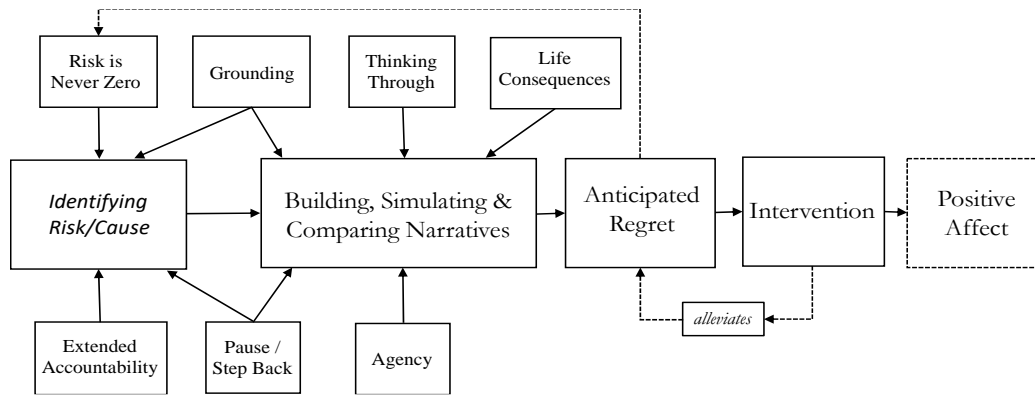


Figure 14: 'Personal intervening' – concept relationships

The '*formative events*' and concepts within this core category do one or more of the following in respect to 'anticipated regret':

1. Initiates the process of anticipated regret as a personal strategy: Anticipated regret as a strategy for enacting safety behaviours is realised through the experience of actual regret as described within the formative events core category, see section 5.4.2.3.
2. Increases the frequency of experiencing anticipated regret: Increased frequency of anticipated regret is achieved by increasing the number of risks identified in more contexts, facilitated by the concepts: Risk is Never Zero, Extended Accountability and Pause/Stepping Back.
3. Increases the accuracy of anticipated regret: Increased accuracy/precision of anticipated regret is achieved through changes in the process and quality of thinking that takes place once a risk is identified, facilitated by the concepts: Pause/Stepping Back, Grounding and Thinking Through
4. Increases the emotional intensity of anticipated regret: Increased emotional intensity is achieved by extending the scope of envisioned consequences of an incident, plus personal association with these extended consequences, facilitated by the concepts: Thinking Through and Life Consequences.

As such the concept of anticipated regret is proposed to be a highly critical factor in safety performance, a proposition which is discussed in relation to relevant literature in section 5.5.

"if I walk past the bag and don't put it under the desk, I feel bad, it's a gut feel I can't live with, so if I walk past I have to go back to take care of it" [a2]

This chapter has described the system of concepts that underly the personal safety practices of the participants that relate to learning established through the experience and reflections of

‘formative events.’ The next chapter now examines the participants safety practices in the domain of leadership.

5.4.4 Cultural Leadership

5.4.4.1 Introduction

The core category of ‘personal intervening’ examined the personal safety practices of the participants which was found to be heavily influenced by the learning participants reported from their ‘formative events’. This section now examines the participants’ practices as leaders in pursuit of creating optimum organisation performance in relation to safety. Again, as will be seen this area of practice was also found to be heavily influenced by formative learning.

Figure 15 below presents the model developed through analysis of the interview sections that related to the participants practice as leaders. The model has the four main concepts some of which are broken down into sub-concepts, all of which are intended to facilitate the creation of a culture of ‘care and anticipated regret’, a culture which is explicitly and or implicitly associated by participants with sustainable higher safety performance.

The foundational concept is ‘*accountability through culture*’, this is a core belief that context has a strong influence on behaviour and because leaders have a role in shaping context, they hold accountability and can be thought of as being at cause of even remote incidents. The cause, in this case being, the culture in which people operate. As such, when an incident occurs the participants experience regret in not having created a culture in which such an incident would have been prevented or mitigated, which then motivates intervention to improve / transform culture.

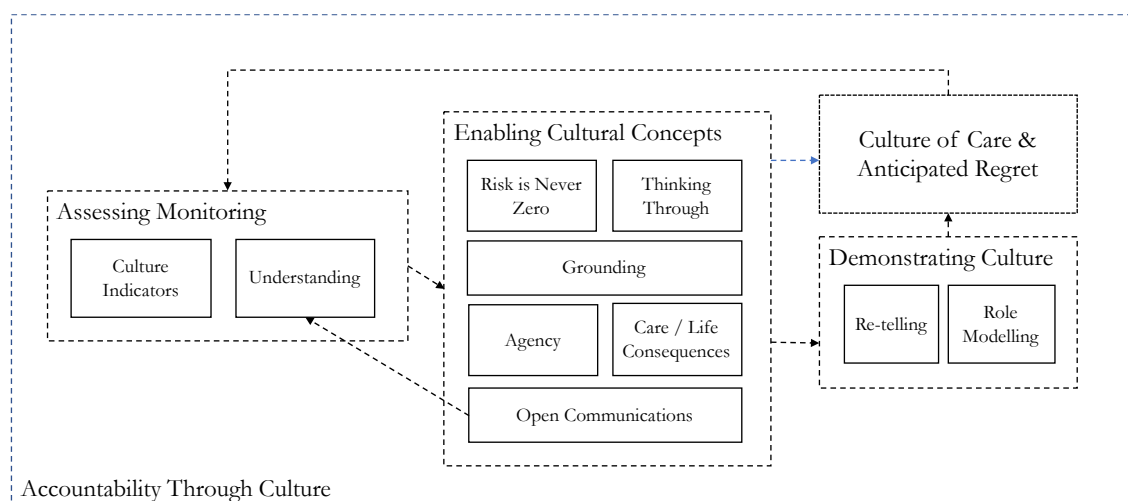


Figure 15: ‘Cultural leadership’ – concept groupings and relationships

To know how to improve the culture, first participants strive to comprehend the present culture. This comprehension is achieved by ‘*assessing and monitoring*’ ‘*cultural indicators*’ and ‘*understanding*’ the habits/qualities of thinking that prevail at a particular locality. ‘*Open communications*’ both facilitates the accuracy of comprehension of the culture and is seen as a key component of a high performing safety culture by participants.

Five additional components / concepts are identified through the interview analysis as being prominent cultural factors that participants seek to enhance/address through their actions as leaders. As can be seen, these concepts are reminiscent of those that have been identified as core in their personal practice and having been developed through formative experiences. Together these have been categorised as ‘enabling cultural concepts’ as they are the factors that the participants strive to embed within the organisation culture, concepts that they intuitively believe enable a sustainable high performing safety culture.

Each enabling concept is built into participants interactions and activities as leaders, e.g. conversations always invite contribution and insight from others, to promote open communication and when acted upon create trust and provide the basis for agency which is furthered through coaching type interactions.

Additionally, the participant’s highlighted the importance of their role in exemplifying the cultural concepts, both through the examples they share from their own experiences and through the behaviours they exhibit and are observed by their teams and wider organisation. These interventions provide the possibility for vicarious learning from participants formative events, and for vicarious learning from anticipated regret they experience as role models. Their teams can learn from, and indeed experience the emotions of the formative events experienced by the participants, and in the ongoing anticipated regret they construct, experience and operate with.

Furthermore, ‘Re-telling’ and ‘role modelling’ are also deemed necessary because as incidents decline the opportunity to have formative experiences reduces. While this is clearly a good thing, it comes with a risk because participants differential practices have been developed from such formative events which will be in decline. Vicarious learning thus becomes ever more important in developing the necessary thinking and behaviours for safety into the future, i.e. creating a culture of ‘care and anticipated regret’.

Table 15 below provides high-level definitions of each of the concepts included within the model. The sections that follow provide detailed descriptions of each concept along with illustrative quotations from participant interviews. Finally, a summary section concludes this chapter.

Table 15: Cultural leadership core concepts

Core Category	Concept Categories	Conceptual Codes	Description
Cultural leadership (Engaging)	Accountability through culture	Non-dispositional, Sense-making, Priming.	Seeing people's behaviours as being driven by context not their disposition, they are sense-making and being primed by the signals sent by the leadership and other contextual signals that leadership can affect.
	Culture Indicators	Things Working, Housekeeping, Managed, Organised,	Identifying signals of the safety culture and thinking present on a site, in particular relating to care and vigilance.
	Understanding	Active listening, Perceptual positions, Gauging (against ideal model), Question to investigate thinking,	With genuine interest; asking open questions and listening to a person's thinking - detecting degree of assumptions v grounding, vigilance v normalisation, and tick the box v thinking through and emotional connection with consequences.
	Open Communication	Dialogue, Trust, Humility, Questioning, Fear of Reprisal, Space for, Team cohesion.	Engendering open two-way open communications, ensuring the time and space to share thinking, concerns, issues; open to asking and answering questions with positive reception and no fears of reprisal.
	Risk is never zero	Change / pause. Chasing through. Normalisation. Relevance	Addressing normalisation of risk, connecting small and infrequent causes to significant lived consequences. Vivid representations engendering representation and recall bias.
	Thinking Through	Chase through, Think through, Plan, Anticipating, Imagining / Seeing What Could Happen	Coaching and facilitating the mapping, understanding and mental representation of all potential cause effect sequences of risks becoming incidents, of what can be done to prevent the sequences, mitigate them, or prevent harmful consequences.
	Grounding	Reality, Actual, Live Site, Current Status, Site Culture	Ensuring people build accurate mental representations of the actual real site / situation in its current and anticipated status, avoiding assumptions and generalised / prototypical representations. No unquestioned reliance on drawings, procedures etc. (including culture)
	Priming Agency	Sharing intent, Localisation, Choice, Purpose based thinking	Ensuring sense of agency through ensuring understanding of intent, using purpose based and engagement in decision making, through choice in how to make things work/safe to the specific location / situation.
	Lived Consequences	Lived lives, Family, Beyond numbers, Perceptual positions.	Ensuring the consequences / potential consequences are related to the real lives of people, associating to people who are cared about, and not abstract numbers or generalised labels (e.g. lorry driver)
	Re-telling	Re-living, Instilling, Structuring stories, Associated, Emotional Response	Sharing stories that exemplified the structure of thinking of regret and anticipated regret, told in an associated not abstract way, demonstrating authenticity through emotion
Role modelling	Present, Focus, Intervening, Inconvenience self, Appreciating interventions.	Demonstrating through action and sharing of thinking and experiences, particularly strong when intervention can be seen as a significant inconvenience to self and business.	

5.4.4.2 *Accountability through culture*

‘Accountability through culture’ refers to a set of core beliefs about what drives the behaviour of people. Firstly, the belief that people come to work with positive intent, they arrive intending to do a good job. Secondly, that their decision-making and behaviours are significantly driven by their context, i.e. that their behaviours make sense if you understand the situation they are in and their sensemaking of the signals that are present in the specific and broader context.

“nobody sets out to do a bad job, you have to see and understand the different pressures that are on someone” [a2]

“a project plan can create an expectation and the assumptions of having to get it done by then by whatever means” [b12]

“it’s like the broken windows pattern, people take on board subtle cues of what’s important or not” [b21]

“when you get under it, they were trying to do the right thing, it’s down to us why they thought it was the right thing” [a8]

“when we spend time talking about cost pressures, it should be no surprise that people think they are helping by taking the shortcut” [b9]

The participants describe the belief that decision-making and behaviours are driven by context as contributing to the sense of leadership accountability for incidents occurring. This belief is based on the logic of – if the context shapes decision-making and behaviours, and I have a strong influence on both the context and how it is interpreted then I’m ultimately at cause, I have the possibility to make a difference. This drives the effort to understand the local culture and the details of the sensemaking taking place when they see changing safety results and unsafe behaviours first-hand; ultimately to understand how to intervene.

“you have to ask yourself, how is that they are doing these things, thinking this way, what’s leading to this as being the acceptable way of working” [b21]

“I’ve seen some strange things in my time but when you dig a bit deeper, they make sense, then you have a clue about what you need to do as a leader” [b4]

“they were like a completely different workforce in a matter of weeks or even days, that possibility was always there, but as leaders we hadn’t understood...and so we hadn’t...” [b21]

This is coupled with the recognition that ultimately people on site are the “*first and last line of defence*” and knowing they can’t directly influence everyone.

“ultimately success is down to everyone on site, but you can’t shake every hand and have a conversation with everyone on a site that size, but you can influence the way conversations happen” [a3]

“it’s at the front line where it happens, you can’t be everywhere, but you can influence the culture, the thinking, the care that is there” [a3]

The sense of accountability through culture leads to the description of a particular type of anticipated regret, the anticipated regret of not enabling people to do the right thing, to be safe.

“I can’t know them all, but I can lead a culture where people care and return to their families, I hate the thought of that not happening” [a3]

“I worry when there has been a compliance drive, I understand why, but it can switch people off to somethings, I have to make sure that doesn’t happen, I can’t be comfortable, knowing that might lead to an incident, I have to...” [a5]

This sense of accountability drives the desire to understand safety culture in general and the specifics of different cultures and localities, including how their own behaviours are being interpreted and made sense of. This understanding is then used to make adjustments to their own behaviours and the wider organisational design and practices.

Engagement in, understanding and working with the organisation’s culture is the principle purpose that unites the concepts within the leadership model shown in Figure 15, and this starts by gaining insight into the current status of the culture as described in the next section.

5.4.4.3 Culture Indicators

As described in the prior section, because participants feel accountability through culture, they are motivated to engage in the process of sensemaking the decision-making and behaviours that they observe. Having made sense of their observations and experiences, they build informal theories or assumptions about how observable indicators relate to the local safety culture. Over time these become generalised theories and associated indicators of safety thinking/culture;

“first thing I notice is the general housekeeping...to me this indicates...” [a4]

“is the same risk and comment on the form each day? you can tell if people are...” [b9]

“is there attention to the details” [b12]

“are they using the right tools, or what’s at hand” [b14]

“are people talking to each other, how are they talking, what about” [a3]

“does it look organised...has it been thought through...?” [b23]

“is there cohesion in the team(s), if not then...” [b12]

“I know when tick boxing is happening when I see...” [b9]

“you just look around, there’s dirt there, there is garbage there, there were materials stored there not cordoned off. You just walk around, and you just see it. I was there last week, and it was much, much better. You could just see it, how that impacts also the way the plant is run and their perception of people, yeah” [a4]

Although participants develop tacit and explicit generalised cultural theories associated with certain indicators, they are sensitive to making assumptions when they have no direct experience of a particular culture; they remain open to alternative systems of sensemaking:

“we have many sites in country [xxxx] but very few people have visited there, how can we know how what we do and say will land there” [b1]

“I went there, to see and understand first-hand, it was an eye opener to the assumptions we can make about another country, another culture, assumption being made for years” [b1]

“the principles apply but you have to see how it makes sense in the local way of thinking” [a4]

“we had to completely change the way we explain things, you have to understand how people take in information in a particular culture, in the reality of people’s lives in that culture” [b9]

“I had a whole set of biases and stereotypes” [b7]

“in country XYZ diesel had ... not following the rules, if you wish, had escaped and thankfully it was hot, and it evaporated. But the fire brigade came as well and, some firemen said, “Where can I smoke around here?” [b16]

Participants also recognise that their presence may have both a temporary and lasting impact on decision-making and behaviours and account/adjust for this as they interpret signals.

“Because I see PPE when I go to site doesn’t mean they are always worn, particularly if I was expected to be there” [b5]

“It’s possible that they polish the brass when the big brass turns up, you have to see past that, you have to put them at ease to get to see the real culture of the site” [a1]

“I know they follow my lead, but that makes it difficult to know how things are when I’m not around” [b9]

This recognition leads to the strategies described under the concepts of ‘*open communication*’ (see section 5.4.4.4) and ‘*understanding*’ (see section 5.4.4.5). The participants sense the level of “*authenticity*” of what they are seeing and experiencing and so determine if they need to “*dig a little deeper*” [a7].

“you get a sense that someone has something say but doesn’t feel comfortable saying it in your or others presence” [b14]

“you can tell if what you’re seeing is their normal working practice, it doesn’t look natural if it’s not, hesitant, like someone driving a different car for the first time” [b2]

‘*Cultural indicators*’ relate to a personally developed underlying theory of what is necessary for effective safety culture, theories that are not always explicit but are reflected in the nature of interventions that are applied by the participants in driving a high performing safety culture. These interventions are targeted towards achieving desired cultural attributes which are described by the ‘*enabling cultural concepts*’ within the model, see Figure 16 below.

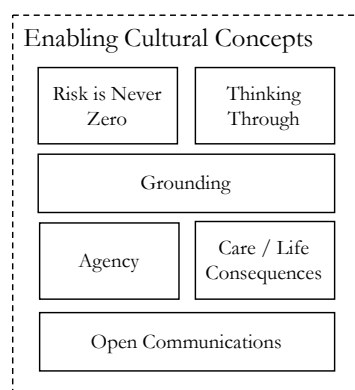


Figure 16: Enabling cultural concepts

It is therefore proposed that participants use observable indicators to build a local theory of mind and culture that they compare to an ideal way of thinking and behaving concerning safety. They are trying to build a theory that makes coherent sense between the state of the physical site, the nature of interactions between people and of their thinking and behaviours. When there is a divergence between what they observe and interpret and their ideal model, they heighten their vigilance and develop interventions to address the identified gap.

“you see...and so you feel less safe...more alert...then you need to understand why and how things are this way, why things aren’t attended to, broken alarms etc...then you can see how to move things forward, more to how you would see it...” [a4]

To make coherent sense of what they are observing they strive to establish ‘*open communication*’ so they get to hear what is happening and how people are really thinking rather than being on the receiving end of impression management.

“people can be eager to tell you what you want to hear for all sorts of well-intended reasons, and for less healthy reasons, I try to understand why people may find it difficult to share their concerns and thinking, so I can get to what’s happened, but also to know what needs to change in the bigger picture...” [b13]

Establishing ‘*open communication*’ is this something that is targeted by the participants as described in the following section.

Because participants feel accountability through culture, as described above, they are motivated to engage in the process of sensemaking the decision-making and behaviours that they observe. This motivation is derived from the emotion of anticipated regret in that any incident happens is seen as a result of culture for which the participant is accountable. Therefore, attention to cultural indicators is a concept that is also motivated by anticipated regret.

“not on my watch, sorry I don’t mean when I’m on site, I mean my leadership” [b5]

“the signs were there if you looked, that’s hard to take, if...” [b12]

“small things can tell you...you can’t let them go...can’t walk past them...” [a5]

“when people ignore the signs, risks can be big, systemic... I worry big then...what might happen...what if my daughter” [b25]

Participants then act with vigilance for culture in addition to the vigilance described within their personal safety practices. Vigilance that is more effective when there is open communication, hence their drive to establish this within the organisation’s culture.

5.4.4.4 Open Communications

Driving towards a culture of ‘*open communication*’ is a focus for the participants. They describe a number of utilities/benefits and reasons why open communication is a key component in a strong safety culture. Firstly, open communication enables the leader to understand the nature

and quality of thinking of those engaged in working for them, this relates to the concept of ‘*understanding*’ (see section 5.4.4.5)

“it’s about being open and it’s then always about listening to their answers, you can get a sense of how they are thinking, are they really focused on and understand this, or are they stumbling or talking in general terms, because they haven’t really thought things through” [b9]

“you’re not trying to catch someone out, you need trust and openness to enable people to speak, so you can hear how they’re thinking, so you know where you need to help” [b12]

“If you’re sincerely curious, I think it’s possible to go to pretty specific places without putting people on the defensive” [b21]

Secondly, open communication enables people to share their observations of the work context, of what has changed, what they have noticed that might be a source risk, what may not have been noticed during planning, etc. this relates to the concepts of ‘*grounding*’ (see section 5.4.4.7) and ‘*thinking through*’ (see section 5.4.4.10)

“my biggest contribution, is to make an environment where people can say what they see and what they think and what they worry about” [b12]

“people are at the front line, they see and experience the live site, you have to have openness so you can learn from them, and the questions you ask also encourage them to keep looking and bringing things to you, because they learn that you want to hear, the reality, not just yes” [b11]

“if we don’t create the space for people to speak, we miss access to what’s really going on” [a3]

“I really believe that open communication, especially when things aren’t going well...I think that’s so important to getting to the bottom of things” [b23]

Open communication enables people to contribute, to raise concerns and or ideas regarding planned activities, based on their experience. But participants recognise that they need to role model being open to receive and learn from others in order to encourage this behaviour;

“My personal accountability is to role model that, is to ask the questions, is to be a learner, not a knower” [b21]

“I think the challenge in what I talked about in terms of open conversations and having that healthy doubt about things being right in the field, being open to listen without fear of blame etc” [b18]

“For me, the goal is almost like, the day that you and I work anywhere, and I intervene because you do something, and I feel totally at ease doing that. But, more importantly, you feel actually totally at ease at receiving that” [b22]

Participants described a number of strategies for engendering open communications;

- Role modelling curiosity and humbleness: Demonstrating the seeking of information, asking questions and searching for alternative and current views, of valuing and responding openly to alternative perspectives. Participants believe when this is done proactively, it means someone who wants to impress will be motivated to share more insight, which may be the case in a hierarchy.
- Sharing intent: This strategy provides the basis on which people can agree, i.e. on intent, which can then enable people to be more open flexible about the means by which it the intent is achieved. Participants see this as being useful when there are people who are high on agreeableness, this enables them the contribute alternative views while agreeing with intent.
- Providing space and time: This was seen as a clear demonstration of the importance of open communication, i.e. providing he space and time (resource) for it to happen. It is described as in contradiction to ask people to be open, but then not provide time and space for this to happen, it demonstrates inauthenticity. Actions here can be as simple as providing the physical space where a conversation is not going to disturb fellow workers. Time is a resource and so committing resource was seen to demonstrate importance.
- Balancing who speaks: This strategy makes sure all voices are heard. It also shows that all voices are important and are expected to contribute. Thus, increasing vigilance through an expectation of having to contribution i.e. there is always risk so you must have noticed something we should be aware of.
- Personal conversations: This was particularly deployed in one-to-one conversations. By demonstrating interest in the person first, authentic interest, the participants believe that individuals will be more open about work issues and concerns. This approach also relates to the development of a culture of care, as discussed in section 5.4.4.9

In addition to the above, there were individual strategies and styles applied by the participants. Indeed, authenticity was seen by participants as an important factor in enabling open communications..

“open starts with yourself being yourself” [b12]

“if your following a policy of involvement rather than believing it, people can tell” [b21]

Participants placed significant importance in the way they and others respond to feedback / information. The most emphatic being to avoid defensiveness and to never leap to blame, instead to focus on understanding. This relates to the first concept in this section ‘*accountability through culture*’ (see section 5.4.4.2). If you believe people’s judgements, decisions and behaviours are driven by context; then the natural response is to seek to understand the contextual drivers rather than seek to blame the individual in the first instance. Participants expressed the belief that repeated demonstration of this behaviour, of seeking to understand rather than placing blame, of seeking to learn rather than be defensive, creates a place of psychological safety and trust in which open communications can occur.

In addition to the benefits of open communications introduced above, of gaining insight into the process and quality of thinking of people, and of bringing all information to the table when making judgements, decisions and plans; participants also recognised significant secondary gains from a culture of open communications with regard to;

- Motivation and agency (see section 5.4.4.8)
- Innovation & adaptability (see section 5.4.4.7)
- Care / Team Cohesion (see section 5.4.4.9)

5.4.4.5 Understanding

‘*Open communications*’ described above is an important pre-requisite for the concept of ‘*understanding*’. ‘*Understanding*’ is about building insight into what a person is paying attention to, how they make sense of what they notice, and how they think about their activities and broader work context. Participants have implicit and explicit theories about how a person should be attending to and thinking about their work and context if they are to be safe and can contribute to the safety of their colleagues. They also have implicit and explicit theories about

what form of attending and thinking is detrimental to safety and indicates a suboptimal safety culture.

Participants use active questioning and listening to develop the necessary understanding to judge the safety thinking of individual and associated local culture. The results of these investigations inform the nature of leadership interventions needed to be made. As described in ‘*accountability through culture*’ they are not questioning to determine blame but to determine what action needs to be taken to help people adopt the optimum mindset, as they see context which includes leadership as determining mindset and behaviours.

“So, when I go to places, first of all, I am very humbled to learn and understand. To observe and to listen, rather than to prejudge” [a3]

“understanding from the person who actually has the exposure. An operator, a contractor. What is it that they are really concerned about, or not?” [b9]

“the eyes and the ears of those running it, who are there, how are they thinking, not only intellectually, but emotionally feel” [a4]

‘*Understanding*’ is applied to an individual and aggregated to identify patterns of thinking across a workforce. Interventions can thus be at an individual level, e.g. coaching, or participants can make culture-wide interventions to address any shortfall identified through the processes of ‘*understanding*’, with much of the assessment being made against the ‘*enabling cultural concepts*’ as follows;

- Risk is Never Zero (vigilance): Seeking to understand the level of normalisation and assumptions being applied. For example; are there places and processes that are assumed safe? are there accepted short cuts which increase risk? are actions based on checklist compliance or mindful assessment of the situation?
- Grounding: Seeking to establish an individual’s awareness of the actual environment and culture, versus assumptions based in generalised experience and or taken from policy, processes and secondary representations e.g. drawings, reports, statistics.
- Thinking Through: Seeking to understand the complexity and scope of thinking, particularly cause-effect. Do people experience and think about the site as complex interacting systems and behaviours or individual independent components? Do they think things through from first principles to understand the properties and potential states of systems and so the potential variations in chains of cause-effect and feedback loops and so anticipate uncertainties and risks present?

- **Agency:** Seeking to establish the degree of accountability and confidence people have in bringing forward observations, ideas and questions, and to take independent action when they have identified something that requires intervention to ensure safety. Do people have some autonomy and choice, and or input into the operating practices they carry out? Do they believe their first-hand experience is valued and drawn out in developing local policy / practice?
- **Care / Life Consequences:** Seeking to understand the degree to which people think about and associate with the experiences of others. The degree of thinking through the consequences of their decisions and actions for others. Even outside of safety, are they concerned about a customer's experience of arriving at retail site that has litter around, or finding shelves empty of stock, do they feel regret for someone having that experience?

When interacting with people, when applying active and open questioning and listening, the participants describe being sensitive to the qualities of the answers they receive, e.g. *"it's not what people say, it's also how they feel saying it"*, with the following being indicators for concern;

- **Vague answers:** Indicating lack of *'grounding'*, *'thinking through'* and *'risk is never zero'*.
- **Hesitant answers/speech:** Indicating lack of trust and *'open communication'*, fear of blame, lack of *'agency'*.
- **Made up on the spot:** Indicating lack of ongoing *'risk is never zero'*, and possibly *'care'*.
- **Generalised statements not specific to their surroundings, recounting policy or check list answers with no reference to application in specific context:** Indicating lack of *'risk is never zero'*, *'grounding'*, *'thinking through'*, *'agency'* and possibly *'care'*.
- **Reluctance to answer when boss is around, referring to authority:** Indicating lack of trust and *'open communication'*, fear of blame, lack of *'agency'*.
- **Inability to recount the major risks and actions to avoid associated with their locality and role:** Indicating lack of *'risk is never zero'*, *'grounding'*, *'thinking through'*, *'agency'* and possibly *'care'*.

In contrast the following are considered positive indicators;

- An answer/dialogue that includes evaluation and critical thinking. That is specific about risks that are contextually relevant, with clear descriptions of the cause-effect associated with the risk and of the barriers that are in place, or could be in place: Indicating strength in the concepts of ‘*risk is never zero*’, ‘*grounding*’, and ‘*thinking through*’.
- An answer/dialogue that demonstrates knowledge of policy, process and check lists but also with reference to examples of how these are relevant to their specific context, which ones are more relevant with clear rationale of why and how: Indicating strength in the concepts of ‘*risk is never zero*’, ‘*grounding*’, ‘*agency*’ and ‘*thinking through*’.
- An answer/dialogue that contains consideration of the impacts upon, and experiences of others, with associated emotions of regret for past incidents, and with the emotion of anticipated regret when considering current risks and potential consequences: Indicating strength in the concepts of ‘*care*’, ‘*thinking through*’, and ‘*agency*’.

The form of questioning described by participants is a supportive coaching style. This both provides the opportunity to gain insight into the qualities of attention and thinking of individuals. It also provides the opportunity to facilitate the individuals thinking towards the desired concepts. The questions being asked by participants are designed to provide access the others thinking but also indicate what thinking / attention is expected, e.g. “*how do you know the safety checks have been done instead of the form just routinely signed?*” This form of engagement also supports the development of ‘*agency*’ (see section 5.4.4.8)

“a good conversation is when we both learn” [b12]

“ask good questions and the really listen...people gain confidence and learn” [b9]

“questions share how you are thinking...people learn about you from them” [b1]

“it’s a co-discovery conversation” [b21]

“if you listen people feel and take ownership” [b25]

Participant’s state that the intention is to learn, and not trying to catch someone out. This is congruent with the concept of ‘*accountability through culture*’. The goal is to learn about the qualities of attention and thinking of individuals, not to blame them, but to understand what in the context is inhibiting or enabling levels of performance, so they can develop interventions that maximise the enablers and address the inhibitors. This diagnostic includes associating into the individual’s perspective and asking what is leading to this way of being / thinking, and so what might address this. Asking, if I was in their shoes what would be helpful? Considering specific contexts/scenarios, e.g. What will work with an area of higher staff turnover? What would work in this high deference culture?

“you have to figure out how people digest information from their position, a casual seasonal worker with limited education needs it clear quick to digest and easy to bring to mind...it has to be simple and relevant from their perspective, not to someone remote in group” [b9]

The process of engaging and listening is also seen as a signal of ‘care’

“If you take the time, you know, everyone is pretty busy. It's a busy world. But if you take the time to stop, have dialogue and listen, it shows real care, and it spreads” [a3]

Finally, in addition to assessing, striving to ‘*understanding*’ the quality of thinking against the ‘*enabling cultural concepts*’, participants also assess the level of technical knowledge and competencies, however, these are seen foundational, with the ‘*enabling cultural concepts*’ described as the “*mindset and emotional intelligence*” that “*brings safety to life*” in the culture of the organisation.

5.4.4.6 Risk is never zero

Participants identify the importance of vigilance, the avoidance of familiarisation with contexts, and the normalisation of risk, recognising the leadership and cultural challenges of achieving this. Indeed, they build strategies to maintain their own vigilance knowing how strong the influenced of familiarisation and normalisation can be (see section 5.4.3.4).

A key strategy utilised in maintaining their own vigilance is the building and maintenance of the beliefs that ‘*risk is never zero*’, that you never step into the same room twice as things can always change, and that small risks can have life changing consequences. As described in section 5.4.3.8 and in the discussion section 5.4.5.10, the consistent identification of risks coupled with mental simulations of the potential consequences to a person’s life, builds a bias in perceived probability of an incident occurring, a perception that is important to self-construct as actual incidents become less frequently experienced.

In their role as leaders, the participants endeavour to build these beliefs in others through their personal interactions, e.g. during building ‘*understanding*’.

Instinctively, and in some cases intentionally participants share the structure/process of their thinking in relationship to vigilance beliefs with those they are interacting with. This can be

through direct sharing of their thinking process and content and or through asking the questions, that are the core structure of their own thinking, to others. The sharing of their thinking is demonstrated through the following examples transforms what could have been seen as a compliance request into a subtle teaching intervention, and demonstration of care;

“a recent example was yesterday on the stairs; I saw a colleague walking up them with both hands full, they couldn’t hold the handrail, plus they were struggling with what they were carrying. I walked over to them and said, please let me help you with that so you can have a hand free for the rail, I don’t like the thought of you tripping and falling down these hard steps, especially seeing story of XXXX in a wheelchair after falling down just three, thank you.” [a2]

“do you mind if I help by putting this under the desk, I wouldn’t want to see you forget and come to and come to any harm, would make me feel bad, hope that’s ok, it happens more than you think, and with trips to hospital, thanks” [b15]

Both examples above see the participant demonstrating and sharing the structure of their beliefs associated with ‘*risk not being zero*’. A simple intervention thus becomes a learning event, not just reminding them of a policy, but priming a way of thinking and intervening. Sharing and priming a way of thinking in relation to risk and consequences also takes place within team and project meetings through the stories that leaders share (see retelling in section 5.4.4.11) and in their facilitation approach, in particular, the questions they ask.

“I’ve been a lot more explicit in why I’m asking a question or what’s behind my question.” [b12]

“Questions I ask in meetings...helps others think through in similar ways” [b1]

Participants are mindful of how they use regular team practices, for example the ‘safety moments’ within meetings. They are careful to ensure these are not just routine agenda items but are “*relevant*” and “*meaningful*”. ‘*Relevant*’ meaning that the incidents talked about are ones that relate to ones the team members could experience and or to people they know or are in proximity to. ‘*Meaningful*’ meaning the incidents are connected to the impacts they have for people. People “*made real*”; even if the name can’t be shared, they are talked about as a person that experiences consequences to their life. Participants believe by being ‘*relevant*’ and ‘*meaningful*’ they see a stronger emotional response and a more engaged discussion, and better results in terms of safety behaviours.

“it’s important make it relevant...in an office context...I’ll give you an example...I got the fire brigade to attend one of our team meetings...things that don’t seem common to us, they experience every day...seeing what they see...and the impacts on lives...and the fire fighters from seeing that...it’s emotional and its real...then you see people pay attention to how fires start in the office and at home...when you know it can happen any time to anyone” [a2]

Based on the analysis from formative events, it’s proposed by being ‘relevant’ and ‘meaningful’ the incidents, or potential incidents, discussed are more readily mentally simulated into vivid and associated mental representations. Hence, increasing both the emotional response and the sense of probability of an incident. This then increases the perception that ‘*risk is never zero*’.

In the example above, the fire brigade provided vivid descriptions of the impacts on people affected by fire, fire started by small risks, regular risks that are normalised, or even not realised, e.g. phone chargers purchased online, due to fakes. This matches the desired pattern; ‘relevant’ because many people buy additional chargers, ‘meaningful’ because the impact on life is real and significant, and ‘vivid’ because it can be imagined based on pictures and descriptions provided, and because the emotions of the fire fighters demonstrated in the ‘*re-telling*’ of their experiences.

The repetition of such examples within teams is intended to achieve the concept of ‘*risk is never zero*’, this was expressed by one participant as a shift in thinking;

“it’s about thinking why wouldn’t you? instead of why would you?” [a6]

This refers to the noticing of regular risks and taking action because of the contrast between the potential consequences and the small effort required pay attention and to act;

“when you think about the pain of falling down the marble stairs we have in this building, why wouldn’t you hold the handrail?” [a6]

Discussion within teams are therefore facilitated to include the full thinking process, of a regular risk becoming a cause with significant consequences a person’s life, which could have been avoided but for a moment of attention and action. Thus, providing multiple vicarious experiences of regret, and the structure of anticipated regret.

Role modelling the concept of ‘*risk is never zero*’ was described as critical in ensuring the insights and experiences shared during team discussions and resulting behavioural changes “*stick*”;

“*you might say all the right things, but if your seen stepping over a hazard, then it’s not authentic and people will follow your lead*” [b21]

Role modelling in relation to the ‘*enabling cultural concepts*’ is further discussed in section 5.4.4.12 below.

The purpose of the concept of ‘*risk is never zero*’ is to increase vigilance towards risks that may be present in the current context, and to some extent to engender anticipation of similar risks in similar environments. The concept of ‘*grounding*’ described in the next section, also attends to vigilance, but the concept of ‘*grounding*’ is focused on specific preparations and planning for entering into an environment and or planning activities/operations.

5.4.4.7 Grounding

The concept of grounding was introduced within the ‘formative events’ in section 5.4.2.5.1.1 and within ‘personal practice’ in section 5.4.3.5. ‘*Grounding*’ is the processes of familiarisation with a site/location, the physical site and the culture i.e. the nature of the thinking, assumptions, values and behaviours that prevail. In contrast to ‘*risk is never zero*’ which is focused on vigilance towards present risk, ‘*grounding*’ is concerned with vigilant preparation for entering into a context or set of activities.

In the concept of ‘*understanding*’ participants, as leaders, seek to establish people’s awareness of their actual environment and culture, versus making assumptions based in generalised experience and or taken from policy, processes and secondary representations e.g. drawings, reports, statistics. Based on what they ascertain from the process ‘*understanding*’ the participants take action to address any perceived lack of ‘*grounding*’ in their teams thinking.

Improving their team’s thinking in relation to the concept of ‘*grounding*’ takes place in two contexts, in one-to-one coaching and when leading team activities, e.g. planning and operational activity. In both contexts, the same strategies are applied:

- Introduction of appropriate doubt in relation to:

- the relationship between drawings/schema and the actual site
- the relationship between written policies and procedures and actual practice on site
- the relationship between policies and the actual capabilities on site
- the relationship between signals/readings/data and the actual status of the site

“the sense of trust and belief that if you've got your diagrams, everything's in control, it's not” [a5]

“how do we know that...” [b12]

“can we be 100% sure that xyz can't happen, I don't think so...” [b3]

“what has or could have changed since...” [b11]

“often they are invented for a type of analytical mindset rather than a daily activity. So, what I tend to look a lot is, what can the audience carry? Rather than, theoretically, how would this look?” [b9]

“how is xyz actually done...” [b17]

“how can we know that the value will definitely be off...” [b12]

“does that light not being on really mean it's safe, or is it the light's not working” [a4]

- Surfacing and testing of assumptions in relation to:
 - the above items, plus
 - people's understanding of the plan being developed
 - people's clarity in what the risks are and how they may manifest
 - awareness of the current status of the site e.g. assumption it's the same as last time

“because it was the same the last ten times, doesn't mean nothing's changed for this one” [a5]

“nods don't equate to understanding...they have to explain it back to show they know it” [b9]

“is it clear in their mind, can they see what to expect, describe it” [b22]

“when people are surprised what they find...it's too late... you made assumptions” [b12]

The goal aimed for during preparation, in accordance with ‘*grounding*’, is for everyone to have shared and accurate mental representations of the site. To this end, the participants endeavour to have everyone in the same room regardless of status, in open dialogue. Also ensuring the people with the most current knowledge and experience are present and contributing. In this practice, the participant’s focus is on the outcome/goal, of grounding, and will extend meeting time as necessary rather than sticking to a pre-planned/allocated duration.

Because ‘*grounding*’ surfaces assumptions and potentially missed risks, it creates the opportunity to experience ‘*anticipated regret*’, an opportunity which is used by participants:

“*you have to think worst case what could happen, what consequences*” [b12]
 “*dwelling on the thought, what if we had missed that, what could have happened, keeps you focused*” [a5]

Participants take the opportunity to openly ‘*think through*’ the consequences of risks identified, rather than just acknowledging it and designing a barrier. By playing out the process of ‘*think through*’ to the consequences people repeatedly experience the structure and emotions of anticipated regret, and so creating the motivation for vigilance in preparation through thorough application of ‘*grounding*’.

The process of ‘*grounding*’ is thus combined with the concepts of ‘*thinking through*’ and ‘*lived consequences*’ which are discussed in sections 5.4.4.10 and 5.4.4.9 respectively.

An important secondary gain from the involvement and open dialogue created and experienced in the process of ‘*grounding*’, is one of increasing the sense of agency within participants teams. Participants actions directed towards increasing agency is discussed in the following section.

5.4.4.8 Priming agency

As described in sections 5.4.2.9 and 5.4.3.2 participants have their own strong sense of ‘*agency*’. In the context of safety culture leadership, they strive to ensure all employees and contractors have the same sense of ‘*agency*’. ‘*Agency*’ is defined here as the capacity and possibility to affect change, to be at cause and so make a difference in outcomes.

The key difference between the concept of ‘*agency*’ as defined here, versus those described in the ‘*formative events*’ and ‘*personal intervention*’ core categories, is the in the latter two core

categories, 'agency' was self-derived / already developed. Here, in cultural leadership, the participant is striving to develop and enable the sense of agency in others, when it is not already present or fully developed.

The development of agency was consistently stated as important, primarily due to these essential role people have in ensuring safety;

“people are our first and last barrier to an incident occurring, they have to be active and have the ability to say no, to say stop, doesn't matter if they are wrong, if they believe there is a risk, they should be able to stop...” [a3]

“I can't be everywhere, no-one can, so people need to understand and have the capacity to take action, to halt things...no matter the cost, no blame or come back” [b3]

In addition, agency was seen as a contributor to enrichment and employee engagement;

“when you listen and give people latitude, people engage differently with their work” [b9]

“no-one had asked for their thoughts before, they were a different team quickly, so were the results” [b21]

“the ownership and pride were transformed by simply involving and listening” [b12]

Participants were found to believe that rules, policy, checklist and compliance have an important role to play in ensuring safety, however, they also recognise that the way these are communicated, implemented and engaged with can remove the sense of agency, accountability and vigilance.

“I worry when there has been a big compliance drive, if it's not done with involvement it can switch people's thinking off” [a5]

“process focus without proper engagement can leave us with tick box thinking” [b8]

Well-intended initiatives and interventions that are delivered in a directive manner leave little room for developing a sense of agency and also often miss the opportunity to help develop the process of anticipated regret in relation to the risks that the compliance processes are designed to address.

Instead, participants focus on engaging their teams/workforce in active dialogue during compliance initiatives. They make sure the purpose and intent are understood first, then move

onto dialogue on how the initiative applies and works in their specific contexts. This has three effects. Firstly, it creates clarity regarding the outcome that is desired. This is important because it's the defined outcome that provides the criteria by which a worker can evaluate if the compliance actions are suitable in a particular context, or if they need to be enhanced/changes. Secondly, it provides the opportunity for input and a degree of choice in how best to ensure compliance and the outcome is achieved, thus increases agency. Thirdly, the process engaging in dialogue that leads to understanding the intention and '*thinking through*' how it can address the specific risks in their context, provides the opportunity to consider the consequences of incidents caused by these risks, and so to experience '*anticipated regret*'.

The strategy of engaging people in dialogue in the form described above is also practised during site visits. Conversations start with clarity of intent, "*I'm trying to understand what the key risks are on this site, and how you identify them*", then provide the space for a response, for the other person to take the dialogue forward, i.e. inviting '*agency*'. Depending on the response, the conversation proceeds with open dialogue or a coaching type conversation. Always continuing to invite contribution from the other while asking questions that guide thinking to the desired form of attention and processes, i.e. the application of the '*cultural enablers*.' Thus, inviting agency throughout and providing experiences of '*anticipated regret*' associated with risks that are identified.

This process of engagement '*primes agency*' and completes the '*thinking through*' to include mental simulation of the potential consequences of an incident to themselves their colleagues and the impact to their lives, the potential '*lived consequences*'. In addition to providing the emotional impetus towards improved safety practices, this also demonstrates '*care*' on behalf of the participant, i.e. that they care about the lives and families of their workforce, provide this process is carried out with authenticity. Authenticity is discussed in section 5.4.4.12 "role modelling", the concept of '*lived consequences*' in leadership practice is described in the next section.

5.4.4.9 *Lived Consequences / Care*

Participants place high importance on creating motivation and personal commitment towards safety in their teams, the wider organisation, and beyond. They strive to build ongoing vigilance, interventionism and agency by establishing a particular emotional drive. An emotional drive created by bringing attention to the actual and potential impacts of incidents on the lives of people, people that others can associate with. A drive that also has the secondary gain of increasing team cohesion.

“it impacted the team, the team cohesiveness...it was a relatively confrontational traditional union environment... if you're able to do it in as transparent a way as possible...you can really graduate from horrible things with ...a tighter team”.[b12]

Through their formative experiences, participants recognise the significance of being confronted with the life consequences of an incident. The life consequences for a person that has come to harm, and their family. As so see creating the connection between an incident and the lives of real people as a critical component in generating an emotional drive that helps overcome normalisation and increases the motivation to intervene with a strong sense of agency.

“you have to get to people's hearts and minds rather than giving them new rules and new processes, is the key to changing your safety, is the key to changing your safety results and output” [a3]

They also recognise the difference between cold logic and numbers and mentally recalling and or simulating a narrative involving the lives of people that they can associate with. Seen as essential in ensuring safety is prioritised over time or cost considerations.

“a percentage reduction if safety incidents might make you think of success, but not if you imagine the reality of it for the one person that is still harmed, what is that was your daughter would it be ok, if she was selected to be the one that number represents?” [b25]

“think around your environment, your people, your family, friends, your kids, et cetera, as well. Just think around that and what would it do to you? And would you want people to intervene to avoid this happening to you and your family? It's super powerful. And particularly in some of the cultures I've worked, that really, really is seen, it really resonates with people better than a tell from a manager, you know? That is there, but you want to get into the hearts and minds of people and the family element is really what comes down well” [b23]

As described in the discussions section 5.4.3.9 the vivid and emotional mental simulations created bias the sense of the probability of an incident, a bias that is proposed to heighten and maintain vigilance. To establish this emotional drive and associated biases, patterns of perception and thinking are established and triggered by the actions of the participants in their roles as leaders, specifically instilling the following patterns:

- Imagining/recalling the potential/actual consequences of an incident to someone's life outside of work
- Imagining/recalling speaking to the family of the person that has come to harm
- Imagining the events happening to part of their own family

“So, this is [Name] he's now [Age]. [Name] she's now [age]. [Name] is now [age], But the thing that I try to envisage often if this something happens to them” [b16]

Imagining in the above patterns means the mental simulation of events, a visual representation of the narrative unfolding from an associated perspective, as if participating either in their own capacity or stepping into the role of someone that may be participating. In this context, an associated perspective means as if experiencing the events first-hand, being an actor in a scene.

As leaders the participants establish and trigger these patterns in one or more of the following ways:

Translating numbers into narratives

Safety performance is often represented through numbers and charts with improvements represented in absolute number changes, percentage changes and magnitudes on a graph. Participants demonstrated taking the opportunity to translate the numbers into examples of events and impacts on people, establishing the desired pattern of thinking and as so challenge the notion that any number reduction no matter how significant is good or ever enough.

“it's great that it's a small number, but what the number means is someone's son is now missing a finger, is that ok, this is why getting to zero is the only target” [b16]

“it might be a negligible percentage chance, but would you put someone you care about there, thinking about what could actually happen to them, what that would mean for the lives if it does happen” [b25]

“And I think that really makes a change. Instead of a statistic.” [b11]

The above is an example of a participant humanising an event in a direct personal way.

Priming the seeing of workers as people

Participants also recounted actions that were designed to interrupt the thinking about a person as their role e.g. a lorry driver, and instead as the person's broader role in life, to be associated

with their role in a family, team or community, as so a life they can associate with them in a personal rather than transaction/utility/economic sense.

“workers were asked to get their children to personalise their hard hats, or if they prefer represent a hobby on it instead. It was powerful because now you had mothers and fathers, football player’s and pianists on site, it created a different atmosphere of care very quickly” [a4]

“It was a big site, 50 thousand plus people, we arranged some speakers for a big event, including a top international cricket star, we couldn’t cover everyone’s sport but, it changed the conversations people had, how they see each other as people for the first time, I really believe this type of action is a key reason for the transformation in safety, the care that is taken when it’s about real people like themselves...you have to mean it though it has to be genuine, you are consistent because you care” [a3]

“I went to find out why their results were so good...and I was on their safety day...they invite the haulier, the drivers to talk, but more importantly, she invited all the wives of the drivers to talk. When a wife talked, and of course, you know, she didn't know all the safety language and all that. But all she said is, you know, I worry every time you leave the house, I'm worried, and the happiest moment is when you come back to my home. I can't repeat of course, you know what she said, but that was impactful, and impactful enough that even grown men in the room started to cry” [b25]

“I go to several sites that have a very personal and very prominent memorials to a worker that has died sometime in the history of the site, the ones that bring the person to life, where you get a glimpse of them as a person have a powerful effect in how people see each other”[b8]

“It’s as simple as starting with personal conversations, starting with our names, a bit about each other, taking a genuine interest, it makes it more enjoyable for me, as a leaders I can’t speak to everyone, but I can speak with everyone I do with a personal interest in them,” [a3]

Coaching the pattern and or introducing in dialogue

When helping an individual or team ‘*think through*’ a plan or reviewing an incident, the consequences to people’s lives is included. This coaching can take the form of sharing examples of potential impacts, and or asking questions that prompt others to describe potential impacts to

people, creating the mental representations of consequences to people that they can associate in to:

“due diligence, proper, thorough thinking, a little creative thinking, I think is needed too. I think you need to have an imagination, and to see what can go wrong, for people, not equipment or numbers but people whose first names you know” [b25]

“I think you have to give the space to talk about the worst thing...you need to bring that to the table when you talk to people so that they, over time develop that unease about what could happen to someone, it was diesel but it could have been gasoline, jet fuel. You know when you there is emotion, an unease, felt regret...” [b12]

“we often sanitise an event, when we are looking at an incident, trying to get to root cause, looking at the mechanisms, barriers, keep to the process the logic not the emotion, that might be important but we are missing the hearts we can miss I think a key part of motivation, we need to prompt people to think about the impacts on quality of life” [a5]

“I ask myself and the team to consider if we go ahead and something goes wrong, would I/they be able to have peace of mind that they had thought of and done everything when speaking to a family member of someone, now have we thought been through every angle” [b11]

“What are other type of issues that could happen? Why would they happen? Have you thought through the implications?” So, it's a bit the, what if? When I'm at those sites [b12]

Re-telling their own stories/examples

Participants believe the authentic sharing of personal experiences of regret and anticipated regret is a particularly strong form of intervention, this is discussed in section 5.4.4.11.

Role-modelling

Participants recognised that “*actions speak louder than words*”. Actions that demonstrate ‘care’ through attention towards people’s lives has a positive impact, with actions that contradict or are inauthentic having significant negative impacts.

“we arranged a flight to get them home right away, it wasn’t in the contract, it was the right thing to do, they were a contractor, doesn’t matter they are a person who needs to get home to their family, people see this, but that’s not why you do it” [a3]

Role-modelling is discussed in section 5.4.4.12 below.

The above approaches intentionally or intuitively applied, are proposed to create mental simulations that create strong vicarious experiences of regret or anticipated regret. Through repetition of such vicarious experience the cognitive processes that lead to the practice of ‘*anticipating regret*’ are instilled and motivate increased and ongoing vigilance and intervening and so improving safety performance.

To this point, the concept of ‘*lived consequences*’ is considered as developing motivation through a strong emotional drive to avoid imagined consequences becoming a reality. However, a balancing set of mental simulations was also mentioned by participants, mental simulations of people leaving the site to go home having had no incidents. These are proposed to reward safety focus, creating a sense of satisfaction and achievement, i.e. that without actions the ‘*lived consequences*’ would have happened, but it is because of vigilance and careful planning people go home safe.

This balancing of both representations, the potential ‘*lived consequences*’ versus the going home safe, may be important in avoiding excessive anxiety. Indeed, one participant only seemed to think about potential negative consequences; they didn’t take time to think of success and talked about experiencing significant anxiety in their role and beyond.

The juxtaposition of the two representations may also have the benefit of de-normalising going home safe, and so highlight the importance of vigilance.

“as we get less accidents, and ideally zero, celebrating in some way that we leave for home safe may remind us that it’s not inevitable, it’s only through diligence, I don’t want to create stress but I want people to realise it’s through their actions we are all safe” [b22]

Bringing the quality of life impacts to mind is a frequent component in the concepts of ‘*thinking through*’, ensuring ‘*risk is seen as never zero*’, and is core content in ‘*re-telling*’ of experiences. ‘*Thinking through*’ is described in the following section.

5.4.4.10 *Thinking Through*

The concept of thinking through in relation to cultural leadership is about the intuitive and deliberate coaching and facilitation of the cause-effect patterns in perception and thinking, the mental playing forward of risks becoming causes of events with consequences. In particular, ensuring that;

- All potential causes of risk are identified and understood, and their chain of impacts/consequences are mentally simulated. As described in section 5.4.3.7 this includes thinking about the different characteristics an object may have and how these may give rise to risk in a particular context
- The possible interactions of risks are understood with all possible chains of events mentally simulated.
- Understanding is ‘grounded’, i.e. does not rely solely on drawings, diagrams specifications etc. but instead first-hand current experience of the context. Understanding the meaning that individuals have visual mental representations of the cause in context, they can literally picture it.
- No assumptions are taken concerning the status of equipment, plant, behaviours etc. For example, if safe working requires a valve to be off, which is its normal status, the question is asked, how can we be certain it’s in and maintains that status during the work?

“I think you need to have an imagination, and to see what can go wrong, and I also think you need to see links” [b12]

‘then you start to think about that journey management plan and what that whole day would look like in terms of the impact to you from a fatigue perspective. Then if you have a flight, then you add another level of complexity and then if you're renting a car, and if you have a dinner. I mean so all these things actually, it's not just one in isolation. It's actually a combination of things’ [b15]

The concept of thinking through is concerned with the quality of individual and shared thinking and understanding that takes place within teams, from the top leadership team through to front line operations, also paying attention to the degree of cohesion and resulting care for colleagues. The goal is to ensure the creation of shared mental simulations of a series of cause effects and so the construction of potential narratives, intentionally worse case narratives.

Participants see this as critical in safety practice as it enables the design of appropriate barriers and mitigation measures to ensure the risks don't become causes of negative consequences. It primes vigilance towards the sources of risk for those participating in the activities. Because they do not have to make sense of the risks in the live environment as they have already "*thought these through*"; they can be present in the moment, with greater cognitive capacity for noticing what is actually happening in the live environment, noticing anything unexpected.

Because thinking through enhances the identification of sources of risk, it is proposed to help avoid normalisation, as each risk is mentally simulated as causing harm and so creating a representative and recall based bias towards a higher probability of the risk occurring. Due to the inclusion of lived consequences in the mental simulations the process of thinking through also constructs the motivating emotion of '*anticipated regret*'.

Knowing how and when to intervene to enhance perception and thinking is informed through building '*understanding*', as this identifies potential strengths and weaknesses in the current thinking/ways of working. Participants' interventions used to enhance thinking through include:

For Team Based Activities

- Creating the right space and time for broad and focused thinking.
- Ensuring everyone is in attendance, particularly those with direct experience and knowledge of the context, and those who will be involved in any activity.
- Ensuring all voices are equal and valid in the discussions and are invited to be heard.
- Creating an atmosphere of trust and learning (see 'open communications' 5.4.4.4).
- Using open questions, checking for assumptions, applying doubt, and seeking evidence
- "Chasing through", facilitating or leading the talking through of the chains of cause effects, building shared narratives of what could happen and how barriers may work to alter these narratives. All the way through to potential consequences for people.
- Ensuring the purpose and intent of each proposed action is understood by those carrying out the activity, and those that will rely on it being completed. Knowing the intended outcome provides the basis for evaluation of whether the activity is achieving what is required to achieve, instead of it just being a task that is completed.
- Checking understanding by asking others to describe the specifics, with descriptive language that include specific prepositions and sensory based descriptors, to ensure

individuals are not talking about abstract concepts but the specific site, systems and processes.

- Ensuring discussions and decision are ‘*grounded*’, i.e. based in current physical knowledge and experience of the site/context, not just drawings.

During one to one interaction

- The above approach is equally applied when working with an individual when talking through aspects of their role, e.g. working at height, or specific risks associated with a project or new activity.

The concept of ‘*thinking through*’ relates to / integrates with the following ‘enabling cultural concepts’:

- ‘*Open Communications*’: Successful ‘*thinking through*’ requires trust and open communication including of lack of knowledge, understanding, capability or capacity, and past mistakes/learning without fear of negative consequences.
- ‘*Risk is Never Zero*’: Successful ‘*thinking through*’ requires the identification of all risks, no matter how small, with no normalisation.
- ‘*Priming Agency*’: The shared ‘*thinking through*’ processes assists in creating agency as it invites contribution and involvement in making a difference in the way things and in outcomes. Because it is not a tick box exercise and there is volition it also engenders accountability.
- ‘*Grounding*’: Understanding in ‘*thinking through*’ is based on live experience of the context, not a sole reliance on drawings/diagrams/policy/procedures.
- ‘*Lived Consequences*’: ‘*Thinking through*’ includes considering the consequences to people and draws attention the specific people who may be at risk if barriers are not in place. As such repeated ‘*thinking through*’ develops the cognitive process that leads to the motivating emotion of anticipated regret.

‘*Thinking Through*’ as a preparatory process has two outcomes. Firstly, as mentioned above, it prepares individuals and teams to carry out activities, with full awareness and anticipation of dynamic risks, ensuring the right things are done in the right sequences by people with the right capabilities and understanding, the right barriers are in place, and everyone knows what to do should things go wrong. It’s intended to avoid experiences such as;

“And I'm standing here in this situation behind a piece of fire equipment which is designed for fire fighters to keep themselves safe, and I am not a fire fighter...I didn't know what to do...there had been a much increased chance that if there was a leak that it would get out of the casing quickly... But I hadn't appreciated it because I wasn't involved in the design of the plant, I hadn't been part of any of the design work or any of the choices that had been made that lead to that moment...I was just in my role as a...I did not know what to do in this situation”. [b7]

And instead to experience;

“And so, but for sure I think it made me change my approach to how I prepare for being on site and understanding and asking more questions about the potential hazards and working with more experienced folks...and when you become consciously in that space, your behaviours become different, you know how to act and how others will act in a particular event...” [b21]

“we had a leak during...but it was anticipated and everyone knew their role...in making it safe and in being safe...it was closed down safely and quickly...there wouldn't have been the time to devise the plan on the spot...we could have done a quick thinking action but the wrong thing“ [b12]

In addition to learning and rehearsing their roles in a particular scenario, the repeated experience of *‘thinking through’* also provides the possibility for the team members to intuitively or explicitly learn the desired patterns of thinking within in the *‘enabling cultural concepts’* as these are concepts that are brought into action during the process of *‘thinking through’*, as seen above.

Repeated exposure to the desired pattern of thinking is also achieved through the *‘re-telling’* of events that either positively exemplify the thinking process in action, resulting in anticipate regret, or exemplify the learning process of experiencing regret from a formative event, both of which are described in the following section.

5.4.4.11 Re-telling

The concept of *‘re-telling’* refers to the sharing of personal narratives and experiences of significant events. Events deemed by participants as significant due to the nature and degree of learning, the nature and degree of consequences experienced or avoided, and by the impact *‘re-*

telling' them has on the audience in terms of emotion and subsequent changes in thinking and behaviour.

Participants express the belief that stories can be more influential in establishing a safety culture than “cold”, “mechanical”, “detached” information and statistics, for example;

“People see it very mechanically sometimes when you just look at the KPI. And that's what we need to report. But that is just statistics. How you take the learning from it and share that in the organisation is a very different way. And I think showing real people, real life, getting them to tell the story, is far more powerful than just showing a statistic on a whiteboard or a television screen” [b23]

The stories that participants chose to share, or are deemed impactful when listened to, have a number of common characteristics. Firstly, the stories are *personal*, that is they are about events that were experienced first-hand by the person ‘re-telling’ the story, which enables a number of features of story-telling that can make them particularly impactful:

- The story can be told from an associated perspective. Meaning the storyteller can re-access the lived experience when describing it to others. This includes accessing and re-experiencing emotions, emotions that are then conveyed to the audience via changes in vocal qualities, changes in physiology, in addition to any verbal descriptions of the emotion provided. The detection of such emotion, by the audience, is proposed to lead to the audience concluding that the storyteller is being authentic.
- The ‘re-telling’ can include descriptions of the storyteller’s thinking processes and content present during the event and post the event in their personal reflections. This means they can pass on the changes to their personal cognitive strategies that have been derived through ‘*formative events*’ and subsequently practiced (as described in section 5.4.3).
- The ‘re-telling’ is a demonstration of being open and of placing trust the audience, because the storyteller is being open about past mistakes that have had consequences for people.

Secondly, the stories being re-told are *relevant* to the audience, which again creates the potential for the events being described to have a greater impact upon the audience:

- By being *relevant*, the audience has the possibility to visualise the story, i.e. they will be able to draw on reference experiences of the situation to construct a mental representation that they can mentally observe or associate into. This means they are more likely to make sense of both the physical aspects of the narrative, but also the thought processes being conveyed.
- The story is also more salient as it is something that can potentially happen to members of the audience. As such the audience member can visualise the incident happening to themselves and or a colleague who they know.

Thirdly, the stories being re-told exemplify the emotion of regret and or anticipated regret, and so draw upon the concepts developed through '*formative events*' (see section 5.4.2) and practiced within participants '*personal practice*' (see section 5.4.3). The passing on of these concepts is what participants refer to as significant learning and include the following concepts:

- Extending accountability
- Agency
- Risk is never zero
- Grounding in reality
- Thinking through

The learning associated with each concept is delivered within narratives that include alternative outcomes, a preferred outcome, and an outcome with negative consequences, outcomes that differ due to alternative decisions and actions, and thus present the structure of regret or anticipated regret. Negative outcomes within the narratives invariably include the consequences to people lives, with the context of the person described, leading to the significant emotion observed in the audience.

It is proposed that the combination of the three features of storytelling identified, *personal*, *relevant* and *exemplifying regret* results in the audience vicariously experiencing the event. Furthermore, these vicarious experiences enable the audience to access similar depths of learning and motivation as that experienced by the participants through their formative events, without having to experience such events directly.

The vicarious experiencing and learning could become a more significant and important part of leadership practice. When safety initiatives result in lower incidents there is a reduction of

directly experienced ‘*formative events*’, increasing the risk of normalisation and reduction vigilance, thus reversing progress from the prior initiatives. The vicarious experience of ‘*formative events*’ may offer an important methodology to maintain vigilance the context of high safety performance. As can be the concept of role modelling as described in the following section.

5.4.4.12 *Role Modelling*

The participants recognise that a key aspect of employees sensemaking process, of determining what is important and valued, is their interpretation of their leaders’ behaviours, communications and decision making. Thus, they see role-modelling as a critical responsibility, but also an opportunity to influence culture, with success requiring consistency and authenticity.

“But I can't help but ask myself... What have I done, and how am I behaving how do I see myself...Is this aligned to what I say, and intend? [a8]

“If I switch of at the gate, what would that say to people who see me...what does it say to me...about how I really think?” [b21]

“People know when you don't mean it and feel it” [a2]

“We characterise people by their habits, the guy that has to have coffee at 11am, the person that always...or never...I want, and hope at least one for me to is taking time to listen when I ask, how are you?” [a3]

The desired outcomes of role modelling are;

- the replication of the thinking and behaviours of the leader by the followers (as per ‘re-telling’ and ‘thinking through’)

“I think out loud, might be a bit annoying for people but that way I share my learning, they can join in with the same process, and help me, correct me...they can then take what works...” [b1]

“I feel good when I hear others using the same questions in meetings and beyond that I ask of myself...” [b12]

“you start with yourself, then others follow copy, initially because you have authority, but later because it works, but it starts with you” [a3]

- the creation and maintenance of the trust that allows the followers to feel empowered and supported and so have agency in relation to safety

“how are you yourself when someone intervenes on what you are doing...are you thankful or defensive...do you act upon it...or do people worry about doing this” [b23]

“Don’t ask if you aren’t going to listen” [a3]

“Are you seeking to blame or find out what happened and what caused someone to think and act that way...to find a way to help” [a8]

“am I seeking to understand or confirm my view...seeking to understand is when I learn and when people will be open...when they can help me...otherwise you shut people down” [b21]

“I have to be open first, to share my learning so yes my mistakes and what I’m doing about them” [b12]

- to demonstrate that safety is the top priority, and so reinforcing the safe working as the number one criterion that followers to be applied in their decision making

“they closed the retail site, then took out the shovel and helped create a safe pathway for people and car’s, no hesitation, that shows what’s important and expected” [b1]

“refitting every gasket on valves that had not had a problem for many years just because one had failed, it’s a big undertaking, does it make sense, it does when you are looking at the safety of a person and not the statistics, when you replace them you show it’s the person that matters most, if you don’t what are you showing matters” [b25]

“what does it say when you put your hand in the lift doors, so you don’t have to wait for the next one, and be on time for the meeting” [a8]

“if your resting a cup of coffee on a book as you walk through the office because your hand are full, what does that say about your care, who will be burnt if you trip in front of someone” [a2]

Participants’ see positive role modelling as critical as small incongruities can have significant impacts on what followers perceive as desired by the organisation and their leader, and so damage safety culture.

“if I ignore the lights crossing the road into work, people see that, what would they think, how can they take me seriously when I ask them to hold the handrail” [b21]

“I saw a VP run across a site, jumping over things to shout at someone for not holding the handrail, what does that show, what do they expect people to make of that” [b23]
“I stop and think how this would look from the outside, then it’s clear what I should do, when you’re caught in your own world then it makes sense to run not to be late” [b11]

The above examples demonstrate why positive role modelling is seen as important. In addition, they reveal a consistent cognitive strategy of high performing participants; they look at themselves and their actions through the eyes of their followers.

They anticipate the sensemaking of their followers and strive to adjust their behaviours, so they are congruent with the concepts described in the above sections, following the same pattern described in ‘anticipated regret’.

For example: When briefly considering an expedient action, e.g. *putting a hand in the lift doors, so not having to wait for the next one, to be on time for a meeting*, they quickly mental simulate how this action would be perceived by those observing and assume the worst interpretation e.g. *“the communications about hands and fingers was more idealised health and safety, it’s ok to use common sense and take risks if gets the job done on time”*, *“clearly doesn’t believe what they are saying, so it’s ok to ignore”*. They anticipate the regret from creating these interpretations and potential resulting behaviours and take a different action, *“I pull back and just get the next lift, it’s more important”*. [a1]

At the same time the participants are realistic in realising that they will make mistakes, and then what matters is the authenticity of the regret they express and the open way they share and carry forward the lessons learnt (see open communications 5.4.4.4). Indeed, explaining and demonstrating the basis of the regret, through to the potential consequences and harm to the quality of life, these provide opportunities for sharing the idealised thinking pattern of anticipated regret. As described in ‘re-telling’ this needs to be told in an associated way with authenticity demonstrated via felt emotion (see re-telling 5.4.4.11).

Participants monitor and modify their behaviours to ensure they are in alignment with the ‘*enabling cultural concepts*’ sections (5.4.4.4 to 5.4.4.10). For example, they reflect on whether what they are saying or doing is intentionally or unintentionally enabling or shutting down ‘*open communications*’, or signalling that health and safety is a compliance issue not a core priority and way of working;

“safety is first on the agenda in our meetings, but when something important comes up we can make the mistake of keeping to the time allotted and moving on, what does that say, are we just ticking the box by having safety on the agenda? If we believe safety is primary is always primary, we have to cancel the next items and stay with the safety issue and resolve it or figure out how we will resolve it.” [b12]

“it’s easy to switch of for regular agenda items, how does that look if it’s the safety moment” [b25]

Participants recognised that single events can become significant examples that are interpreted and shared as definitions of the real culture and values of the leadership / organisation. Indeed, recognising that such events have shaped their own ways of working.

“he just said no to our plan, they insisted we are going to shut down, it might cost millions, we may be late but it the safest option, and said they would take that decision all the way to the top of the organisation, that changed the way I think” [b8]

“they listened to everyone they met on site with equal curiosity and interest, didn’t matter their role or level” [a5]

“events and actions become stories that people share, they become myths...so we have to be sure we are creating good stories from our decisions and behaviours” [b21]

“when it’s easy it doesn’t get seen or shared, but when you have really inconvenienced, yourself and the organisation to keep people safe they notice, you clearly mean it” [a3]

From the above examples it can be seen that participants reflect on their own experiences of sensemaking of other people’s actions, and in turn reflect on, and take seriously, their employees’ sensemaking of leadership actions to determine what is valued the organisation. As such ‘role modelling’ is seen a key concept in creating the desired safety culture.

5.4.4.13 Summary: Culture of Care & Anticipated Regret

The objective of this chapter was to describe the system of concepts that underlie participants leadership practices directed towards achieving a high performing safety culture. The target culture is defined by both ‘care’ and ‘anticipated regret’. Experiencing ‘anticipated regret’ results from the culmination of the cognitive processes defined by the ‘enabling cultural concepts’ which the participants strive to embed within the organisation.

Thinking about potential consequences for people’s lives as a result of being involved in an incident, that can be avoided, is a critical aspect of an ‘anticipated regret’ that motivates

vigilance and intervention. The degree of motivation that arises from this is reliant on 'care', that is seeing people as people with lives, histories and futures that can be associated with, rather than a number or statistics, and it's treating people with respect and prioritising their wellbeing above all else. When facilitating and embedding each of the 'enabling cultural concepts', the participants focus on developing and enabling 'care', as can be seen within the descriptions of each concept. Demonstrating 'care' is also core in their 'role-modelling' and in their authenticity when 're-telling' their experiences.

As shown in Figure 17 below, participants are continually assessing and monitoring the cultures in which they work and feel accountable for, assessing against their idealised culture for high safety performance. What they discover then informs the priorities and actions to be taken in relation to the 'cultural enablers' in order to achieve the desired culture. While actions can be adaptive and personal to the participants, they are consistent in alignment to the concepts described within the model.

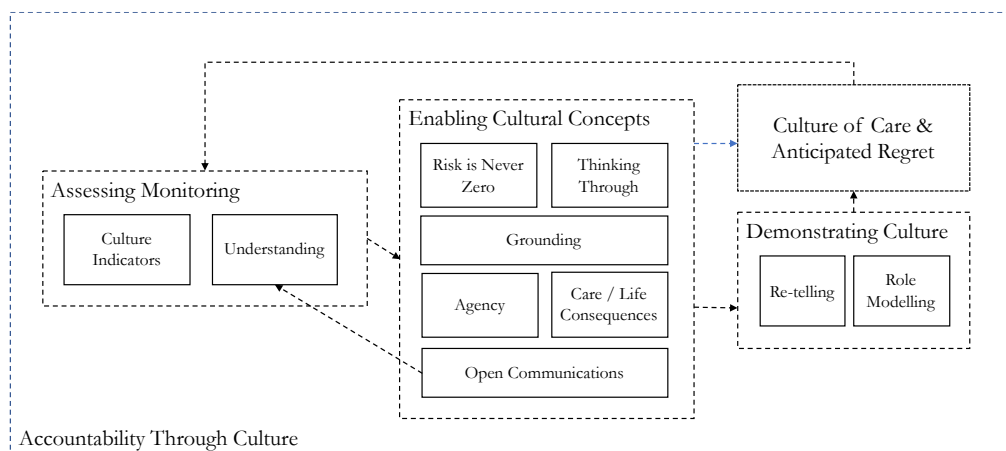


Figure 17: 'Cultural leadership' – concept groupings and relationships

The purpose of this and the prior two chapters has been to present the core categories derived from analysis of participant interviews across three contexts, formative learning events, personal practice and cultural leadership. As described in the finding's introduction, the analysis has been presented at this level with the aim of informing three areas of practice, i.e. in creating learning that is formative, in developing interventions to drive individual thinking and behaviours and to guide leadership development.

The consistencies reported in this and the prior core categories of 'formative events' and 'personal practice' are sometimes based on explicit theories that participants have developed from experience, and sometimes based on intuition developed from experience. The purpose of the final chapter of this study, that follows this section, is to present an emergent theory of

safety performance developed by looking across all three core categories, essentially drawing on the participants explicit and implicit beliefs and theories present in the interview data.

5.4.5 Theory of Anticipated Regret Based Safety Performance

5.4.5.1 Introduction

This section describes a theory of safety performance developed through theoretical sorting (Glaser, 1978) of the three core concepts previously presented, *formative events*, *personal practice* and *cultural leadership*. Once presented, it examines the theory's constituent propositions through literature drawn from the fields of safety and cognitive psychology relevant to each proposition. The chapter goes on to consider the implications for practice and future research with due reference to the limitations of the present study. The chapter closes by discussing the theory from the perspective of the questions raised during the development of the overall thesis.

As per the development of the core categories previously presented, the development of theory that follows was completed prior a review of relevant literature from the fields of safety and safety psychology, in accordance with the methodology described in section 5.3.

The presentation of the theory begins with a brief overview to orientate the reading of the detailed descriptions of the theory's constituent parts that follow. Each section starts by listing its relevant abductively developed propositions that are then described and related to the theory. Quotations and examples are provided to illustrate and support description; however, quotations are omitted when they have been previously provided in the explanations of core category concepts.

5.4.5.2 Anticipated Regret Based Safety Performance – An Overview

Figure 18 below illustrates the theory of anticipated regret based safety performance. The theory proposes that the frequency, precision and salience of the emotion of anticipated regret experienced by an individual and within an organisation correlate with individual and organisational safety performance. Furthermore, it is proposed that high performing safety leaders intuitively, and in part explicitly, act to increase the frequency, precision and salience of anticipated regret in order to improve safety performance. Additionally, high performing safety

leaders intuitively seek to address organisational / cultural factors that may interfere with the potential to experience anticipated regret.

Anticipated regret is posited to be an aversive emotion that individuals construct and act to alleviate. As such, it is a motivational emotion that is proposed to sustain ongoing vigilance and intervention concerning safety. Within the theory, the construction of the emotion of anticipated regret is proposed to be based on the mental simulation and comparison of contrasting narratives. A narrative of a negative outcome resulting from inaction, compared to a preferred outcome resulting from appropriate and timely intervention..

Finally, it is proposed that for anticipated regret to be experienced two pre-requisites need to be met, i.e. an individual requires both a sense of personal accountability and agency. If these pre-requisites are not met, other emotions are experienced, which are argued to be less productive in terms of safety performance.

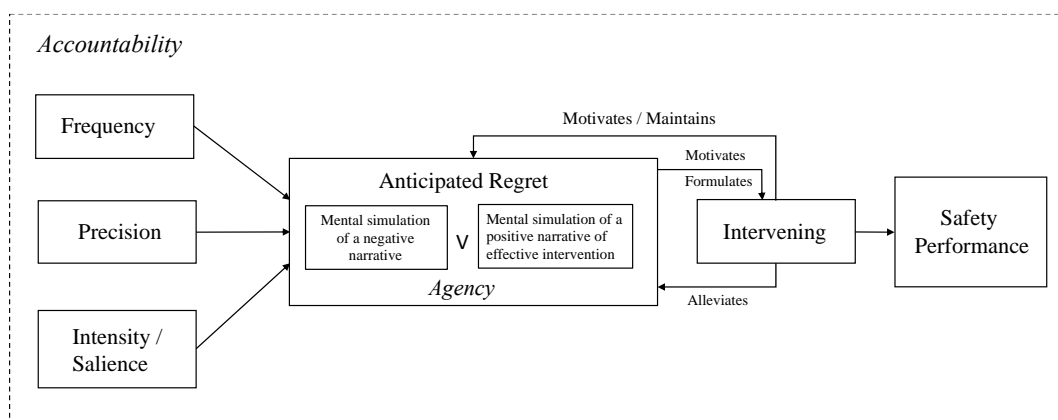


Figure 18: Theory of Anticipated Regret Based Safety Performance

5.4.5.3 *Anticipated Regret Motivates Intervening and Vigilance*

Proposition 1: Anticipated regret motivates vigilance to identify risks to safety by reducing the potential to experience actual regret.

Proposition 2: Anticipated regret motivates intervening to address risks to safety by reducing the potential to experience actual regret.

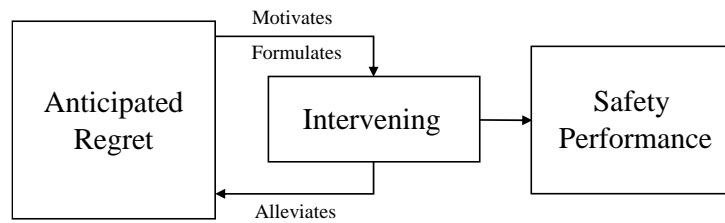


Figure 19: Anticipated Regret Motivates Intervening

The core of the theory proposes a positive relationship between the development and practice of anticipating regret and safety performance, with anticipated regret motivating vigilance to identify risk and intervening to address them and so prevent incidents and or harm. This proposition is made on the basis that participants point to formative learning events as having been instrumental in establishing their current safety practices and leadership, and analysis of these formative events revealing that they share the process and experience of the emotion of regret (see sections 5.4.2.3 and 5.4.2.11). A perceptual and cognitive process then generalised and used in practice to avoid future experiences of regret. Indeed, the concepts with *personal practice* and *cultural leadership*, as discussed in section 5.4.5.11 all contribute to the application and efficacy of anticipating regret.

Anticipated regret is an unpleasant aversive emotion that participants, paradoxically, both construct and wishes to alleviate. Although unpleasant, anticipated regret can be alleviated through vigilance and intervention, and so critically, it reduces the potential to experience the more intense and sustained emotion of actual regret. From this perspective, to both construct and alleviate the emotion of anticipated regret is no longer paradoxical, as it motivates vigilance and intervening to ensure actual regret is avoided, which is more distressing and long-lived.

5.4.5.4 *Anticipated Regret and Mental Simulation*

Proposition 3: Anticipated regret results from comparative narratives.

Proposition 4: Comparative narratives within anticipated regret are embodied simulations.

The above propositions suggest participants construct the emotion of anticipated regret by mentally simulating and comparing two narratives (see Figure 20 below). Firstly, they construct and mentally simulate a negative narrative, that is, a narrative of an identified risk becoming the cause of an incident and impacting the quality of a person's life, and so an outcome that would be regretted should it be allowed to occur. This is contrasted with an alternatively constructed and simulated narrative, that of an intervention being made that prevents the identified risk from creating an incident and or prevents harm.

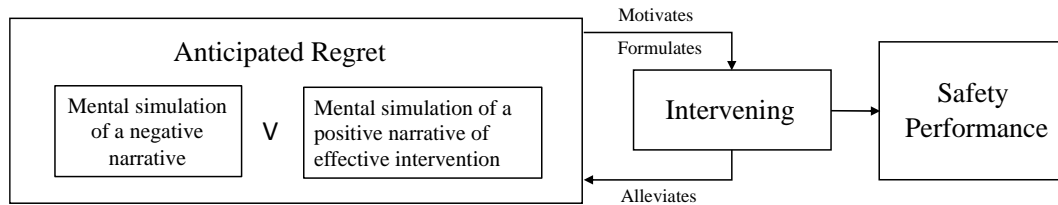


Figure 20: Anticipated Regret and Mental Simulation

The contrast is an embodied experience, in that the simulations are proposed to be based in sensory systems and result in contrasting felt emotions. A felt emotion of regret versus relief or indeed positive affect from having prevented an imagined incident. The emotion of regret is based on a simulation of a potential future event, as such, it is anticipated, and so can be alleviated by preventing the event from occurring.

Comparative mental simulations were identified across participants formative events, see section 5.4.2.10, in which an alternative outcome is constructed and simulated based on a narrative that includes a different decision or action, the absence of which is now regretted. Section 5.4.3.9 presents three forms of comparison within participants personal safety practice, and comparative mental simulation is seen throughout participants cultural leadership actions and in particular, passed on through the structure of their '*retelling*' of their learning and experience.

Indeed, as argued later, organisational and leadership initiatives that unintentionally interrupt the development, simulation and comparison of narratives are detrimental to higher levels of safety performance, e.g. simple compliance base policy and practice.

5.4.5.5 *Awareness of Mental Simulations*

Proposition 5: Mental simulation can run consciously and subconsciously.

Proposition 6: Mental simulation can result in emotion without conscious awareness of the simulation.

Proposition 7: Patterns of mental simulation can become more proficient through experience (conscious / subconscious simulations).

Embodied simulations may be rapid and even subconscious with just the emotion coming into the participant's conscious attention, "*I just feel bad and so have to do something*". When the

afore statement is questioned e.g. “*what leads to feeling bad?*”, the participant accessed and describe a narrative. Furthermore, participants sometimes describe the simulated narrative coming into awareness if they consider not intervening, “*if I keep walking I see what might happen and have to go back*” [b23]. It is unclear from analysis whether the initial rapid simulation is of a prototypical simulation, which is then followed by a situationally specific simulation. With the situation-specific simulation development requiring some time to think through. It could be argued that narratives have been brought to mind and constructed retrospectively, but then what is the cause of the emotion. It might be argued that it's a Pavlovian response; however, the conscious emergence of a narrative as a strategy to motivate intervention if the initial signal emotion is ignored does not fit this explanation.

The quotation below suggests proficiency of mental simulation can be improved. It could be that simulations become subconscious through repetition and learning, particularly if prototypical. Or it could be that the general skill of simulation gains in proficiency. With limited data to draw any conclusion with this regard, the proposition will be developed in the review of the literature.

“it’s fast, it’s like what people describe in an accident, time slows down, but it’s your mind running faster...especially when I have seen it before” [b23]

In addition, the significance of embodied simulations is discussed further in section 5.5.1.16 with regard to their role in biasing perceived perception probability of a risk becoming the cause of an incident. Where it is proposed that perceived probability of an incident increases as simulations become more specific, more vivid and more easily recalled into working memory.

5.4.5.6 Anticipated Regret Initiated by Experiences of Regret

Proposition 8: The strategy of anticipating regret is developed from significant experience(s) of regret.

Proposition 9: Regret that initiates and or informs the strategy of anticipating regret can be a direct or vicarious experienced event.

While the application of anticipated regret is core to the participants current personal and leadership safety practice, it was not employed by participants throughout their careers. The use of anticipated regret as a core cognitive strategy was initiated and further developed through significant learning events, i.e. the ‘*formative events*’ as described in section 5.4.2. Formative

events are ones that are characterised by a strong experience of regret and initiate one or more concepts of the anticipated regret model.

The learnings and experiences of regret from such formative events are proposed to go through stages of generalisation, with patterns of thinking rather than just specific content being learnt and put into practice. For example, if the consequences of a particular incident led to a participant having to tell a family that their loved one was critically injured, then this possibility is generalised across narratives outside of those that relate to the specific type of incident in which regret was experienced. This is described by the concept '*lived consequences*'. If the '*formative event*' for '*lived consequences*' was a lorry crash, the mental simulation of risks leading to lived consequences is generalised to other types of risk, for example, carrying out a maintenance activity, or a production change over.

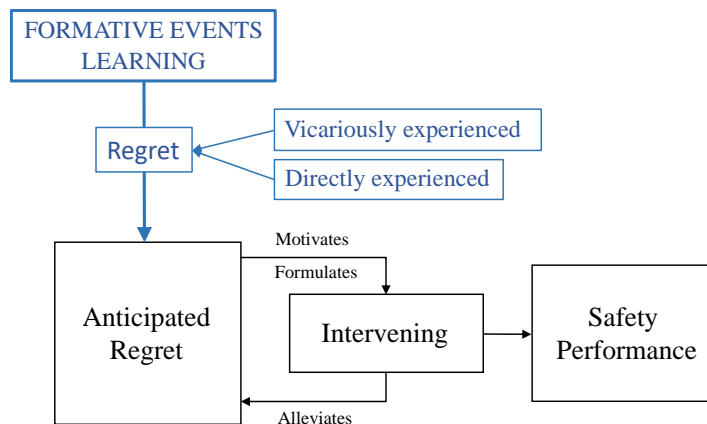


Figure 21: Anticipated Regret Initiated by Experiences of Regret

As shown in Figure 21 above regret that develops anticipated regret can be a directly experienced or be a vicarious experience, i.e. experienced through hearing the narratives of events that one was not directly involved with. In such experiences, regret is developed by assuming an associated 2nd position(s) within the retold narrative. That is mentally simulating the narrative from the perspective(s) of people involved in the narrative. For example, from the perspective of a person that may have prevented the incident. And possibly from the perspective of those directly or indirectly harmed. Indeed, participants demonstrated significant emotion when recounting such vicarious learning experiences. This form of learning is significant in that it allows others to adopt the patterns of anticipated regret without the need for a direct experience of a significant event, important as success would mean a reduction in actual direct experiences.

Furthermore, this raises the possibility for mental simulations to generate emotion and so influence future behaviours and decision making in the absence of an actual event. Concerning the proposed theory of anticipated regret based safety performance, this has three important implications. Firstly, it confirms the possibility to develop emotion from mental simulations as per the core of the theory. Secondly, it confirms the possibility to engage others in the practice of anticipated regret through the sharing of narratives and associated emotions and patterns learnt. Thirdly, and as discussed in the next section, it provides the basis for the ongoing motivation towards vigilance and intervention.

5.4.5.7 *Alleviation of Anticipated Regret*

Proposition 10: The point of alleviation of anticipated regret is dependent on occurrence of risk exposure.

It is posited that alleviation of the anticipated regret can occur at two points, it can occur as soon as an intervention is identified and committed to, or when an intervention has been completed. The point that alleviation occurs is dependent on risk exposure (see Figure 22 below). If there is no exposure to risk before the intervention is implemented, then alleviation occurs at the point of intervention formulation, for example, thinking about putting on safety glasses before grinding steel. However, if there is ongoing risk exposure before the intervention is implemented then anticipated regret may not be alleviated until the implementation is complete, for example identifying and addressing a trip hazard in a high trafficked area.

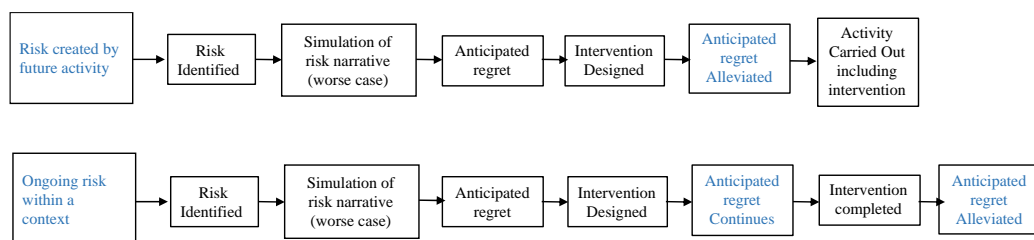


Figure 22: Alleviation of Anticipated Regret

5.4.5.8 *Increasing Intensity of Anticipated Regret*

Proposition 11: Simulating life consequences intensifies anticipated regret.

Proposition 12: Increasing detail of mental simulations intensifies anticipated regret.

Proposition 13: Additional modalities in mental simulation intensifies anticipated regret.

Proposition 14: The perspective(s) taken within a mental simulation impact the intensity of anticipated regret.

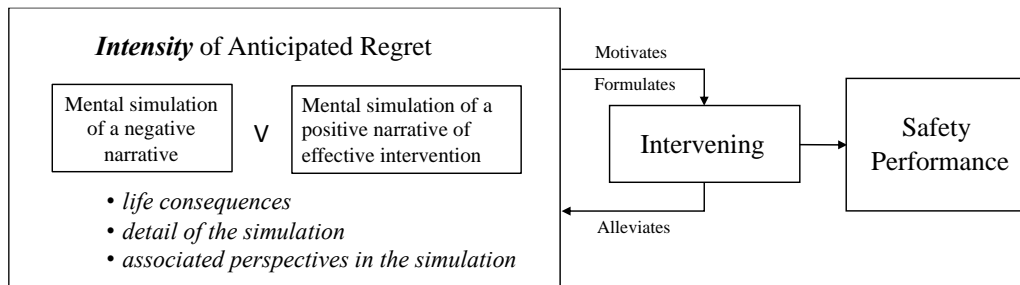


Figure 23: Increasing Intensity of Anticipated Regret

Intuitively the intensity of anticipated regret could vary based on the scale of the incident and its impact. For example, the scale of monetary cost and the number of days of lost time and types and numbers of injuries to people can be considered. However, the analysis of participant interviews shows that intense regret can be experienced, and intense anticipated regret can be created, in instances of small risks and with impacts limited to a small number of people, even one person.

Three factors are postulated to affect the intensity of the anticipated regret experience, all of which relate to the embodied simulations of the narratives. The first factor relates to the content of the simulated narrative, the second to the detail of the simulation and the third to the perspective the simulation is experienced from.

The intensity of anticipated regret is seen to intensify when a narrative includes the consequences to the quality of life for those that could come to harm, e.g. imagining a person who is no longer playing football with their children, or an empty chair at a school play. Intensity can be further enhanced by imagining the interaction of informing the family of the injury to their family member, and or relating such experiences as if they happened to their own family or close friends. There is a reported and observed difference in emotion experienced when consequences are made specific and simulated versus thought about in the abstract, e.g. a statistic of leg injuries versus simulating someone struggling with the transition from an able-bodied life to one in a wheelchair.

This reported and observed difference further intensifies as the detail of the simulation increases. As participants increase the details of the scene simulated the emotions expressed increase. The emotion demonstrated by participants who described a precise narrative appeared more intense, for example, when describing intervening when someone is not holding hand rail,

“you can see the stairs are marble, old, uneven, very hard, what they were carrying, the way they are stacked, the way they were moving, balancing things and climbing, you see what can happen, the way things would go flying, the papers, the cup, could be a big fall for them and others, marble’s unforgiving you have to...” [a2]. The discomfort builds as the description builds. This is in contrast to a nonspecific description/simulation. “yesterday I saw someone not holding the rail because they have both hands full, I stopped to help, pointed out that it’s important to hold the handrail so they don’t come to harm, they need to remember people do trip and fall” [a6]. From this and similar examples more detail in terms of more features or more granular perception of features is associated with greater emotion experienced. Beyond emotion experienced the detail of a simulation has potential consequence for the efficacy of the intervention that follows, as will be examined later in section 5.4.5.9.

A second form of detail which is proposed to intensify the emotion of anticipated regret is increasing the sensory modalities included within a mental simulation, and the detail thereof. In addition to enhancing detail within a mental simulation's visual modality, participants that demonstrated significant emotion included descriptions of other modalities; for example, the *smell* of chemicals, fuel, fire, etc. or the *feeling* of cold, heat, burning, weight, sharpness etc. or the *sound* of an alarm, of shouting, screaming, metal crashing, etc. Like enhanced cinema experiences, through the quality of sound, or well written literature through the experience it evokes, modalities are proposed to enrich the embodied experience and so the salience of the emotion that is given rise from the narrative.

The third factor that further varies the emotional intensity experienced is the perspective from which the narrative is simulated. As discussed in section 5.4.2.10, three perspectives are identified. Firstly, a perspective of observing the events from outside, like watching a movie, this is a dissociated observer perspective. The next perspective is a 1st person associated perspective, essentially experiencing the simulation from within it, as oneself, like being in a virtual reality simulation. A third perspective is a 2nd person associated perspective, being someone else in the simulation, like experiencing events as another character in a virtual reality simulation. It is proposed that emotional intensity increases through the adoption of a 1st person associated perspective and further increased through also taking a 2nd person associated perspective. Indeed, when participants took the latter two associated perspectives when describing their experiences, significant emotions were observed, including the holding back of tears.

5.4.5.9 Prerequisites of Anticipated Regret

Proposition 15: Accountability is pre-requisite for experiencing anticipated regret

Proposition 16: Agency is a pre-requisite for experiencing anticipated regret

Thus far, it has been proposed that improvements in safety performance can be the result of constructing and alleviating the emotion of anticipated regret. An aversive emotion that can be intensified by variances within the embodied mental simulations of the narratives that lead the experience of anticipated regret, with this emotion becoming the emotional drive for vigilance and intervention.

Base on the proposition that anticipated regret is a constructed emotion that is unpleasant, and participants seek to resolve, the question thus arises, what conditions lead to, or are necessary, for participants to construct the emotion? Analysis of the core concepts and interview data identified two prerequisites, agency and accountability (see Figure 24 below).

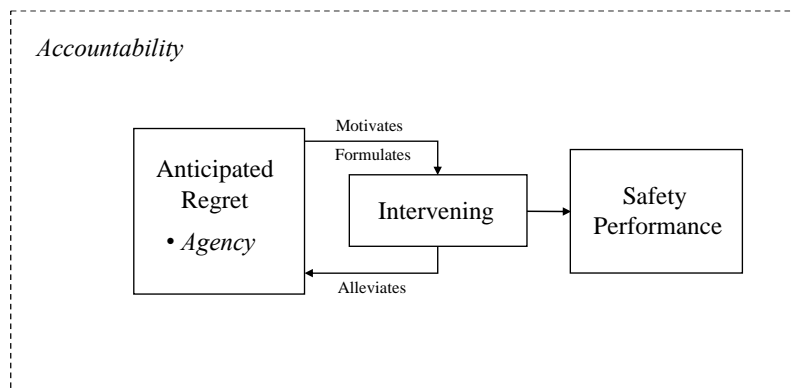


Figure 24: Prerequisites of Anticipated Regret

Accountability is defined as a situation in which responsibility is felt for things that happen. In the case of the participants, this was a personally assumed responsibility. It is beyond that bestowed through an organisation role and extends to all contexts in which they find themselves. It is proposed that the absence of accountability allows for a different narrative to be simulated pre and post an incident that avoids the emotion of anticipated or actual regret, and replaced with a different emotion, e.g. sadness, anger, grief etc. Such an alternative narrative may centre around someone who had official accountability but failed to take action that could have prevented an incident and so lead to the emotion of anger or disappointment towards that person. It is proposed that although unpleasant these emotions are not equivalent to anticipated regret in terms of motivating personal vigilance and intervention in relation to safety.

The accountability described by the later narrative of someone else not acting would be a narrow scope of responsibility in comparison to that assumed by the high performing participants. Thus, safety would require perfect organisation design to ensure every risk had clear accountability, and for the person with accountability to be present to address their scope of risks at the time that it presents itself. This form of organisational structure-based accountability is thus proposed to be significantly enhanced in terms of safety by the adoption of a personal accountability for safety, beyond organisational role, in all contexts with the broadest scope possible based on the competence of an individual.

Competence is a component of *agency* which is the second proposed prerequisite of anticipated regret. *Agency* being an individual's belief that they have the capacity and capability/competence to affect change, to be at cause and so make a difference to an outcome. It is posited that a lack of a sense of agency, like accountability, allows other narratives to be simulated that would result in different emotions, e.g. '*It wouldn't be possible for me to have known what might happen and to have intervened...I was flat out looking at*', or, '*If I had of tried to intervene I would have failed or made it worse because I wouldn't know what to do*'. Capacity can also be limited by policy or role limits, e.g. '*I would have intervened if I was allowed to, but...*'. Like accountability, it is proposed that such alternative narratives may result in alternative emotions, e.g. sadness that something had occurred, or disappointment, or grief. Again, although unpleasant, these emotions are proposed to be less efficacious at motivating vigilance and intervention.

5.4.5.10 Mental Simulations as Formative Events – Self Motivation

Proposition 17: Experiencing and alleviating anticipated regret motivates the ongoing application of the strategy of anticipating regret.

Proposition 18: Compliance based instructions can remove or reduce mental simulation and so reduce experiences of anticipated regret.

Proposition 19: Increased detail and salience of mental simulations and anticipated regret increases the perceived probability of a risk becoming an incident.

High performance concerning safety is proposed to require ongoing vigilance and intervention. The question then arises, how to maintain such vigilance, particularly as success leads to a reduction in direct experiences of risks becoming incidents that cause harm. With no experience of incidents, what is the source of motivation? Based on analysis of participant interviews and their demonstrations of emotion, it is proposed that the mental simulations constructed in the application of anticipated regret act as ongoing formative events. That is, they create

experiences of regret that participants never want to actually experience, and so are motivated to maintain vigilance because each simulation provides evidence that without vigilance regret is a highly probable experience, “*seeing is believing*”. It is also proposed that mental simulations can also act like formative events in terms of providing the basis for learning and generalisation as described above.

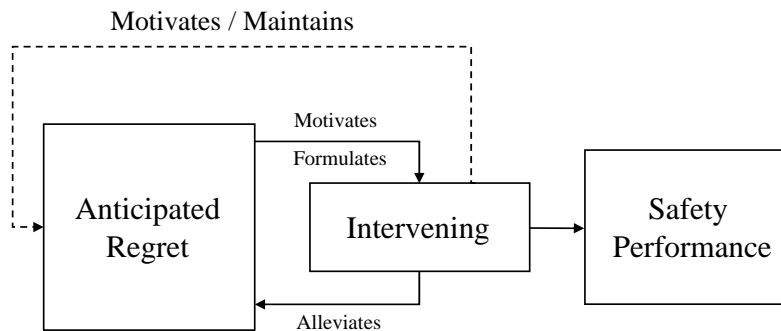


Figure 25: Mental simulations as formative events – self motivation

As such, the application of the practice of anticipated regret establishes an ongoing motivational cycle, as presented in Figure 25 above. Indeed, as described in the following section, the personal and leadership practices of the participants can be seen to be aligned to maintaining and refining this cycle. Also, it is proposed that the concern raised by participants regarding safety culture following a compliance drive can be explained in terms of fears of interrupting this cycle, in particular disrupting mental simulation, accountability and agency. This proposition is based on the idea that it is possible to comply with a safety instruction without mentally simulating the outcome that it is designed to prevent, perhaps this is why the intuitive description of “*blind compliance*” is used and literally makes sense. As such without mental simulation the experience of anticipated regret is absent, as mental simulation is essential to constructing the emotion of anticipated regret as previously proposed, and so anticipated regret as a basis for motivation is removed.

Furthermore, the effect of compliance-based initiatives can be seen to interrupt the sense of personal accountability and agency as discussed later in section 5.5.1.15. This again has the potential to disrupt the practice of anticipating regret, with both having been previously described as prerequisites for establishing efficacious anticipated regret, see section 5.4.5.9 above.

This is not to say that compliance should not be an essential part of safety practice within organisations. Still, it is proposed that compliance initiatives be rolled out in ways that

encourage and sustain the practice of anticipated regret and seek to enhance rather than interrupt accountability and agency. This is proposed based on the individual and leadership practices described in the following section are designed, explicitly or intuitively, to ensure the establishment and maintenance of the concepts that support the practice of anticipating regret.

5.4.5.11 Strategies to Leveraging Anticipated Regret for Safety Performance

A theory of anticipated regret based safety performance has been proposed, in which anticipated regret is defined as an aversive emotion that motivates vigilance for risk and for taking action to address identified risks to ensure incidents and or harm does not occur. The emotion has been posited as being the result of comparing contrasting mentally simulated narratives, with adjustments of content, degree of detail and perspective to such simulations affecting the intensity of emotion.

This section of the thesis proposes that participant's safety leadership is intuitively directed towards utilising the process of anticipating regret to improve personal and organisational safety performance; with participants application of anticipating regret initiated by experience(s) of regret. While participant's reported leadership practices are deliberate, their coherence in instilling and enhancing the process of anticipating regret does not appear to be deliberate; it is a coherence identified during the analysis of interview data, rather than an insight offered by participants. The coherence is proposed as intuitive, rather than by chance, on the basis that the participants share experiences of regret as formative learning events in the development of their safety practice, with regret being proposed to initiate the process of anticipating regret.

This section presents the proposed coherence between anticipated regret and participant's safety leadership practice by examining the relationship between the concepts within '*personal practice*' and '*cultural leadership*' and the process of anticipating regret.

Proposition 20: Personal and leadership practices of high performing safety leaders increase frequency of anticipated regret.

Proposition 21: Personal and leadership practices of high performing safety leaders increase precision of simulation within the construction of anticipated regret.

Proposition 22: Personal and leadership practices of high performing safety leaders increase the salience of anticipated regret.

Analysis of concepts within core categories of '*personal practice*' and '*cultural leadership*' identifies each concept as making one or more of three contributions to the practice of

anticipated regret based safety performance. The three categories of contribution to practice identified are listed below and shown in Figure 26;

1. Increasing the frequency of the experience of anticipated regret.
2. Improving the precision of simulation within the construction of anticipated regret.
3. Increasing the salience of the emotion of anticipated regret.

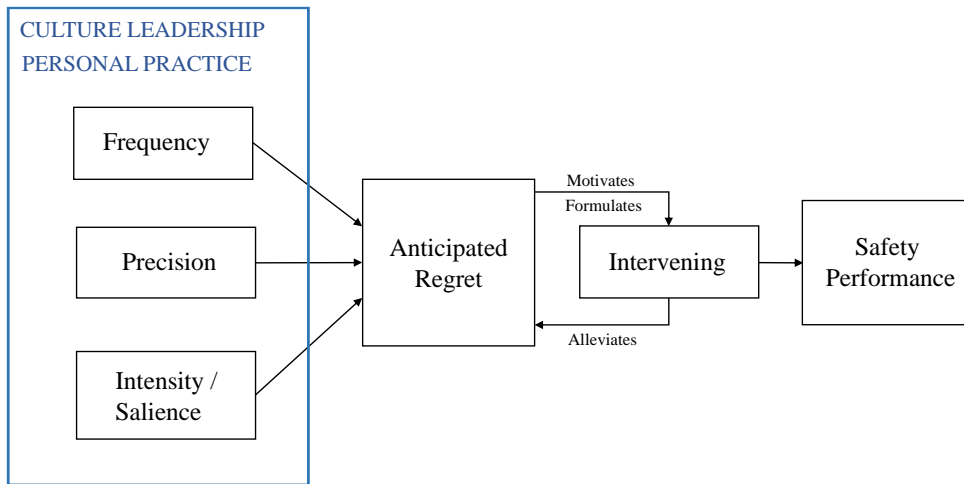


Figure 26: Strategies to leveraging anticipated regret for safety performance

Table 16 below provides a brief description of each category/variable proposed to increase anticipated regret’s contribution to safety performance and lists the concepts that are posited to contribute to positive variation of each category/variable.

Table 16: Strategies to leveraging anticipated regret for safety performance

Category/Variable	Description	Supporting Concepts
Frequency of anticipated regret	Increasing the frequency of the experience of the emotion of anticipated regret through increased identification of risks and or the increased number of simulations of different potential consequences of a risk.	<ul style="list-style-type: none"> • Extended Accountability /Accountability Through Culture • Priming agency • Risk is never zero • Grounding • Pausing/stepping back • Thinking through • Cultural indicators • Understanding • Open communications

Precision of anticipated regret	Improving the degree of correspondence between a participant's perceptions and mental simulations and the actual/potential conditions in the world. Increasing precision of perception and simulation, and accuracy of narrative/cause effect.	<ul style="list-style-type: none"> • Risk is never zero • Grounding • Pausing/stepping back • Thinking through • Open communications
Intensity/salience of anticipated regret	Increasing the intensity of the emotion experienced, both in terms of regret and in terms of the satisfaction at addressing risk, but not to excess, i.e. to the point where anxiety or stress reduces competence or capacity or is harmful to wellbeing.	<ul style="list-style-type: none"> • Lived consequences • Re-telling • Thinking through

The coherence of their total system of practice concerning anticipated regret, demonstrated in the above table, is proposed to evidence an intuitive level of learning. Additionally, evidencing a deeper level of generalisation of core cognitive patterns (e.g. regret, or counterfactual thinking); the latter being a proposal that will be considered within the literature review that follows later.

The following sections describe the three variables from table 16 along with how each concept contributes to positive variation and as a result, improves safety performance.

5.4.5.12 Frequency of experience of anticipated regret

Proposition 20: Personal and leadership practices of high performing safety leaders increase frequency of anticipated regret.

This first variable refers to practices that increase the frequency of experiencing anticipated regret. Frequency is increased by identifying more risks and or increasing the number of plausible consequences simulated from an identified risk. For example, newly identifying litter on a retail forecourt as a health and safety risk, rather than just aesthetic issue, increases the potential for a person to experience anticipated regret. Furthermore, litter has the potential to result in multiple incidents, e.g. a slipping hazard, a fire hazard, a hygiene hazard, may attract rats and so be a disease hazard. Thus, multiple outcomes could be regretted should they occur from a single source of risk.

“it’s not asking people to pick up litter, it’s them understanding why it matters, and thinking about it...I feel uneasy leaving it there because I have thought about why...and that feeling is there if I try to ignore what I have seen” [b1]

“it’s different to doing it because the boss asked you, getting caught out might be something you regret, but that’s not care, care is about not leaving something that might harm someone down the line...that’s something to regret, and to be satisfied as having prevented” [b9]

“if it’s not from a place of caring about what might happen, then it’s easy to get out of the habit, because it’s just a habit, a tick list” [b16]

The above quotes relate to examples of improving hygiene, hygiene in this case meaning removal of litter or waste. It is not suggested that detailed multiple mental simulations are run every time a piece of litter is spotted out of place, however, a fleeting negative emotion is experienced, which is alleviated by taking action. If action is delayed, the process of anticipated regret escalates until the emotion, the “bad feeling”, motivates action.

“if I keep walking, I feel worse, until...” [b23]

“if I keep walking I see what might happen and have to go back” [b23]

As discussed in section 5.4.5.5 delayed action brings mental simulation of negative outcomes to conscious attention, which is observed from analysis to include the simulation of multiple potential outcomes, intensify anticipated regret and the motivation to intervene.

Logically, increasing the number of risks being identified and acted upon will improve safety performance; however, analysis from the interviews suggest that this is not enough or sustainable without the accompanying experience of anticipated regret. As previously argued, the presence of anticipated regret is posited to play two crucial roles in sustaining performance. Firstly, in providing the ongoing emotional drive to maintain performance, and secondly to motivate the generalisation of learning from each experience, e.g. from seeing a sump left open generalised to vigilance for uncovered openings, i.e. anticipating the regret of a class of outcomes. Thus, concepts that increase the frequency of anticipated regret are defined by not just increasing risk identification and intervention, but in ensuring these are based on a particular emotional drive, anticipated regret based in ‘care’.

The concepts from the core categories of ‘*personal practice*’ and ‘*cultural leadership*’ that increase the frequency of anticipate regret are:

- Extended Accountability / Accountability Through Culture:

With more contexts in which a person feels accountable for safety the more potential there is to both identify risks and in which to feel regret for not acting. *“it would be easy*

to switch of noticing because you're in an airport and it's other people jobs to take care of security, but I don't anymore, if I see a bag unattended, I do something about it, I can't leave it" [b23]

- Priming Agency:

Similar to accountability, if a person believes they have the possibility, the capability and capacity to intervene, then they are more likely to be vigilant and to construct anticipated regret. *"people stop noticing when they don't think they can do anything about it, it becomes normal quickly", "you don't want think about it if you can't do anything about it, so I have to find a way, because I will keep thinking about what could happen" [a3]*. Indeed, and in contrast to the latter quote, relating to a lack agency is a way to alleviate the emotion of regret that would be detrimental to safety performance.

- Risk is Never Zero:

The belief that risk is never zero drives vigilance which increases the frequency of identifying risks and so increases the potential to construct anticipated regret. *"if you remember the times you were surprised by something unexpected, or familiar...you would not walk looking at your phone...you would worry about what you're not seeing, what might happen...you stay vigilant" [b22]*

- Grounding in Reality / Grounding:

By taking time and effort to build an accurate representation of the reality of the physical site/situation and the working practices and culture, there is the increased potential to identify risks unanticipated by existing policy/procedures and assumed working practices, *"because something should have been switched off, doesn't mean it has been...so how do you know...you have to think all possibilities of what might be different to what's expected" [b12]*. The recognition that you start with assumptions that can lead to unidentified or misidentify risks is itself an opportunity to anticipate regret, i.e. of not taking the time to ensure actions and plans are 'grounded'.

- Pausing/Stepping Back:

By pausing to look afresh at a familiar context or pause *"to fully take in"* a new context, the attentional focus and cognitive capacity to identify risk is increased, as is the opportunity to construct anticipated regret in relation to additional risks identified. Again, like in 'grounding', not taking the time to pause, is something that can be regretted.

Stepping back enables the assessment of multiple options and consequences before taking action, therefore provides the opportunity for multiple experiences of anticipated regret.

“when I forget to pause, to look properly, I think what I could have missed and what might have happened, not a conscious thing just a feeling a bit like dread” [b11]

- Thinking Through:

Thinking through is the processes of constructing and mentally simulating the narrative of a risk becoming consequences to individuals and their ongoing quality of life. As such, it generates multiple experiences of anticipated regret. *“you have to think through worst case scenarios, through to the end” [b12].*

- Cultural Indicators:

Cultural indicators provide insight into the general safety culture and so can give rise to concerns about inattention towards types of risk. With these concerns considered through to consequences, negative indicators provide multiple mental simulations that result in anticipated regret, *“when it’s disorganised, you start to think, what else haven’t they thought about, what might happen because they haven’t...” [b23].*

- Understanding:

Similar to cultural indicators, understanding builds insight into the quality of safety perception and thinking, and concerns identified give rise to consider potential risks that may not be identified and attended to, the consequences of such can be mentally simulated and so provide multiple opportunities for anticipated regret, *“when someone can’t tell you the main risks in their area, I worry about what they are missing and so could happen” [a1].*

- Open Communications:

Open communication enables people to bring forward concerns and utilise their experience and expertise to bring risks to a team’s and their leader’s attention. Therefore, creates more awareness of risks and so the increases the potential to construct and experience anticipated regret, *“if people expect a search for blame things get hidden, open means everyone focused on solving problems they can be open about” [b22].*

Each of the above concepts is proposed to increase the frequency of the experience of anticipated regret. This is based on each identified risk and intervention always being

accompanied with the mental simulation (including at a subconscious level) of the consequences of not intervening, and so resulting in the negative affect, “*feeling bad*”, i.e. experiencing anticipated regret. This is evidenced by the examples shared by participants concerning the above concepts consistently including consequences that are regretted with demonstrable emotion.

5.4.5.13 Precision of anticipated regret

Proposition 21: Personal and leadership practices of high performing safety leaders increase precision of simulation within the construction of anticipated regret.

The precision of anticipated regret refers to practices that improve the degree of correspondence between a participant’s perceptions and mental simulations and the actual and potential conditions of a context/situation/event; additionally, increasing the distinctions and details in perception and in mental simulations. Precision in these terms is proposed to;

- avoid misperception; failing to notice a risk because it is not anticipated to be present or because focused attention causes attentional blindness
- enable interventions to be accurately designed, by both ensuring all risks are identified, and all interventions are designed in ways that avoid creating unanticipated new risks
- increase the perceived probability of a risk leading to an incident.
- increase the intensity of the emotion experienced (see section 5.4.5.8)

The following starts by looking at precision concerning perception before moving on to consider precision within the development and mental simulation of risk narratives, and in both cases relating them to the concepts with ‘*personal practice*’ and ‘*cultural leadership*’ and proposing the value/benefits of increased precision.

5.4.5.14 Precision in Perception

Precision in *perception* refers to seeing what is actually present in a context instead of what is expected/anticipated, i.e. avoiding misperception;

“*the cover is always down, so you don’t see that its actually open*” [b5]

“*when the signal is always green do you see that the light is not even on*” [a4]

“I’m unsure if they misread the temperature change or it doesn’t just register as it the same reading for the last 6 months” [b9]

“I was searching for my keys, didn’t see them on the table 2 or 3 times, I never leave them there...is that what happens when we miss things on site?” [b14]

Precision in perception also means actively perceiving more aspects and details of a context, of an object, or of a system;

“a guy was loading boxes, they didn’t notice an item was sticking through the side of one of the last ones to be loaded, they didn’t expect it, didn’t see it, it was in plain sight in retrospect...it was a bad cut but could have been much worse” [b22]

Acting on assumptions and expectations is a fundamental cognitive process that enables us to operate efficiently within the world (Matheson and Barsalou, 2018), however in the cases of high performing safety leaders’ assumptions and expectations are habitually constructed to focus on difference/surprise and of the worst case. For example;

“when I walk back into a room I assume that something has changed, e.g. something has been left out, fallen over, etc. my children trained me well with Lego blocks they hurt when you stand on one full weight because you didn’t expect it to be there”[a7].

This is proposed to lead to a deliberately constructed de-normalisation of risk as opposed to subconscious normalisation of risk.

“I always used to reverse out of my drive, it’s a quiet road and there was never anybody about when I leave for work, one day my parking sensors go off, I didn’t see them, didn’t expect to...I could have, I looked round, but didn’t see them, but they were there to be seen...I drive off going forward now, I think about the people that might be around, the paper boy, early runner, dog walker...so now I look two or three times...expecting to see someone now” [b24]

It is proposed subconscious normalisation of risk through experience is based on developing generalisations and assumptions from the repeated experiences of a context or class of contexts. For example, the more I drive and do not see an incident, the more I assume driving is safe, and so I reduce vigilance to cars pulling out of side roads. In contrast, deliberately constructed de-normalisation, as per the above quote, involves the ongoing simulation of risks being present and occurring, and thus non-occurrence being atypical. For example, when approaching a

junction I expect to see a car waiting to cross, when I see a car there I assume they haven't seen me and may pull out, I slow down because at my current speed that would be a bad and unavoidable accident, and I'm relieved when I drive past and it does not occur.

"like a phobia you ...you expect the worst...and ignore many experiences to the contrary" [b24]

"it's thinking worst case that keeps you vigilant, you see and recall things missed by others and myself in the past" [a3]

Deliberately constructed de-normalisation is thus proposed to be the habituation of a process of continually constructing pre-emptive simulations of risks. This is in contrast to the passive normalisation of experience of non-incident associated with risks and contexts. As such, constructed de-normalisation, creates a cognitive bias towards a higher probability of an incident, in contrast to an empirically established level of risk. As a consequence, it is proposed that this worst case constructed de-normalisation increases the attention towards active perception of a context.

From the above, active attention can be seen as having the potential for making a positive contribution to safety performance, however, overly focused active attention, based on pre-emptive constructions, can give rise to another form of misperception that of inattentional blindness. Perception can be narrow when attention is heavily focused on specific tasks, even actively perceptual tasks, most famously demonstrated by not seeing the gorilla amongst the basketball players (Simons and Chabris, 1999), this suggests it's possible to not 'see' something present;

"vigilance has to be active, it's easy to get caught in your thoughts...you can trip over a bag that was in plain sight... like I did...I didn't see it...right there...mind on something else... but been lucky with the consequences...what else haven't I seen, but just been lucky..." [a2]

"I was so focused on fixing xyz, I had not noticed abc had started to leak" [b8]

"it's easy to walk along a safety zone painted on the floor and think about the meeting your late for, and yes you're watching your step, but you forget the zone is marked out because there are hazards either side...paint on the floor doesn't stop a reversing forklift that was obvious but not seen" [b24]

As a result, to achieve accuracy in perception and to avoid misperception, the participants strive to achieve two things. Firstly, they construct pre-emptive simulations with expectations of risks

being present in a context, particularly a familiar environment. Secondly, they ensure time is given for a broad level of attention to be applied to ensure there is not an over-focus on one form of risk or task, and of only those anticipated, i.e. they also look for novelty and difference in a familiar context. This is reflected in the following concepts from participants' personal and cultural leadership safety practices:

- Risk is never zero:

The belief that risk is never zero, more specifically that you never step into the same context twice, challenges normalisation from experience and instead focuses cognition towards the active anticipation of risks and focuses active attention/perception towards these anticipated risks and in actively scanning for and perceiving novelty and difference.

- Pausing / stepping back:

Facilitating the cognitive capacity and time for active attention/perception to check against anticipated risks and to search a context for novelty/difference and assessing if there is any associated risk from differences identified. Avoiding inattention blindness from focusing on a primary task, or primary risks.

- Thinking through and Mental Simulation:

The pre-emptive construction of expected/potential risks and of those risks causing incidents with consequences, creating an anticipated regret that motivates vigilance, providing a context sensitive checklist of risk to attend to.

Increasing detail in perception also posited to contribute to the efficacy of intervening and the intensity of anticipated regret experienced. Increasing intensity of anticipated regret through the enhancement of detail of mental simulation has been discussed in section 5.4.5.8, and detail in perception provides one source of such detail, with the others proposed to be long term memory and or prototypes. Below are two contrasting descriptions that relate to intervening when a colleague is not holding a handrail, the first demonstrates detailed observation, the second provides little detail.

“you can see the stairs are marble, old, uneven, very hard, what they were carrying, the way they are stacked, the way they were moving, balancing things and climbing, you see what can happen, the way things would go flying, the papers, the cup, could be a big fall for them and others, marble’s unforgiving you have to...” [a2]

“yesterday I saw someone not holding the rail because they have both hands full, I stopped to help, pointed out that it’s important to hold the handrail so they don’t come to harm, they need to remember people do trip and fall” [a6]

In addition to the first description being presented with more observable affect; the intervention that followed is also differentiated by the detail in which action was considered. The difference in interventions, argued to relate to the detail of perception/observation, is discussed in the following section along with their safety implication.

It can be seen from the examples presented within this section it is at least problematic if not an error to separate perception from cognition, as expectations and assumptions impact perception and mental simulations are constructions that comprise prior sensory experience, specific or prototypical. With this in mind this section has focused on precision of perception of a current context, recognising that it is at least in part a constructed perception. Likewise, the following section focuses on cognition but acknowledges this is interlinked with the concepts included within *perception*.

5.4.5.15 Precision in cognition

Proposition 23: In the absence of knowledge of a specific context. Prototypical simulations of typical risks associated with a context are utilised in constructing narratives for anticipating regret.

The *precision* of anticipated regret refers to the level of specificity of the narratives and mental simulations that construct and resolve the emotion of anticipated regret. And critically the degree correspondence of these to context. There are two types of narratives constructed and simulated, both of which are enhanced in their impact on affect and contribution to the efficacy of intervening through precision; there is a prototypical narrative and a known context narrative.

A *prototypical* narrative is constructed when there is an absence of knowledge of the particular context (see Figure 27 below). For example;

“I hadn’t been to that country or airport before, it’s not the safest country, so I think what might happen trying to find a proper licenced taxi, in a busy noisy airport, people might grab my case to gain my custom, how should I deal with that in that culture, will people help...do I even know what the taxis look like...” [b7]

Or a participant's personal example preparing for an ultra-marathon;

"I don't know what precisely to expect, but I am precise about the types of things that can happen in an endurance event in that type of country e.g. the water provided at the drink stations can be refilled bottles, you see the seals are broken, is that safe, what happens if I get sick from it mid-stage" [a2]

In each such case presented, participants paint a picture rich in detail and from a perspective of being present in a scene; as a result of the simulated narrative, they are uncomfortable to proceed without addressing the adverse situation and consequences simulated.

Although detailed/precise, the scene is based on prototypical components and may have little correspondence to the actual context that will be encountered. As such, these simulations can be considered inaccurate, however, they serve two essential purposes, firstly they create anticipated regret and so the emotional driver to plan; secondly, they provide a set of risks that will need to be more accurately represented and resolved by seeking information as per the concept of 'grounding'.

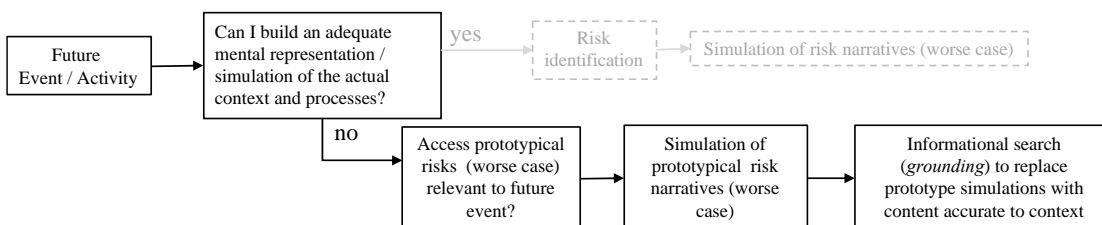


Figure 27: Utilising prototypical risk simulations

The opening test/question in figure 27 above is based on the ability to adequately mentally simulate the future context. It is a heuristic identified in the participants' safety practice, proposed as important due to it being an initial signal for the requirement to prepare, to anticipate and address risks. An inability to create such a simulation creates the signal of significant unease, significant in that it is at a level that drives action to resolve the absence of such a simulation.

"I get uneasy if I don't know what to expect, what it will look like, be like, what might..." [b15]

“I don’t like it when things are hazy, has to be clear, have to be able to think it through” [b21]

“If they can’t see it and explain it back to me I know I have more to do...” [b9]

“It was all new to me, I don’t know how to react, or the local language...but from their faces I knew I was in a very dangerous situation...I will not let it be new to me ever again...I was the wrong person in that situation” [b7]

Probing for the basis of this unease finds the same construction as anticipated regret but in this case with reference to typical harm and consequences that can arise from similar contexts, e.g. same types of industrial, domestic, travel, etc. contexts and incidents, any of which would be regretted.

Less easy for participants to describe was the notion of *adequate* within the opening question. Although knowing when *adequate* has been attained was regularly stated as a ‘grey area’ it was possible to identify a consistent heuristic used by participants to determine when this threshold had been reached. Again, this is a heuristic which is indicated by changes in emotion, i.e. when the feeling of unease is relieved and replaced with vigilance based out of specific regrets now anticipated, then preparation via mental simulation is *adequate*. The feeling of unease is alleviated when all prototypical risks have been replaced with context specific representations which are checked for recency. From the earlier example; is the information about taxis at the airport from the someone who has made a recent visit?

In several cases reported during interviews, participants did not have reference to prototypical risks for a context as reflected in the following example, which was a formative event.

“It was all new to me, I don’t know how to react, or the local language...but from their faces I knew I was in a very dangerous situation...I will not let it be new to me ever again...I was the wrong person in that situation” [b7]

In the above case, the participant described the preparation as inadequate, and indeed it would have remained inadequate if the above process had been applied as the participant did not have the requisite knowledge to simulate prototypical risks for the context in which they later found themselves.

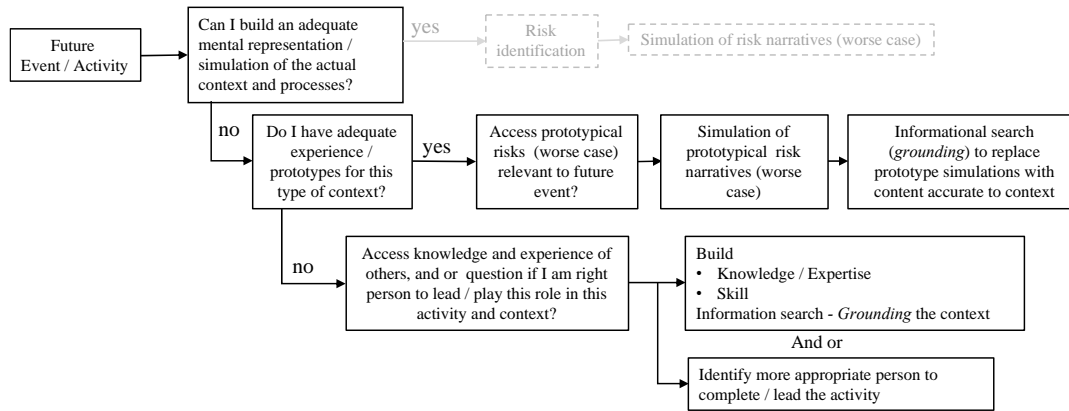


Figure 28: Precision by accessing the experience of others

Instead, the process described in Figure 28 resulted from the learning associated with the participant's formative event, a process also found across participants. In this process, participants identify a lack of knowledge and seek to access the knowledge and experience of others. Indeed, a bias towards doubt was found, so even when participants had good knowledge and a depth of risk knowledge, they would check to see if they might be missing something and or if things had changed within a familiar context, as per Figure 29 below.

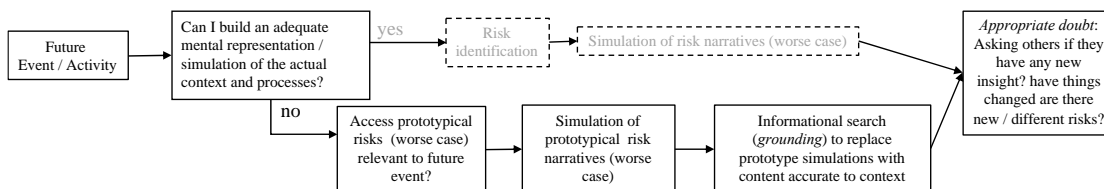


Figure 29: Precision through appropriate doubt

Development of prototypical narratives are posited to result from the following concepts from 'personal practice' and 'cultural leadership';

- Risk is never zero:

The belief that risk is never zero, drives preparation for being in a future unknown context. Knowing that risk is never zero motivates pre-identifying risks (prototypical) that are assumed to be present and simulating potential prototypical interventions. These then drive the search for information to ensure the pre-identified risks are accurate and cover all possible risks i.e. 'grounding'.

- Grounding:

Replacing prototypical risks with actual risks and associated interventions. The learning from grounding is further proposed to create or update risk prototypes associated with the category of context and risk for future scenarios.

- Pausing / stepping back:

Provides the time and focus to initiate and run the process picture in Figure 29 above.

- Thinking through and Mental Simulation:

The pre-emptive construction and simulation (prototypes) of expected/potential risks and of those risks causing incidents with consequences, creating an anticipated regret that motivates developing context specific sets of interventions and associated states of vigilance.

In contrast to the afore prototypical narratives and simulations, the context can be known and so be accurately represented. Indeed, it may be present, for example, a hot drink at the edge of a table. Again, as the precision of narrative increases, i.e. increasing the detail and clarity of the mental simulation, so the level of affect seems to intensify and per the previous description of the below example.

“you can see the stairs are marble, old, uneven, very hard, what they were carrying, the way they are stacked, the way they were moving, balancing things and climbing, you see what can happen, the way things would go flying, the papers, the cup, could be a big fall for them and others, marble’s unforgiving you have to...” [a2]

In contrast to a nonspecific description.

“yesterday I saw someone not holding the rail because they have both hands full, I stopped to help, pointed out that it’s important to hold the handrail so they don’t come to harm, they need to remember people do trip and fall” [a6]

As previously stated, while the second participant intervened, little emotion was observed. Questions raised by the reduced emotion will be explored momentarily, for now the implications of the lack of detail in perception is considered in relation to the cognitive and behavioural process of intervening.

It is proposed that detailed observation and subsequent simulation is necessary for efficacy of an intervention even in these cases of intervening on the stairs. If limited attention has been paid to the load being carried, and no mental simulation has been run on how the person may react to an

intervention, then there is a risk that the intervention could induce an incident. For example, a person who has paid little detailed attention, and not thought about how to intervene, and what the response may be, could start by calling to the other person to stop or wait, this could cause the person to turn, this could dislodge something being carried, they could try to prevent it's fall and so reach out, and so fall badly on the hard marble stairs.

“you have to think through the details, so you don't make things worse, it's like the old adverts of throwing water on a chip pan fire, all fire is not the same, the details matter”
[a2]

“it becomes a fast process...the cup is knocked of the table...you reach out to catch it...but no...does it have hot liquid in it...could you burn yourself, knock it upwards trying to catch it...burning someone's face instead of feet...it's practice...seeing important detail...rapid seeing what could happen...acting...” [a2]

The above are simple and in the moment processes, however the same attention to detail is applied by participants in planning complex activities. Participants apply the concepts of ‘grounding’ and ‘thinking through’ to ensure every “detail” is attended to and planned for and ensure the time and space necessary for such preparation is provided. This is proposed to ensure a team has a shared mental representation of the context and expectations for what to expect and so how to respond, thus providing more cognitive capacity to be available for active perception, i.e. noticing what was not anticipated.

Earlier it was mentioned that more detailed simulations with consequences considered lead to the experience of observable emotion. Referring to the handrail example above, both participants intervened, although doubt has been raised about immediate efficacy of the intervention, here an additional question is raised; will the interventions be experienced differently? It is suggested that an intervention that lacks the emotion developed through detailed and complete anticipated regret may be perceived as an intervention made on the basis of policy/rules/compliance rather than based in concern/care. This is proposed to be significant for a number of reasons. Firstly, in an organisation that communicates about care, then this action could be experienced as inauthentic. Secondly, if it is experienced as a compliance based intervention then it could trigger compliance based reflection, i.e. one lacking the structure of regret or anticipated regret as previously argued. This means the opportunity to pass on the thinking behind the motivation to intervene, i.e. sharing their experience of anticipating regret, is lost, as is the possibility to affirm a culture of care.

The propositions made in the previous paragraph are stated as suggestions as they are developed mainly from one participant who described the importance of accepting interventions that are made towards them. In doing so they described what makes it easier to accept an intervention;

- “*is made with genuine care for what could have happened to me*” [a5]
- “*demonstrated through the type of emotion they show when they intervene*” [b21]
- “*it’s easier to be grateful when it’s based in care, not about catching out*” [b16]

The propositions are included because they are coherent with the concepts associated with applying anticipated regret. Indeed, it is argued that the practice of anticipated regret leads to authentic experiences of care in such situations. As such the propositions are recommended for future research.

This section has defined *precision* as the degree of correspondence between a participant’s perceptions and mental simulations and the actual and potential conditions of a context / situation / event; additionally, the distinctions and details in perception and in mental simulations. *Precision* has been proposed to be important in anticipated regret due to its enhancing of the emotion and in the efficacy of interventions, which is achieved through application of the concepts of;

- Risk is never zero
- Grounding
- Pausing/stepping back
- Thinking through

from participants’ *‘personal practice’* and *‘cultural leadership’* actions. While it could be argued that precision is not essential for the experience of the emotion of anticipated regret, as you can experience salient emotion based on inaccurate but detailed simulated narratives, but for improving safety performance emotion isn’t enough. Based on the practices explicated in *‘personal practice’* and *‘cultural leadership’* safety performance is enhanced through emotion based motivation but directed at precise identification of risks and precise interventions.

5.4.5.16 Intensity of anticipated regret

Proposition 22: Personal and leadership practices of high performing safety leaders increase the salience of anticipated regret.

Three factors have been postulated to affect the intensity of the anticipated regret experience, all of which relate to the embodied simulations of the narratives (see section 5.4.5.8).

- Simulation extended to include the lived consequences of harm (including comparison to own family)
- Increased detail contained within such simulations (including numbers sensory modalities)
- Perspective the simulation is experienced from (associated as self and other)

The participants' practices that produce variation in these factors are proposed to be incorporated in the following concepts:

- Lived consequences:
The impact of mentally simulating the consequences to a person's ongoing life has been described in sections 5.4.3.8 and 5.4.4.9 above. This clearly relates to the first of the three factors above. However, if the content of lived consequences is simulated with more detail and from an associated perspective, and further, from an associated perspective of the harmed person and their family, then the experienced emotion of anticipated regret is proposed to further intensify increasing the motivation to act.
- Re-telling:
Re-telling is the method by which the structure of anticipated regret can be shared with others. This means retelling the event and its consequences but importantly including the thinking and emotions experienced. It means incorporating description of the mental simulation content, detail and perspectives describe above in '*lived consequences*'. Importantly this form of re-telling is proposed to provide the potential for vicarious experiences of formative events as described in section 5.4.5.6. With greater detail and more perspectives described, it is proposed that the simulation carried out by the audience will be enriched and the intensity of regret/anticipated regret experienced increased, resulting in stronger aversive based motivation and retention in long term memory.
- Thinking through:
The process of thinking through provides the opportunity to repeatedly run mental

simulations, adding more detail and taking more perspectives, thus increasing the intensity of anticipated regret.

- **Grounding:**

The process of grounding provides the opportunity to enhance the detail within mental simulations thus increasing the intensity of anticipated regret.

As described in the previous section, emotion by itself is not enough for safety performance, it's no use being emotional about the wrong risk and being motivated to carry out an ill thought through intervention. Hence the important of combining emotion with precision. Moreover, it is proposed that the process of building detail in an intervention simulation is critical in ensuring that a simulated risk and its consequences do not become overwhelming, i.e. that agency represented in a solution begins to alleviate the intense feeling of anticipated regret. Plus, subsequent success/satisfaction of a safe outcome balances experiences of regret. This balancing of positive affect or at least the alleviation of negative affect through action was a consistent pattern observed across participants, with one exception.

One participant did appear to be solely focused on regret and anticipated regret, and an absence of simulation of successful past interventions, instead always focusing on simulating the negative consequences that had been avoided. In addition, recounting early formative events where they had no agency. While this created significant motivation for vigilance and ensuring agency, the persistent negative affect could be seen to be creating excessive anxiety possibly impacting wellbeing and efficacy. Although a single case its implications are considered in the literature review and in implications for practice.

5.4.5.17 Summary: strategies for leveraging anticipated regret

This section has proposed that participant's safety leadership is intuitively directed towards utilising the process of anticipating regret to improve personal and organisational safety performance. The proposal is made due to the coherence between anticipated regret and participant's safety leadership practice identified by examining the relationship between the concepts within '*personal practice*' and '*cultural leadership*' and the process of anticipating regret.

The concepts have been posited as effecting three variables in application of anticipating regret;

Variable 1: Frequency of experiencing anticipated regret.

Variable 2: Precision of mental simulation of risk, consequences and intervention.

Variable 3: Intensity of emotion therefor motivation experienced.

The relationship between variables and concepts are shown in Table 17 below.

Table 17: Strategies to leveraging anticipated regret for safety performance

Category/Variable	Description	Supporting Concepts
Frequency of anticipated regret	Increasing the frequency of the experience of the emotion of anticipated regret through increased identification of risks and or the increased number of simulations of different potential consequences of a risk.	<ul style="list-style-type: none"> • Extended Accountability /Accountability Through Culture • Priming agency • Risk is never zero • Grounding • Pausing/stepping back • Thinking through • Cultural indicators • Understanding • Open communications
Precision of anticipated regret	Improving the degree of correspondence between a participant's perceptions and mental simulations and the actual/potential conditions in the world. Increasing precision of perception and simulation, and accuracy of narrative/cause effect.	<ul style="list-style-type: none"> • Risk is never zero • Grounding • Pausing/stepping back • Thinking through • Open communications
Intensity/salience of anticipated regret	Increasing the intensity of the emotion experienced, both in terms of regret and in terms of the satisfaction at addressing risk, but not to excess, i.e. to the point where anxiety or stress reduces competence or capacity or is harmful to wellbeing.	<ul style="list-style-type: none"> • Lived consequences • Re-telling • Thinking through • Grounding

As the supporting concepts listed in the table above are developed from the leadership practice of high performing safety leaders from within the study organisation, they, following review against relevant safety and psychological literature, form the basis of recommendations in section 0.

5.4.5.18 Summary of Propositions: Theory of Anticipated Regret Based Safety Performance

Figure 30 below illustrates the theory of anticipated regret based safety performance, indicating the positions of relevant abductively developed propositions. The theory proposes that the frequency, precision and salience of the emotion of anticipated regret experienced by an individual and within an organisation correlate with individual and organisational safety performance. Furthermore, it is proposed that high performing safety leaders intuitively, and in part explicitly, act to increase the frequency, precision and salience of anticipated regret in order to improve safety performance. Additionally, high performing safety leaders intuitively seek to

address organisational / cultural factors that may interfere with the potential to experience anticipated regret.

Anticipated regret is posited to be an aversive emotion that individuals construct and act to alleviate. As such, it is a motivational emotion that is proposed to sustain ongoing vigilance and intervention concerning safety. Within the theory, the construction of the emotion of anticipated regret is proposed to be based on the mental simulation and comparison of contrasting narratives. A narrative of a negative outcome resulting from in action, compared to a preferred outcome resulting from appropriate and timely intervention.

Finally, it is proposed that for anticipated regret to be experienced two pre-requisites need to be met, i.e. an individual requires both a sense of personal accountability and agency. If these pre-requisites are not met, other emotions are experienced, which are argued to be less productive in terms of safety performance.

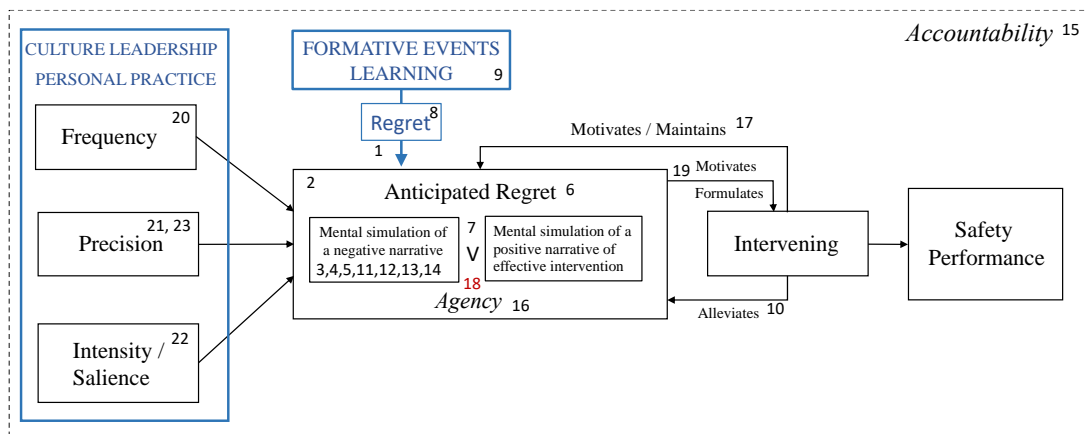


Figure 30: Propositions mapped to model of anticipated regret based performance

Table 18: Summary of propositions

#	Proposition
1	Anticipated regret motivates vigilance to identify risks to safety by reducing the potential to experience actual regret.
2	Anticipated regret motivates intervening to address risks to safety by reducing the potential to experience actual regret.
3	Anticipated regret results from comparative narratives.
4	Comparative narratives within anticipated regret are embodied simulations
5	Mental simulation can run consciously and subconsciously.
6	Mental simulation can result in emotion without conscious awareness of the simulation.
7	Patterns of mental simulation can become more proficient through experience (conscious / subconscious simulations).
8	The strategy of anticipating regret is developed from significant experience(s) of regret.
9	Regret that initiates and or informs the strategy of anticipating regret can be a direct or vicarious experienced event.
10	The point of alleviation of anticipated regret is dependent on occurrence of risk exposure.
11	Simulating life consequences intensifies anticipated regret.

12	Increasing detail of mental simulations intensifies anticipated regret.
13	Additional modalities in mental simulation intensifies anticipated regret.
14	The perspective(s) taken within a mental simulation impact the intensity of anticipated regret.
15	Accountability is pre-requisite for experiencing anticipated regret.
16	Agency is a pre-requisite for experiencing anticipated regret.
17	Experiencing and alleviating anticipated regret motivates the ongoing application of the strategy of anticipating regret.
18	Compliance based instructions can remove or reduce mental simulation and so reduce experiences of anticipated regret.
19	Increased detail and salience of mental simulations and anticipated regret increases the perceived probability of a risk becoming an incident.
20	Personal and leadership practices of high performing safety leaders increase frequency of anticipated regret.
21	Personal and leadership practices of high performing safety leaders increase precision of simulation within the construction of anticipated regret.
22	Personal and leadership practices of high performing safety leaders increase the salience of anticipated regret.
23	In the absence of knowledge of a specific context. Prototypical simulations of typical risks associated with a context are utilised in constructing narratives for anticipating regret.

5.5 Literature Review

The objective of this literature review is to conduct a preliminary evaluation of the reliability and potential contributions of the theory of *anticipated regret based safety performance*. The evaluation is stated as preliminary as the conclusions drawn from the review inform recommendations for future research that could test, refine and extend the theory (Glaser, 1998).

The review commences by assessing the alignment between the definitions of ‘regret’ and ‘anticipated regret’ developed herein, with the definitions of these terms found within the literature. This is to ensure the search terms used for the literature review are appropriate, i.e. that the search is targeting equivalent concepts. With alignment established, the literature review begins with a synopsis of the anticipated regret research field, considering any implications for achieving the objective of the review, i.e. evaluating reliability and potential contributions.

The review then proceeds by considering each of the propositions developed within this study against the literature pertaining to both regret and anticipated regret. When propositions are neither supported nor contradicted by this literature, their reliability is examined via reference to tangential fields, with the resulting implications for theories of regret and anticipated regret considered. When looking at tangential fields the search has been necessarily limited to finding initial support, or the absence thereof, for the proposition. Each field/theory identified as supporting a proposition could be the subject of a review and thesis in their own right and

would be beyond meeting the objective of assessing initial plausibility and reliability of the theory developed.

Having reviewed each proposition against the literature, a summary of implications is presented before examining the theory against safety literature pertaining to both safety theory and safety leadership practice.

5.5.1 Conceptual alignment with definitions of regret and anticipated regret

The core categories and theory developed in this grounded theory study are centred around the concepts labelled ‘regret’ and ‘anticipating regret’. The first stage of the literature review is therefore, to assess the concordance of the concepts developed herein and those associated with the same labels within the literature. If a strong match is identified, then the review could start with a comparison between the core categories, theory and propositions of this study, with those found within the literature associated with the terms of ‘regret’ and ‘anticipating/anticipated regret’.

Within regret literature, the following is a generally accepted definition of regret (Koch, 2014);

“Regret is experienced when we realize or imagine that our present situation would have been better had we made different decisions” (Zeelenberg & Pieters, 2006, p.418).

Below is a prototypical quotation from participant interviews. Such quotations were the basis for developing the definition of regret within this study, which is also shown below. As can be seen, there is congruence between the quote, the study’s definition and Zeelenberg & Pieters definition above.

Interview example: *“I wish I had...it could have a different outcome...” [b23]*

Definition from page 109 of this study: “Regret... involves the comparison of two outcomes, the outcome that actually happened and an imagined outcome that would have been preferred, with the latter outcome assumed possible through different prior decisions and actions”

Furthermore, Zeelenberg’s description of regret as a *“painful”* emotion resulting from being *“confronted with a negative outcome”*, in combination with the realisation of one’s *“own role in*

causing that bad outcome” (Zeelenberg, 2018, p.276), is also in concordance with the descriptions and experiences presented within this study’s core category of ‘formative events’. Again, taking prototypical examples from the study;

Painful: *“sorry I can’t talk about this without becoming emotional” [b12]*

Confronted by a negative outcome: *“I know what the results are, the disastrous results that there have been” [b23]*

Own role: *“I’ve now been confronted with an action I didn’t take” [b23]*

Zeelenberg’s description of regret above is subsequently enhanced by propositions stated within Regret Regulation Theory (Zeelenberg and Pieters 2007, p.4). Zeelenberg and Pieters propositions, which are shown in italics and quotation marks below, align with concepts and propositions from within this study; propositions are referenced below in accordance with Table 18 on page 228:

*“Regret is a comparison-based emotion of self-blame, experienced when people realize or imagine that their present situation would have been better had **they** decided differently in the past.”*

This is congruent with proposition number 3 herein, the proposition that anticipated regret results from comparative narratives; also propositions 15 and 16 i.e. that both accountability and agency are necessary for regret.

“Regret can stem from decisions to act and from decisions not to act..”

This is congruent with the sources of learning from formative events, for example giving the permission to start work having not identified a risk (decision to act) or failing to intervene having seen a potentially unsafe situation (decision not to act).

“Regret can be experienced about past (“retrospective regret”) and future (“anticipated or prospective regret”) decisions.”

Regret and anticipated regret described herein, also share the same structures and the same distinctions of temporality.

Because Pieter’s & Zeelenberg’s propositions are again in concordance with concepts of ‘regret’ and ‘anticipating regret’, developed herein, the literature review advanced to evaluate the propositions developed by this study commences by examining the literature associated with the terms ‘regret’ and ‘anticipated regret’. A synopsis of this literature follows directly.

5.5.1.1 *The landscape of anticipated regret research*

While regret is argued to be a common experience (Beike et al., 2009) or even omnipresent (Zeelenberg and Pieters, 2007), regret research only commenced relatively recently. Subsequent to its origination in economics and psychology in 1980's, interest has grown rapidly, with research into regret and anticipated regret expanding across numerous domains, to include fields such as consumer and market research, organisational behaviour, medicine, economic psychology, neuroscience, and health and safety (Zeelenberg and Pieters, 2007).

Within the domain of health and safety, research on anticipated regret has included the topics of; vaccination (Falk et al., 2020; Brewer et al., 2017; Lagoe and Farrar, 2015), driving/road safety (Falk and Montgomery, 2007;(Kennedy et al., 2018) Hamilton et al., 2018; Parker, 2002), food health (Lagerkvist et al., 2015), health screening (Van Dam et al., 2013), sexual health (Kok et al., 2007; Arden and Armitage, 2008), and swimming pool safety (Hamilton et al., 2019), amongst others.

Surprisingly research on anticipated regret in the area of industrial and organisational safety was not forthcoming from the literature search. This is described as surprising because of the explanatory power, and efficacy of influence, concerning intention and behaviour, consistently reported in relation to anticipated regret (Erika J. Koch, 2014; Breugelmans et al., 2014; Zeelenberg, 2018; Saffrey et al., 2008). Indeed, in drawing conclusions from their meta-analysis, Brewer et al., (2016, p.1264) states that “anticipated inaction regret has a stronger and more stable association with health behavior than previously thought. The field should give greater attention to understanding how anticipated regret differs from similar constructs, its role in health behavior theory, and its potential use in health behavior interventions”.

The majority of research conducted on anticipated regret is experimental (Koch, 2014), indeed, using the Web of Science, Ovid, Scopus and EBSCO databases only one grounded theory study that references anticipated regret was identified. This gives rise to an interesting, and important question. If anticipated regret is “prevalent in daily decisions” (Bjälkebring et al., 2016, p.381) and has significant explanatory power (Sandberg and Conner, 2008), then why is anticipated regret not more frequently identified as significant in grounded theory studies? As mentioned, this question is discussed later, for now, the past and current focus on experimental methods means there is a significant body of research available to triangulate and assess the initial reliability (Glaser, 1998) and potential contributions of the present research.

In proceeding with the review, and when drawing conclusions, the lack of forthcoming literature of anticipated regret research within the context of industrial and organisational safety needs consideration. Because of this absence of research, the literature used to assess the initial reliability and contribution of this study is drawn from different settings. Thus, it could be argued that because the comparisons are drawn from different contexts, any variances found are the result of differences in context, and any findings are not generalisable beyond the context of this study. However, prior research into anticipated regret suggests that its propositions are highly generalisable across contexts and cultures (Breugelmans et al., 2014). As such, the findings proposed herein are posited to apply across contexts, findings that can be tested by subsequent empirical research (Glaser, 1978).

The sections that follow review each the propositions presented in Table 18 on page 228 in relation to the literature concerning regret and anticipated regret. When there is an absence of literature to support a proposition, tangential fields are examined to determine plausibility/reliability, with the implications for theories of regret and anticipated regret and future research considered in the subsequent summary.

5.5.1.2 *Propositions 1&2*

1	Anticipated regret motivates vigilance to identify risks to safety by reducing the potential to experience actual regret.
2	Anticipated regret motivates intervening to address risks to safety by reducing the potential to experience actual regret.

The literature is consistent in concluding the process of anticipating regret increases intention to act and actual behaviour, furthermore that it is distinct from other constructs such as the theory of planned behaviour (Sandberg and Conner, 2008). Regret is identified as a negative but valued emotion (Saffrey et al., 2008) that one seeks to avoid by anticipating and reducing its potency through self-regulation strategies (Pieters and Zeelenberg, 2007), which includes the accurate planning and taking of appropriate action, i.e. intervening. As such, the literature provides comprehensive support for proposition 2 above. Furthermore, studies find that anticipated regret's efficacy is stronger in avoiding inaction, i.e. the regret anticipated for potential inaction is stronger than that for taking an action that leads to a regrettable outcome, therefore motivating intervention (Sandberg et al., 2016).

A link between anticipated regret and vigilance was not forthcoming within the literature search. This may be due to the nature of research conducted in this field. As previously stated,

the majority of research is experimental and considers individual risks, e.g. a particular virus and decision to vaccinate, to speed or wear a seatbelt when driving, the research has not looked at the ongoing identification and attendance to risks across categories, additionally the risks examined are already identified in most scenarios considered. No experiments or studies were identified that vary the development and application of anticipated regret as a general strategy across domains of risk.

A further, but more subtle, divergence between anticipated regret theory and proposition 2 is identified when considering Zeelenberg & Pieters proposition below:

“Proposition 6: Anticipated regret is experienced when decisions are difficult and *important* and when the decision maker expects to learn the outcomes of both the chosen and rejected options quickly” (Zeelenberg and Pieters, 2007, p.4).

‘Importance’ in the above proposition is determined by external factors, i.e. the complexity of the problem, typical consequences, and the value placed on them socially. This is in contrast to the strategy of participants who develop increased importance in simple situations which would be disregarded by the majority of people, e.g. holding a handrail, covering a cable on the floor in a training room. They build representations of significant consequences from small risks, the repeated experience of which, is proposed to increase broad and ongoing vigilance. This feedforward process of repeated strong experiences of anticipating regret was not identified within the literature. Although regular use of anticipated regret is identified via diary-based studies, for example (Bjälkebring et al., 2016), the relationship between significant experiences of regret (anticipated or not) and the ongoing practice of anticipating regret appears to remain unexplored.

Within the safety literature, there is evidence that the experience of an incident increases attention and vigilance for similar types of risk, for example, see (Sund et al., 2017). However, this effect appears transitory, i.e. the risks become normalized over time, for example, see (Stave and Törner, 2007)). Therefore, the potential for anticipated regret to serve as a frequent and effective reminder of risk that primes broader vigilance could be an important finding that requires further research to substantiate.

Based on the above, proposition 2 is argued as supported, and proposition 1 is argued to be supported concerning individual risks made prominent. However, the proposition of broader and ongoing vigilance resulting from anticipating regret requires additional research to establish the reliability of the proposition 1.

5.5.1.3 *Proposition 3*

3	Anticipated regret results from comparative narratives.
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This proposition is posited to be supported by the definitions of anticipated regret proffered by the literature previously referenced, i.e. imaging “that our present situation would have been better” implies the comparison of two narratives. The notion of narrative structure is supported by the closely related theories of counterfactual (Fung, 2019) and prefactual thought e.g. (Epstude, Scholl and Neal J. Roese, 2016), the latter positing that casual beliefs about future actions and their effects inform the construction of mental simulations of potential future sequences of events i.e. narratives.

5.5.1.4 *Proposition 4*

4	Comparative narratives within anticipated regret are embodied simulations
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In 1981 Kahneman and Tversky described mental simulation in decision making (Kahneman and Tversky, 1981). Since then the role of mental simulation in regret (counterfactual) and anticipated regret (prefactual) based thinking, and affect, has been described by numerous studies, for example, see (McConnell et al., 2000; Bonnefon et al., 2007; Connolly and Reb, 2005). A role that is also supported by recent neuroscientific studies, see (Van Hoeck et al., 2015) for a review. The aforementioned studies all confirm mental simulation plays a central role in the cognitive and affective processes of regret and anticipated regret, furthermore, describe the scope of such simulations; however, the nature and form of these simulations is neither explored nor explained.

The nature of mental representation and mental simulation is a hotly debated topic within cognitive science. Several positions within this debate see mental simulation as embodied, i.e. comprising modal sensory-based representations. More significantly, that such modal representations form a “computational mechanism in the brain that supports a broad spectrum of processes from perception to social cognition” (Barsalou, 2009, p.1281). Barsalou’s perceptual theory of knowledge, with foundations in experimental psychology and neuroscience, proposes a fully functioning conceptual system based in modal (sense-based) perceptual simulations, as opposed to abstract amodal symbols (Barsalou, 1999). Alongside protagonists of contemporary theories of predictive processing such as (Clark, 2015; Williams, 2018a), Barsalou argues that “cognition is inherently perceptual” (Barsalou, 1999, p.578), sharing systems with perception at both the cognitive and the neural levels. Additionally, experiments that involve the

visualisation of using a tool show durations of cognitive processing that correlate with the time it would take to physically perform the actions. With brain imagining showing parallel engagement of brain regions associated with motor functions (Kosslyn and Moulton, 2009), thus demonstrating simulation as a multi-modal embodied experience.

These theories support the findings expressed in proposition 4 above, i.e. that the mental simulations identified are not abstract but perceptual, embodied and situational (Barsalou, 2008). Support for this proposition is an essential finding as proposition 4 is a necessary premise for propositions 12, 13 and 14.

5.5.1.5 Proposition 5

5	Mental simulation can run consciously and subconsciously.
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Subconscious decision-making processes are described in dual-processing theories of decision making which posit “two minds” for decision making, system 1 comprising unconscious automatic processes, and system 2 comprising conscious, deliberate processes (Evans and Frankish, 2009). Kahneman and Tversky (Kahneman and Tversky, 1981) describe a system 1 heuristic that operates via mental simulations that can become conscious i.e. move from system 1 to system 2. Termed as the simulation heuristic, the heuristic references the ease and speed in which simulations are developed, a simulation that one can be consciously aware of.

Barsalou, in his exposition of grounded cognition, suggests conscious and subconscious processes share a common substrate i.e. the operating of mental simulations; “The presence of simulation mechanisms across diverse cognitive processes suggests that simulation provides a core form of computation in the brain” with simulation frequently becoming “active automatically and unconsciously outside working memory” (Barsalou, 2008, p.619).

While the above can be contrasted in regard to their views about the fundamental structures of cognition, both share proposition of conscious and unconscious mental simulation. and so are posited to provide support proposition 5 above.

5.5.1.6 Proposition 6

6	Mental simulation can result in emotion without conscious awareness of the simulation.
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Perhaps because of its origins in cognitive and behavioural psychology, decision research had paid limited attention towards the role of emotion in decision-making until interest began to

gain momentum in the 1990's (Loewenstein and Lerner, 2003). Affect is now seen to play an integral role in decision-making, with affect posited to both influence, and result from, underlying cognitive processes (Slovic et al., 2007). As such, cognitive processes that one is unaware of, can result in conscious, embodied experiences of affect. One example being intuition, which is described as “affectively-charged judgments that arise through rapid, nonconscious, and holistic associations” (Dane and Pratt, 2007, p.33). Which concords with the observations that individuals can detect patterns and develop accurate predictions ahead of conscious awareness of the underlying decision strategy (Bechara et al., 1997).

Regret and anticipated regret are described as a “rather complex emotional experiences that both stems from and produces higher-order cognitive processes” (Zeelenberg and Pieters, 2007, p.5). With this description, and the above evidence for the possibility of experiencing affect without awareness of the cognitive processes that led to its experience, combined with proposition 5, i.e. that the cognitive processes of mental simulation can run outside of conscious awareness, proposition 6 is argued to be supported.

5.5.1.7 *Proposition 7*

7	Patterns of mental simulation can become more proficient through experience (conscious / subconscious simulations).
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Increasing the proficiency of mental simulation is implicit in the simulation heuristic (Kahneman and Tversky, 1981). Here judgments of possibility and probability are influenced by the speed and ease of the development of a mental simulation that depicts the outcome being achieved. Therefore, the more regular an outcome is experienced (actual or simulated), the more efficient its simulation can become (Kosslyn and Moulton, 2009), and so efficacy of simulations and probability correlate. Increasing efficiency thus serves as a useful heuristic based in both efficiency of recall, and in the efficiency of construction of novel narratives based on prior experience derived prototypes (Barsalou, 2008; Kahneman, 2011).

Improved efficacy of simulation derived from experience is also confirmed in Kosslyn & Moulton's (2009) review, in which differential processing of imagery is related to improvements in performance via mental practice. Additionally, Tayler et. al. (1998, p.437) conclude that “mental simulation is a process that can be actively harnessed” and developed “for beneficial self-regulation” and “other problem-solving activities”.

Proficiency of specific simulation is also evidence within, and essential to predictive processing (Williams, 2018) and other associated theories. Together these posit that emotion plays a role in

efficiently bringing forward salient past representations for making sense of current sensory input, and for subsequent judgment and decision-making (Barrett and Bar, 2009). This notion was earlier identified within Damasio's (1994) somatic marker hypothesis, in which Damasio argues that thought is largely imagistic, with learning and experience leading to positive or negative affect being linked to percepts directly or via somatic states. This integration of affect and cognition suggests that both proposition 6 and 7 are intimately connected.

The aforementioned suggests patterns of mental simulation, developed through experience and associated with affect, can increase the efficacy of determining appropriate action and thus, performance. However, there appears to be an absence of research on the possibility and value of improving the process of mental simulation as a fundamental capability to enhance performance outside the arena of sports performance. Research does suggest fundamental mental capabilities can be improved for general performance enhancements outside of sport, for example, mental transformation abilities (Frick et al., 2014) and metacognition (Schraw, 1998).

In conclusion, there is evidence to support proposition 7 in terms of improving the proficiency of mental simulations via experience, however, the potential value of improving mental simulation as a mental skill in safety performance appears to remain an untested possibility.

5.5.1.8 Proposition 8

8	The strategy of anticipating regret is developed from significant experience(s) of regret.
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The literature on regret supports the proposition that experience of regret motivates the development and deployment strategies for avoiding future regret, which includes its anticipation, see (Zeelenberg and Pieters, 2007) for a review. What differentiates the findings of this study and proposition 8 from the literature is the purposeful practice of intensifying the emotion of anticipated regret primed by formative events of regret. The literature describes multiple strategies for regret regulation i.e. to reduce the emotion, which do not include the deliberate intensification of the emotion. Understanding why and how formative events lead to this strategy in high performing participants, thus remains to be explicated.

5.5.1.9 Proposition 9

9	Regret that initiates and or informs the strategy of anticipating regret can be a direct or vicarious experienced event.
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Vicarious experiences of regret and their effects on anticipated regret strategies are not discussed within the core literature on regret or anticipated regret. However, Galinsky & Moskowitz (2000) demonstrate the vicarious learning of counterfactual thinking. Additionally, theories of empathy (Stotland, 1969) and vicarious learning (Myers, 2018) posit the ability to learn from the emotions and cognitive processes of others. Thus, support for this proposition is found within the extended literature.

5.5.1.10 Proposition 10

10	The point of alleviation of anticipated regret is dependent on occurrence of risk exposure.
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Risk exposure can be current, e.g. *I'm drilling some metal*, or in the future, *I'm going to drill some metal this afternoon*. Anticipated regret can thus be current, *"I'm not wearing eye protection, metal might get in my eye and cause blindness,"* or can be based in the future *"If I don't wear eye protection, metal might get in my eye and cause blindness"*. Alleviation is proposed to occur at two distinct times in these conditions. In the future risk exposure condition, anticipated regret is alleviated when action is planned and committed to. In the live risk exposure condition, anticipated regret is only relieved when action is actually taken, not when it is planned and committed.

Anticipated regret is posited to be deployed when the decision-maker expects to learn of the "outcomes of both the chosen and rejected options quickly" (Zeelenberg and Pieters, 2007, p.10). In both conditions above, the outcome is known quickly, in one condition an actual outcome, in the other, a mental simulated one. Thus, the conditions of anticipated regret theory are met even if the risk event is sometime in the future. Therefore proposition 10 is proposed to be in alignment with anticipated regret theory.

5.5.1.11 Proposition 11

11	Simulating life consequences intensifies anticipated regret.
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Decision importance is proposed as a criterion for engaging in the process of anticipated regret, see proposition 6 in regret regulation theory 1.0 (Zeelenberg and Pieters, 2007, p.4), furthermore, outcomes that are socially important meet this criterion. The life consequences to people that can be associated with are proposed to fit this criterion, with affect being intensified through empathy which again is intensified as narratives of people are provided or primed (Stotland, 1969b; Gerace et al., 2013a). Further confirmation of this proposition is provided by stronger beliefs and behaviours concerning road safety via the imagining of the personal

aftermath of accident scenarios (Falk and Montgomery, 2007). Therefore proposition 11 above is argued plausible based on the literature associated with regret and social emotion.

5.5.1.12 Propositions 12,13 and 14

12	Increasing detail of mental simulations intensifies anticipated regret.
13	Additional modalities in mental simulation intensifies anticipated regret.
14	The perspective(s) taken within a mental simulation impact the intensity of anticipated regret.

The above propositions all relate to the qualities of a mental simulation and not the content thereof. As previously stated the qualities of mental simulation were not found to be prominent in the literature on regret and anticipated regret, but with exceptions such as Falk and Montgomery, (2007, 2009). Here the more detailed the description, and so proposed simulation, the greater the emotional intensity experienced, and more reliable the resulting intentions and behaviour. Following the interviewer asking what do you feel, smell, see, or hear? greater detail was induced as measured by the number modalities and detail thereof. This resulted in more vivid descriptions and stronger emotional responses from participants.

Looking outside of regret literature, studies support there being a relationship between the qualities within mental simulations and the nature and degree of emotion experienced. For example see (Morina et al., 2013; Holmes et al., 2008; Hayakawa and Keysar, 2018). Each demonstrates increasing the vividness of a mental representation results in an increase of emotional intensity, and/or, demonstrate a reduction in vividness suppresses either positive or negative emotions. The literature also suggests the relationship is not one way, and that the more intense the emotions experienced at the time of an incident, the more vivid the imagery that is committed to memory (D'argembeau and Van Der Linden, 2006; Kensinger et al., 2007); perhaps due to an emotional schema being encoded in the visual system, as proposed by Kragel et al (2019a). This may begin to explain the mechanism for feeding forward the learning from formative events, i.e. the learning may inform perceptual schema for developing potent experiences of anticipated regret.

The term 'imagery' used in this literature often refers to multiple senses, e.g. sound or smell, the introductions of which is also seen to increase the intensity of affect, e.g. (Bucci et al., 2016). Indeed, different qualities of modalities are proposed to differentiate different emotions (Cavanaugh et al., 2016). Finally, research investigating the taking of different perspectives within a simulation/narrative confirms differential brain activation, affective impact, decision making and behaviours, for example (Berndsen and McGarty, 2012; Batson, 2015; Ruby and Decety, 2001; Bucci et al., 2016b).

The above is a brief review of a rapidly expanding literature on emotion and cognition. The literature was found to be supportive of the reliability of propositions 12,13 and 14.

5.5.1.13 Propositions 15,16

15	Accountability is pre-requisite for experiencing anticipated regret.
16	Agency is a pre-requisite for experiencing anticipated regret.

Regret literature provides support for both of the above propositions. In regret regulation, Zeelenberg and Pieters (2007) posit the passing off of accountability to others as a strategy to reduce or avoid the emotion (Zeelenberg et al., 1998; Zeelenberg and Pieters, 2007). Agency is also seen both as a factor in the regulation of regret and anticipated (Giroto et al., 1991; Contractor and Kumar, 2013; Bjälkebring et al., 2016b), and as a factor that contributes to differentiating regret from other similar emotions e.g. disappointment (Zeelenberg & Pieters, 2007).

5.5.1.14 Proposition 17

17	Experiencing and alleviating anticipated regret motivates the ongoing application of the strategy of anticipating regret.
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While the strategy of anticipating regret is identified as being used frequently in everyday life (Bjälkebring et al., 2016), and benefits of its application are reported e.g. (Oettingen et al., 2001a), indeed people are shown to place high value in the emotion of regret (Saffrey et al., 2008); the experience of relieving/alleviating the emotion is not discussed as a potential motivation for further application of the strategy, at least in the literature forthcoming in this search.

In this study, it is proposed that formative events initiate a cycle of avoiding future regret through anticipation of negative outcomes and the design of actions to prevent them. Motivation could be ongoing based in both the felt need to avoid and alleviate negative emotions, and the experiences of positive emotions of relief at the achievement of a positive outcome. While this fits with the self-regulated goal-setting process of Oettingen & Schnetter (2001), nothing was identified within the literature that describes the initiation of this process nor what maintains its application. As safety performance requires ongoing vigilance and intervention (Reason, 2016), exploring the reliability of proposition 17 is an important topic for future research.

5.5.1.15 *Proposition 18*

18	Compliance based instructions can remove or reduce mental simulation and so reduce experiences of anticipated regret.
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Support for the reliability of proposition 18 is provided indirectly by the notion that compliance instructions reduce accountability and agency, and as described in propositions 15 & 16 a lack of agency and accountability is detrimental to experiencing regret. However, the claim here is for impact on anticipated regret via changes in mental simulation. Girotto et al (1991) have demonstrated that counterfactual thinking is reduced when actions are constrained (e.g. through a compliance rule set). As counterfactual thinking is based on mental simulation this is posited to provide support for the above proposition. In further support of this proposition, a reduction in the process of anticipating regret in compliance situations was also found by Crawford et al (2002).

5.5.1.16 *Proposition 19*

19	Increased detail and salience of mental simulations and anticipated regret increases the perceived probability of a risk becoming an incident.
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There are a number of heuristics identified in decision research that support this proposition, for example availability (Carroll, 1978; Reyes et al., 1980). When images more readily remembered and recalled, i.e. are available, then the availability heuristic leads to positively biased judgments of probability, and the more vivid (detailed and salient) the image, the greater the recall. Furthermore Slovic et al., (2007) propose a role for emotion in availability, that's is to say that ease of recall is facilitated by the emotion that is tagged onto the images stored. Which bridges to another supporting heuristic, that is 'risk as feeling' (Loewenstein et al., 2001, p.271). Loewenstein et al suggest that affective evaluations are impacted by the "vividness with which consequences can be imagined" with judgments of risk based in affect, remaining insensitive to changes in actual probabilities.

Looking more broadly the proposition can also be seen to gain support from construal level theory (Lerner et al., 2016) which posits that lower levels of probability are associated with abstract rather than concrete thinking. Szpunar & Schacter (2013), investigated the impact of repeated simulation on perceived plausibility and probability. They found that perceived plausibility increases through repeated simulation, but only when events simulated are emotional, in line with proposition 19, and increased plausibility was associated with concurrent

increases in detail and arousal. Together with the above, this is posited to provide evidence for the reliability of proposition 19.

5.5.1.17 Propositions 20, 21 and 22

20	Personal and leadership practices of high performing safety leaders increase frequency of anticipated regret.
21	Personal and leadership practices of high performing safety leaders increase precision of simulation within the construction of anticipated regret.
22	Personal and leadership practices of high performing safety leaders increase the salience of anticipated regret.

The practices that sit behind each of the above propositions, 20, 21 and 22 are argued to contribute to safety performance by impacting experiences of anticipated regret in accordance with the factors contained within the propositions previously described. Therefore, they will not be re-examined at this point. The efficacy of the individual practices in affecting each factor is recommended for future research, but is beyond the scope of this initial study, at this stage the differential performance of individuals who exemplify these practices is posited as support for their combined effectiveness.

That is not to suggest that each of the practices only act on anticipated regret and indeed safety performance, however it is argued that the nuanced application of them, via anticipated regret, leads to differentiated safety performance. This is discussed further when reviewing the practices against models of safety leaders in section 5.5.3 below.

5.5.1.18 Proposition 23

23	In the absence of knowledge of a specific context. Prototypical simulations of typical risks associated with a context are utilised in constructing narratives for anticipating regret.
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This proposition is supported by theories associated with anticipated regret, in particular the notion that prefactual thought i.e. constructions about possible futures, are derived from past counterfactual constructions and associated beliefs about cause effects (Epstude, Scholl and Neal J Roese, 2016). This is further supported by the constructive episodic simulation hypothesis, which posits that the raw materials of imagined future experiences are pieces of episodic memories (Schacter and Addis, 2007) and thus imagined futures are recombination's of details garnered from past episodic experiences into representations of future events "that allow individuals to readily confront previously un-encountered situations" (Gaesser, 2013, p.1).

5.5.2 Summary of anticipated regret literature review findings

The objective of the review of literature was to assess the potential reliability of the theory developed within this study and so to guide recommendations for future research and to inform implications for practice. This is ahead of considering limitations of the research.

The review began by concluding that the main construct of anticipated regret within the study was in alignment with the definitions of anticipated regret within the literature, and thus the fields of regret and anticipated regret were the primary sources of literature reviewed. Five forms of conclusions are possible from the review approach:

- A. There was an alignment between a proposition and the anticipated regret literature indicating reliability of the proposition made.
- B. There was a contrast between a proposition and the anticipated regret literature indicating the need for additional research to resolve and to confirm or reject a contribution to refining anticipated regret theory.
- C. There was an absence of literature on anticipated regret to assess the reliability of finding, but support found within other fields, indicating reliability of the proposition and potential contribution to anticipated regret theory.
- D. There was an absence of literature on anticipated regret to assess the reliability of finding, and absence of literature found within other fields, indicating potential contribution to anticipated regret theory and possibly other fields but requiring additional research to confirm.
- E. There was an absence of literature on anticipated regret to assess the reliability of finding, contrasting findings found within other fields, indicating unreliability of the proposition; requiring additional research to resolve.

Table 19 below summarises the review findings, with each proposition indicated against the above categories of conclusions in blue. The majority of propositions have been assessed as fitting category 'C' above, that is they are supported from a tangential field. This is argued as an important finding in terms of developing practice, as it indicates practice can be best informed by drawing from across, and integrating theories from, multiple fields. The methodological implications are discussed later in section 6. The principal topic of the propositions indicated in category 'C' is mental simulation, a topic that is emerging as an important debate in cognitive science. If the side of the debate as evidenced herein is accepted, then the propositions are

argued as refinements to anticipated regret theory, not contradictions, and instead providing potential refinements, and more importantly to more precisely inform practice.

Three propositions have been categorised as 'D', that is there was no evidence forthcoming from the literature search approach. These propositions are important from a practice point of view as they relate to the ongoing vigilance towards risk and the motivation to ensure safety for self and others. This gap in the literature is proposed to arise from the prior focus on experimental methods in the field of anticipated regret research, leading to a focus on individual instances of risk, rather than the ongoing application of anticipated regret by an individual in the diverse environments they encounter. These findings point to the need for future research and has implications for research strategy for informing practice, both of which are discussed in section 6. below. No propositions were identified as fitting categories 'B' and 'E' above, and due to the support found from across the literature review it is proposed the study findings can be seen to be generally reliable; thus, suggesting value in conducting future research to assess the category 'D' propositions.

Table 19: Summary of anticipated regret literature review findings

#	Proposition	Supported in AR Literature	Other Supporting Theories
1	Anticipated regret motivates vigilance to identify risks to safety by reducing the potential to experience actual regret. [D]	Only single risk scenarios examined.	Ubiquity of AR confirmed (Bjälkebring et al., 2016) and perceived value (Saffrey et al., 2008), but an ongoing vigilance across risks remains to be examined.
2	Anticipated regret motivates intervening to address risks to safety by reducing the potential to experience actual regret. [A]	Supported	Not reviewed
3	Anticipated regret results from comparative narratives. [A]	Supported	Counterfactual (Fung, 2019) and prefactual thinking (Epstude, Scholl and Neal J Roese, 2016)
4	Comparative narratives within anticipated regret are embodied simulations [C]	Partially	The simulation heuristic (Kahneman and Tversky, 1981), Simulation in counterfactual thinking (McConnell et al., 2000)(Bonnefon, Zhang, & Deng, 2007)(Connolly & Reb, 2005), perceptual symbol systems/grounded cognition (Barsalou W., 1999, 2008), predictive processing (Barsalou, 2009) (Clark, 2015)
5	Mental simulation can run consciously and subconsciously. [C]	Not discussed	Dual-processing (Kahneman and Tversky, 1981)(Evans and Frankish, 2009) (Kahneman, 2011), grounded cognition (Barsalou, 2008)
6	Mental simulation can result in emotion without conscious awareness of the simulation. [C]	Not discussed	The affect heuristic (Slovic et al., 2007) (Loewenstein and Lerner, 2003), risks as feelings (Loewenstein et al., 2001), intuition (Dane and Pratt, 2007), pattern detection (Bechara et al., 1997)
7	Patterns of mental simulation can become more proficient through experience (conscious / subconscious simulations). [C]	Not discussed	Simulation heuristic, availability bias, (Kahneman and Tversky, 1981) mental imagery /mental practice (Kosslyn and Moulton, 2009), imagination in self-regulation (Taylor et al., 1998), predictive processing (Williams, 2018), somatic marking (Damasio, 1994) (Barrett and Bar, 2009), mental transformation ability (Frick et al., 2014), metacognition (Schraw, 1998)
8	The strategy of anticipating regret is developed from significant experience(s) of regret. [D]	The deliberate intensification of anticipated was not identified in the literature.	
9	Regret that initiates and or informs the strategy of anticipating regret can be a direct or vicarious experienced event. [C]	Partially	Learning of counterfactual thinking (Galinsky and Moskowitz, 2000), empathy (Stotland, 1969), vicarious learning (Myers, 2018)
10	The point of alleviation of anticipated regret is dependent on occurrence of risk exposure. [C]	Partially	(supported based on validity of mental simulation above)
11	Simulating life consequences intensifies anticipated regret. [C]	Partially	Empathy (Stotland, 1969) (Gerace, Day, Casey, & Mohr, 2013), narrative content in driver behaviour in road safety (Falk and Montgomery, 2009)
12	Increasing detail of mental simulations intensifies anticipated regret. [C]	Not discussed	Narrative detail (Falk and Montgomery, 2009), emotion and mental representation (Morina, Leibold, & Ehring, 2013)(Holmes, Lang, Moulds, & Steele, 2008)(Hayakawa & Keysar, 2018), emotion, imagery and memory (D'argembeau & Van Der Linden,

#	Proposition	Supported in AR Literature	Other Supporting Theories
			2006)(Kensinger, Garoff-Eaton, & Schacter, 2007), emotional schema (Kragel, Reddan, LaBar, & Wager, 2019)
13	Additional modalities in mental simulation intensifies anticipated regret. [C]	Not discussed	Phenomenology of cognition (Bucci et al., 2016), encoding emotions (Cavanaugh, MacInnis, & Weiss, 2016),
14	The perspective(s) taken within a mental simulation impact the intensity of anticipated regret. [C]	Not discussed	Perspective taking (Berndsen and McGarty, 2012) (Batson, 2015) (Ruby and Decety, 2001) (Bucci, Maskit, & Murphy, 2016).
15	Accountability is pre-requisite for experiencing anticipated regret. [A]	Supported	Not reviewed
16	Agency is a pre-requisite for experiencing anticipated regret. [A]	Supported	Not reviewed
17	Experiencing and alleviating anticipated regret motivates the ongoing application of the strategy of anticipating regret. [D]	Not discussed	Self-regulated goal-setting process (Oettingen et al., 2001b)
18	Compliance based instructions can remove or reduce mental simulation and so reduce experiences of anticipated regret. [C]	Partially	Constrained counterfactual thinking (Giroto et al., 1991), reactance and compliance and AR (Crawford et al., 2002)
19	Increased detail and salience of mental simulations and anticipated regret increases the perceived probability of a risk becoming an incident. [C]	Not discussed	Availability (Carroll, 1978)(Reyes et al., 1980), emotion and availability (Slovic et al., 2007) risk as feeling (Loewenstein and Lerner, 2003), construal level (Lerner et al., 2016), repeated simulation & emotion (Szpunar and Schacter, 2013)
20	Personal and leadership practices of high performing safety leaders increase frequency of anticipated regret. [Not applicable]	Not discussed	Not applicable
21	Personal and leadership practices of high performing safety leaders increase precision of simulation within the construction of anticipated regret. [Not applicable]	Not discussed	Not applicable
22	Personal and leadership practices of high performing safety leaders increase the salience of anticipated regret. [Not applicable]	Not discussed	Not applicable
23	In the absence of knowledge of a specific context. Prototypical simulations of typical risks associated with a context are utilised in constructing narratives for anticipating regret. [C]	Not discussed	Prefactual thinking, beliefs about cause effect. (Epstude et al., 2016) (Roese and Epstude, 2017), episodic simulation (Schacter and Addis, 2007), constructing empathy (Gaesser, 2013)

5.5.3 Anticipated regret in safety: literature review

5.5.3.1 Introduction

The prior review has identified literature that supports anticipated regret playing a role in behaviours in connection with particular risks in particular contexts. This section reviews safety related literature and considers the reasons for why only two items of literature were identified that connects anticipated regret to safety leadership and why no literature was identified connecting anticipated regret with safety behaviours within industrial and other organisational contexts. Additional discussing why anticipated regret hasn't been identified by prior grounded theory studies completed in such settings.

In light of the absence of literature connecting anticipated regret to safety leadership, the review moves on to examine relationships between the concepts within the proposed theory of anticipated regret based safety performance and theories associated with high performance safety organisations, in particular, High Reliability Organisations (HRO) (Roberts, 1989; La Porte, 1996; Weick and Sutcliffe, 2015); Resilience Engineering (RE), and Chronic Unease (Fruhen et al., 2014; Fruhen and Flin, 2016).

5.5.3.2 An absence of anticipated regret in organisational safety literature

As previously mentioned, no literature connecting anticipated regret to safety behaviours within industrial and or other organisational settings was identified in the literature search. This absence was described as surprising due to;

- the rapidly expanded application of the theory across many contexts
- the explanatory power of the construct
- its efficacy at changing intent and behaviour
- anticipated regret's, broad and ongoing intuitive application in daily life

The points above give rise to a key question. If anticipated regret is both prevalent, and has strong explanatory power, then why has it not been identified within other grounded theory studies?

A review of grounded theory studies conducted on the subject of safety in organisational contexts (including industrial and construction) reveals one potential answer to the above

question. The grounded theory based studies identified all included upfront literature reviews appropriate to their context. The subsequent fieldwork and analysis are then guided by existing theories or new constructs derived from existing theories. These studies are thus refining and extending existing theory, rather than taking the approach promoted by Glaser (2003) and adopted herein. As such, it is proposed that because anticipated regret has not been previously associated with this context, it would be less likely to be identified in upfront literature reviews conducted in such studies, and so data collection and analysis would be much less likely to lead to the inductive development of the construct of anticipated regret.

A second distinction between this study and others, is the focus on differential performance. The population interviewed for stage 1 of this study were identified as very high performing individuals. In the second stage of the study it was possible to differentiate these high performers from lower performers by utilising the characteristics identified through the grounded theory analysis. It is proposed, if the study had taken a general population of safety leaders from an organisation as the study sample, then aspects of anticipated regret would not have been identified, and so anticipated regret would not have emerged as a finding. Accepting this proposition and noting that other studies in this context have not generally focused on high performers; then if anticipated regret is a basis for differential performance, it makes sense that it is not identified by general population-based studies.

The notion that anticipated regret is related to higher performance is supported by the findings of the many studies that examine its relationship with behavioural intention and actual action. These studies demonstrate a positive relationship between anticipated regret and performance, i.e. increasing anticipated regret is associated with increased intention and actual behaviours (Erika J. Koch, 2014; Noel T Brewer et al., 2016).

Together the above are proposed to provide explanation of why previous studies have not identified anticipating regret as an important concept within organisational and industrial safety. The following section considers the absence of the concept of anticipated regret with safety leadership literature, the causes of which have parallels with the proposed explanations for the absence of literature concerning safety performance in industrial and organisation settings.

5.5.3.3 Anticipated Regret in Safety Leadership Literature

Leadership is argued to play a major role in shaping organisation culture and in determining organisational practices and in organisational performance (Yukl, 2010). An argument that is replicated concerning the relationship between leadership styles and safety performance (Flin

and Yule, 2004; Pilbeam et al., 2016; Clarke and Taylor, 2018), with increasing numbers of organisations now measuring and developing aspects of leadership to predict and improve safety performance (Zohar, 2002).

To date, safety leadership research has predominately focused on transactional and transformational leadership styles (Flin and Yule, 2004; Mattson Molnar et al., 2019), with results demonstrating a positive relationship between transformational leadership (Griffin and Hu, 2013), safety climate and performance, and a positive relationship between transactional leadership and safety outcomes (Grill et al., 2017). Furthermore, evidence is presented that suggests organisations need to strengthen both styles of leadership, transactional and transformational to improve safety performance (Hoffmeister et al., 2014) with safety context and leadership level are factors proposed as determining the more efficacious leadership style in terms of safety results (Clarke, 2013; Willis et al., 2017).

Although ubiquitous, the focus on the concepts of transformational and transactional leadership styles in safety leadership research is not without criticism. Pilbeam et al., (2016) suggest a research agenda to address criticisms arising from their review of literature concerning to safety leadership practices. Criticisms made include; narrow definitions of safety performance/compliance in academic studies, utilisation of a limited selection of leadership models, failure to address the critiques of transformational and transactional leadership theory, limited selection of contexts/settings for investigation, and restricted research methodologies applied.

Some of the above criticisms are countered by a limited number of studies, for example; Hoffmeister et al., (2014) connects specific aspects of each leadership style to a range of safety measures/outcomes; Flin and Yule (2004) stepped outside of the usual research settings of manufacturing and energy and look at safety leadership in medical settings; Stiles et al., (2018) looked at different types of leadership intervention in the atypical setting of rail construction projects. Alternative leadership theories are also examined by a number of studies, for example; theories of 'authentic leadership' and 'psychological capital' have been explored in relation to safety performance (Eid et al., 2012); and Maslen (2019) explores safety management through values based interventions across the oil, gas, mining and chemical industries. Because the aforementioned safety leadership research applies existing leadership theories to the subject of safety leadership, anticipated regret is absent from this literature. This is due to the absence of anticipated regret in general theories of leadership practice. Indeed, a search combining the terms "leadership" and "anticipat* regret" in the title, abstract, subject and key word fields across the 'web of science', 'Ovid', 'EBSCO', and 'Scopus' databases returned no results.

The limitations of applying prior general leadership theories to the study of safety leadership is a key criticism made by Pilbeam et al. (2016) resulting in their call for a research agenda that incorporates methodologies that directly focus on the safety leadership, rather than leadership in general, and that examine safety leadership in action and in context. By way of example they consider three possibilities. Firstly, direct study of safety leaders using content and linguistic analysis or a sense-making approach akin to that of Karl Weick. Secondly, they propose the use of critical incident techniques that explore the perspectives of the individuals involved, considering “affective, behavioral and cognitive elements” (p.120). Finally, they suggest application ethnographic approaches that could combine different methods for studying safety leaders in their natural settings, and in doing so gain insight into “informal organisational rules, tacit knowledge and discretionary activity that underpins the particular practices of safety leadership” (p.120).

The present study is argued to align with two of the methodologies proposed by Pilbeam et al., (2016); primarily content and linguistic analysis, and through exploration of formative events, and with participants experiencing some major incidents, the study includes elements of critical incident methodology. As anticipated by Pilbeam et al. (2016), by applying such methodologies Study 3 has produced new insight into the “tacit knowledge and discretionary activity” and “affective, behavioral and cognitive elements” of safety leadership, specifically the personal practice and leadership of a culture of anticipating regret.

The results of Study 3 do not contradicted findings from prior safety leadership research that has applied classic leadership theories, indeed the core category of ‘cultural leadership’ includes leadership actions that can be mapped to transformational leadership style categories, see Table 21 below. However, the concepts within the ‘cultural leadership’ extend beyond those described by both transactional and transformational leadership, and again as anticipated by Pilbeam et al., (2016), the concepts provide more granular insight into the affect, cognition and behaviour of safety leadership, thus supporting their criticism and Pilbeam et al’s proposed research agenda.

Table 21: Mapping ‘cultural leadership’ to transformational leadership behavioural categories

Cultural Leadership		
Concept Categories	Description	Leadership Style Categories
Accountability through culture	Seeing people’s behaviours as being driven by context not their disposition, they are sense-making and being primed by the signals sent by	No Mapping

	the leadership and other contextual signals that leadership can affect.	
Culture Indicators	Identifying signals of the safety culture and thinking present on a site, in particular relating to care and vigilance.	No Mapping
Understanding	With genuine interest; asking open questions and listening to a person's thinking - detecting degree of assumptions v grounding, vigilance v normalisation, and tick the box v thinking through and emotional connection with consequences.	Specific - individual consideration
Open Communication	Engendering open two-way open communications, ensuring the time and space to share thinking, concerns, issues; open to asking and answering questions with positive reception and no fears of reprisal.	No Mapping
Risk is never zero	Addressing normalisation of risk, connecting small and infrequent causes to significant lived consequences. Vivid representations engendering representation and recall bias.	Specific - intellectual stimulation
Thinking Through	Coaching and facilitating the mapping, understanding and mental representation of all potential cause effect sequences of risks becoming incidents, of what can be done to prevent the sequences, mitigate them, or prevent harmful consequences.	Specific - intellectual stimulation
Grounding	Ensuring people build accurate mental representations of the actual real site / situation in its current and anticipated status, avoiding assumptions and generalised / prototypical representations. No unquestioned reliance on drawings, procedures etc. (including culture)	Specific - intellectual stimulation
Priming Agency	Ensuring sense of agency through ensuring understanding of intent, using purpose based and engagement in decision making, through choice in how to make things work/safe to the specific location / situation.	Part mapping to – Inspirational motivation and individualized consideration
Lived Consequences	Ensuring the consequences / potential consequences are related to the real lives of people, associating to people who are cared about, and not abstract numbers or generalised labels (e.g. lorry driver)	No mapping
Re-telling	Sharing stories that exemplified the structure of thinking of regret and anticipated regret, told in an associated not abstract way, demonstrating authenticity through emotion	Specific – combined intellectual stimulation and inspirational motivation
Role modelling	Demonstrating through action and sharing of thinking and experiences, particularly strong when intervention can be seen as a significant inconvenience to self and business.	Specific - Idealized influence

In further support for the proposed Pilbeam et al.'s research agenda, safety leadership studies that have examined leadership in relation to specific outcomes and contexts have identified concepts influencing performance that are not described within classic leadership theories. For example, Hede (2017) examined the crisis preparedness and motivation of municipal leaders and posited the application of 'anticipated regret' as playing a role in leadership motivation. Additionally, from the same study, and taking a grounded theory approach, Enander et al., (2015) identified prior experience of crisis events as a determinant of preparedness; with the

described influence exerted by such experiences relating to the core category of ‘formative events’ identified in study 3.

The above study is the only safety leadership study identified in the present literature review that includes the concept of ‘anticipated regret’ and does so with a very limited depth of analysis with regard to this concept. However, it is a rare example of a grounded theory study in this setting that does not approach with a prior theory to test, and thus adopts Glaser’s (2003) approach, as per the present study. Therefore, it is argued that the same explanations for the lack of anticipated regret in industrial and organisational safety setting applies to the absence in safety leadership literature.

A further explanation is anticipated by Pilbeam et al. (2016) and is demonstrated by the mapping in Table 21 above. That is, the focus and level of analysis in the present study is more specific with regard to activities and context and thus provides more granular insight into the affect, cognition and behaviour of safety leadership. For example, the theory of anticipated regret based safety performance defines three critically different types of intellectual stimulation, with intellectual stimulation being a single factor in transformational leadership. Such distinctions are argued to provide contributions to safety leadership theory and practice, contributions that can be fully tested through future research as proposed later.

As it is argued that study has provided granular insight and therefore contributed to safety leadership theory and practice, the possibility for similar contributions to organisational safety theories is considered in the following section.

5.5.3.4 Concepts and practices of anticipated regret in safety literature

Safety theory and practice has been described as evolving through a number of distinct stages. These stages are defined by the aspect(s) of safety theory and practice that became prominent. Figure 31 below Harvey et al.’s (2019) attempt at integrating the various accounts of the ages of safety theory and practice in which they combine the following schema:

- Hale & Hoyden (1998): technical, human factors, management systems
- Reason (1997): personal, engineering, organisational safety
- Hudson (2007): technology, systems, culture
- Borys et al. (2009): adaptive age

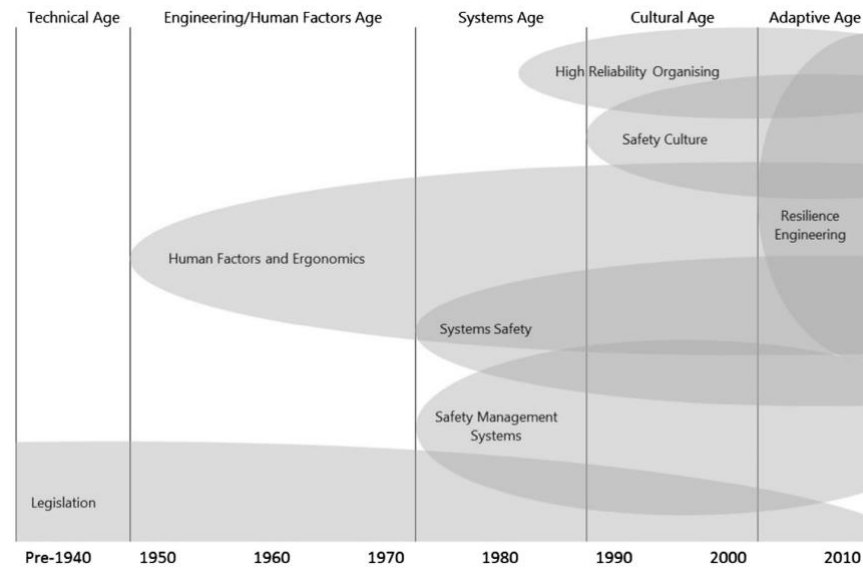


Figure 31: The five ages of safety from (Harvey et al., 2019)

The individual and leadership practices identified as contributing to the efficacy of anticipated regret in achieving safety performance in this study are most closely aligned to the *adaptive age* theories of safety performance which focus on exceptional performance in challenging contexts. These theories including; High Reliability Organisations (HRO) (Roberts, 1989; La Porte, 1996; Weick and Sutcliffe, 2015); Resilience Engineering (RE) (Hollnagel et al., 2006), and Crew Resource Management (Helmreich et al., 1999; Flin et al., 2002). Additionally, theories of Situational Awareness (Endsley, 1995; Jones, 2015), and Chronic Unease (Fruhen et al., 2014; Fruhen and Flin, 2016), include concepts that relate to the mental simulation at the core of anticipated regret.

While there is alignment between the above theories and the theory of anticipated regret based safety performance, as per safety leadership theory, there are differences that are proposed to offer the opportunities for this new theory to contribute refinements and explanations that can enhance both existing theory and practice.

HRO's are identified by operating in high complexity and high-risk environments but without the experience of incidents that normal accident theory (NAT) (Perrow, 1984) would anticipate. Five principles have been identified as key to such performance (Weick and Sutcliffe, 2015); these are listed in Table 20 below and are compared to the concepts identified in this study.

Table 20: HRO principles comparison with study concepts

Principles of HRO's	Core Concepts from Current Study
<p>Preoccupation with failure:</p> <p>Focus on small anomalies as cues for evolving failures, avoidance of normalisation, and the institutionalisation of wariness and doubt as a mind-set. Creating awareness of vulnerability, actively tracking down bad news, and seeing near a near miss or adaptive action as a signal and potential for future failure.</p>	<p>Risk is never zero Pause / stepping back Lived consequences Anticipated regret Mental simulation</p>
<p>Reluctance to simplify:</p> <p>Sensitivity to variety, increasing distinctions of complexity instead of simplifying, being mindful of expectations, building requisite variety into capabilities, credit the senses – be open and don't sense-discredit, assume novelty. Examine adaptations. Attitude of scepticism and curiosity.</p>	<p>Risk is never zero Grounding (seeing past the paper) Thinking through Understanding Culture accountability & indicators Priming agency Mental simulation</p>
<p>Sensitivity to operations:</p> <p>Requisite variety from complex interdependencies, enactment unfolding in real-time, watchfulness in the present, outcomes over procedures, support openness and humility, bring knowledge to the surface, facilitating speaking up.</p>	<p>Risk is never zero Pause / stepping back Thinking through Grounding Understanding Priming agency Culture accountability and indicators Mental simulation</p>
<p>Commitment to resilience:</p> <p>Capacity to investigate, learn, and act, continuous increasing of capacity/capability to learn, just-in-time adaptive learning, adaptive to emergence, fragmenting and recombining knowledge. Knowledge as temporary.</p>	<p>Understanding Thinking through Open communications Priming agency Mental simulation</p>
<p>Deference to expertise:</p> <p>Recognising your knowledge is always partial and out of date, and so can be enriched by people with more local and different insights / perspectives, base in compressed knowledge, attitude of curiosity, humility, appropriate doubt and openness, and questioning of assumptions.</p>	<p>Open communications Understanding Thinking through Mental simulation</p>

The multiple mapping of concepts from the current study to the five principles of HRO's, is interesting to consider. Reviewing the descriptions and definitions, it is argued that the HRO's principles are concerning *'what'* an individual and organisation needs to do to perform as an HRO, in complementary contrast, the model of anticipated regret and its supporting concepts define *'how'* to achieve these outcomes, many of which support multiple outcomes. For example, *how* does someone become sensitive to variety? *How* does someone become motivated to pay attention to small anomalies? *How* does someone avoid normalisation? *How* does someone become watchful? It is posited that building the beliefs and associated cognitive processes of 'Risk is Never Zero', and of 'Anticipated Regret' incorporating consequences to 'Lived Lives', answers a significant part of *'how'*. Hence, these concepts bridging the first three principles of HRO's.

The picture is similar for the abilities of resilience engineering (RE), described by Hollnagel (Dekker, 2019):

1. The ability to respond to the actual
2. The ability to flexibly monitor the critical
3. The ability to anticipate the potential
4. The ability to learn from the factual

And for the organisational properties posited by Wreathall (2006):

1. Top-Level commitment
2. Just culture
3. Learning culture
4. Awareness
5. Preparedness
6. Flexibility
7. Opacity

Again, the concepts developed in his study are posited to address the ‘*how*’ of the factors that are identified by the above, and other similar studies. As such, it is argued that the alignment of the current study with these two contemporary theories of safety (HRO & RE) provides support for the theory of anticipated regret based safety performance; while the differences, resulting from both methodological differences and a focus on the ‘*how*’ of safety performance, suggests that the current study contributes to both safety theory and safety practice.

Looking specifically at mental simulation, which is a core concept in anticipated regret as conceived in this study, the review identified a number of references to mental simulation. Firstly, Weick & Sutcliffe (2015, p.92) make a brief reference to encouraging “people to simulate their work mentally”, suggesting that the content should be about how their work is linked to the work “upstream and downstream from them”, additionally, how things could “unravel, and how they would cope”. This aligns with concepts within the current study but falls far short of the scope and qualities of simulations developed and primed in others by the exemplars in this study, and does not include the content that would establish the emotion of anticipated regret.

The concept of ‘chronic unease’ is associated with higher levels of safety performance, and describes a state of constant wariness towards risk (Fruhen et al., 2014). Refined through a literature review, and inductive analysis, Fruhen et al. conceptualised chronic unease as comprising five themes or attributes; *pessimism*, *propensity to worry*, *vigilance*, *requisite imagination*, and *flexible thinking*. A second study comprising in-depth interviews with safety

leaders concerning the construct of chronic unease added experience to the attributes of chronic unease (Fruhen and Flin, 2016) as shown in Table 22 below.

Table 22: Comparison with attributes of chronic unease

Chronic Unease Attributes	Core Concepts from Current Study
<p>Pessimism: A personality trait reflecting a tendency to resist complacency and to anticipate failure.</p>	<p>Risk is never zero (<i>belief not trait</i>) <i>Thinking through</i> <i>Pausing / stepping back</i> <i>Lived consequences</i> <i>Mental simulation</i> Anticipated (<i>regret</i>)</p>
<p>Propensity to Worry: A tendency to worry about risk and safety. This can include emotional and somatic reactions.</p>	<p><i>Risk is never zero</i> <i>Lived consequences</i> <i>Extended Accountability</i> <i>Mental Simulation</i> <i>Anticipated regret</i></p>
<p>Vigilance: The ability to notice and identify (weak) indicators of risks in the environment.</p>	<p><i>Cultural indicators</i> <i>Understanding</i> Risk is never <i>Grounding</i> <i>Pausing / stepping back</i></p>
<p>Requisite Imagination: The ability to mentally project the development of a situation into the future based on its current state.</p>	<p>Thinking through Grounding Contrasting mental simulations</p>
<p>Flexible Thinking: The ability to approach safety-related issues from many angles, to think about them critically and to question assumptions.</p>	<p>Thinking through Grounding <i>Contrasting mental simulations</i> <i>Understanding</i></p>
<p>Experience: [not a component of chronic unease – but a factor that may increase its experience of the state]</p>	<p><i>Precision in cognition</i> <i>Risk prototypes</i></p>

Table 22 also compares the attributes of chronic unease with concepts from the current study thus the construct of anticipated regret based safety performance. Two concepts that have been posited as pre-requisites for experiencing anticipated regret are not included in the table, the concepts of *agency* and *personal accountability*. Their absence is due to it being unclear which, if any, attribute of chronic unease would they be matched to. As pre-requisites, the absence of these concepts was proposed to lead to the experience of an emotion other than anticipated regret and indeed regret post incident, e.g. grief, deep sadness; as regret was argued to pre-suppose that an action could have been undertaken with agency and personal accountability. It is thus proposed that this is key reason why the nature and name of the affect differs between the two constructs.

There is, however, also a significant degree of alignment between the two constructs as shown by the mappings in the table above. Like the comparison with HRO's there is a distinction between the *what* and the *how* between the two columns. For example, chronic unease describes the trait and behaviours of pessimism, the concepts associated with the present study align to these, but also describe *how* someone becomes and sustains pessimism. A process that also involves aspects of requisite imagination, and aspects of worry. It is thus proposed that the current study can contribute to the construct of chronic unease, which has established a relationship to high levels of safety, by providing insights into the interactions between the attributes of chronic unease, and also provide answers on *how* to prime and develop these attributes in others. The particular concepts that are proposed to align but also add insight are those in italics within the table.

5.5.3.5 Review Conclusions

The review identified an absence of the concept of anticipated regret in theory pertaining to safety performance of leaders and in industrial and organisational settings. It has been proposed that this absence is due to the application of research methodologies that develop research questions and hypotheses from prior theories, including within grounded studies. Thus, because anticipated regret is absent in prior leadership and organisational theories it will not be identified in such studies.

Indeed, when a grounded approach is applied without reference to prior theory 'anticipated regret' is identified as a possible cause for leadership motivation in a study that is argued to fit a new research agenda (Enander et al., 2015). A research agenda proposed following review and criticism of methodologies that have drawn heavily on classic leadership theories (Pilbeam et al., 2016).

Reviewing safety leadership and organisation theories against the concepts within the theory of anticipated regret based safety performance developed within the present study, confirmed the predictions made by Pilbeam et al, (2016). Specifically, that the application of methodologies such as those applied within Study 3 herein will provide additional insight into the cognitive, affective and behavioural elements of safety performance. This was demonstrated through the alignment with, but more granular insight into, the concepts within prior safety leadership and organisational safety theories. Thus, establishing the basis of contribution to both safety practice and theory made by Study 3, as discussed in the following section.

5.6 Conclusions, limitations and contributions

5.6.1 **Research questions**

This study set out to explore the question posed by Hastie (2001, p.664): i.e. “how are deliberate decision-making problems represented cognitively, and what are the major determinates of the representation of situations”, by answering the following research questions, questions that also address the interests and needs of the participating organisation.

1. What are the cognitive and associated behavioural patterns of consistently high performing safety leaders?
2. Can the patterns identified be used to anticipate the performance of leaders in regard to safety?
3. How do any cognitive and behavioural patterns identified contrast with those identified in Study 1 & 2?

The following section reviews findings, specifically the *theory of anticipated regret based safety performance*, in relation to questions 1 & 2. Question 3 is considered in the overall thesis conclusions described in section 6.

5.6.2 **Differential safety performance**

1. What are the cognitive and associated behavioural patterns of consistently high performing safety leaders?
2. Can the patterns identified be used to anticipate the performance of leaders in regard to safety?

The study identified three core categories, *formative events*, *personal intervening*, and *cultural leadership*, that described cognitive, affective and behavioural patterns of high performing safety leaders, thus answering question 1 above. These core categories were integrated into a *theory of anticipated regret based safety performance*. In answering question 2 above, initial support for the theory having explanatory power was provided by its ability to discriminate high performing safety leaders from average and low performers through analysis of interview transcripts, however, recognising the limitations described in section 5.6.4 below.

Two additional forms of support for the theory having explanatory relevance to differential performance were subsequently developed. Firstly, the concepts comprising the core categories were found to align with, and are proposed to contribute to, contemporary theories of adaptive safety, particularly HRO's, RE, and the concept of chronic unease. Secondly, strong evidence of anticipated regret motivating desired behaviours was identified in the literature.

The aforementioned evidence is taken as preliminary support for the proposition of the theory providing valid and actionable insight into the differential performance of safety leaders. Support is stated as preliminary as validation in a full-cycle study proceeds via stage four, i.e. the field based experiments and implementation. Although preliminary, it is argued that the supporting evidence is strong enough to recommend investment in stage four research.

In considering the stage four research one important matter to resolve/confirm is the proposition that directly experienced *formative events* can be replaced through the priming and self-reinforcement of mental simulations that generate sufficient emotional salience to drive and sustain the perceptual, cognitive and behavioural patterns of anticipated regret.

Formative events are emotionally challenging events in which significant harm has occurred. Repeating such *formative events* to facilitate similar learning in others is clearly undesirable and gives rise to the question; is it necessary for other to experience similar real events to develop the same patterns of cognition and behaviours and to remain committed to them?

The answer to this question appears to be, 'No'. This conclusion is in part based on the fact that the high performing leaders in this study, induce higher levels of safety performance in the wider workforce, a workforce that has not shared the same formative experiences as the participants in this study. However, this premise is open to challenge; as others may have had equally significant but different experiences, and the high performing leaders could simply be facilitating a new way of thinking and feeling about those events. This is not to suggest that such facilitation would not be a positive intervention, but the goal of the participating organisation is zero incidents, and as this goal is approached, then by definition, such direct experience becomes unavailable. The data is not available within the study to refute this challenge, thus replacing *formative events* is an important aspect to be developed and tested in stage four of the full-cycle of research, i.e. field experiments and interventions. In the meantime, encouraging anecdotal evidence supports the efficacy vicarious learning from another's experiences, replacing directly experienced *formative events*.

The picture below is a demonstration of the authors behavioural change resulting from exposure to the experiences of the participants, and from the priming the strategy of anticipating regret. The author has no personal incidents/experiences that qualify as a *formative event*; therefore, this behaviour is the result of the vicarious experience of the participants' formative events, and the ongoing mental simulation of anticipated regretful events. The covering of cables and holding of handrails amongst other safety behaviours are now natural self-sustaining behaviours for the author, and if ignored lead to negative emotion (anticipated regret), that forces action.



Picture 1: Compulsion to cover a cable

Discussions are underway for field based experiments that will provide evidence to confirm the efficacy of developing the necessary cognitive and affect patterns using the methods identified herein, without the workforce having direct experience of significant events. In advance of those experiments, proposition 9 (see below) within the anticipated regret based theory of safety performance, the theory derived from the aforementioned core categories of *formative events*, *personal intervening* and *cultural leadership*, finds some support in the literature:

Proposition 9: The experiences of regret that initiates and or informs the strategy of anticipating regret can be a direct or vicarious experienced event.

The conclusion drawn from the above is, therefore, that the results of the study provide plausible explanation for the differential performance of the higher performing safety leaders, and thus the answers to the research questions raised in the study suggest value in proceeding to the final stage of the full-life cycle research process.

5.6.3 Limitations of the study

The study acknowledges a number of limitations. Firstly, the participants were interviewed and not observed in their practice, except in the office environment when they, took care of the author as an escorted visitor in their premises. This means the behaviour they described could not be validated by observation. However, this is mitigated to an extent through attention to congruency of embodied actions and nuances in language, e.g. are they associated and present in a prior experience or are they commenting on an experience in a dissociated state. This limitation is further mitigated by the methodology only integrating patterns into the findings when they have been identified in most of the participants. Secondly, the perspective of those that the leaders interact with was not available, again partially mitigated by the prior points.

The sample of participants also contributes to a number of limitations. Firstly, the measures used to identify high and low performers were drawn from multiple systems that are not unified across the organization, therefore different data was drawn upon. This was mitigated as much as possible by triangulation between multiple sources of data and a sense-check from senior safety specialists who had good knowledge of the volunteering participants. Secondly, because the sample was drawn from volunteers the representation of low performers was limited.

The current study also takes place within a single organisation therefore the ability to generalise the findings is limited at this stage, however the literature that has supported the findings are from multiple contexts therefore it may indicate a reasonable possibility for generalisation beyond the current organisation.

With regards to the interviews, the positioning of the author may have influenced the focus of the participant's answers. Positioned by the organisation as a psychologist may focus their answers toward a cognitive aspect of the experience. Relative status may also be an issue, to mitigate the author matched the participants dress code, and by chance the age difference was on average small. The participants were used to working across cultures and were all fluent in English, therefore cultural bias was assumed to be minimised.

5.6.4 Implications for practice

The implications for practice are the development of anticipating regret as individual and leadership capability and practice, with aligned adjustments to organisational context factors to prime and support the ongoing practise of anticipating regret, specifically to increase and then maintain its frequency, its accuracy, and its intensity.

In considering the above, it is posited that actions designed and taken to transition to such new practices and ultimately culture, need to be designed to target cognition and affect. The learning the high performing individuals experienced were not behavioural, their new behaviours are the result of shifts in cognition and affective patterns which have combined to establish new beliefs and associated behaviours, which are self-reinforcing.

Learning and leadership programs therefore need to be adjusted to subtly to assist in the development and reinforcement of the component cognitive skills and processes of anticipating regret, and processes design in alignment. It is proposed that this calls for differential capability and approach to organisational development, one that is sensitive to and can utilise the cognitive and affective implications of both action and language. The afore can go alongside behavioural interventions, however, it must be recognised copying a behaviour does not guarantee the right cognitive pattern, therefore development needs to combine both.

For example, changing a review of a significant safety incident, from a '*lost time incident review*', to '*a lost quality of life incident review*' both suggest a change in actual process, but equally it primes the cognition of the mental simulation of *life consequences* and thus a component of anticipated regret.

This sensitivity to language and action is argued to require refined skill, however, as per the previous example, small changes can have big effects, as exemplified by many of the examples provided by the participants, e.g. when a story is told in the structure of anticipated regret has a profound effect on team culture. Equally the sensitivity to language and actions that can interrupt the desired patterns is critical, for example, avoiding language on check lists that are task based instead of outcome based, thus priming rather than reducing agency.

The implications of developing and utilising such capabilities are discussed in the overall discussion in the final section of this thesis.

5.6.5 Stage 4: Future research

Three connected streams of research are recommended in regard to the *theory of anticipate regret based safety performance*. The first two relate to practice and would be conducted within organisational contexts. The third can be conducted in the lab and or the field.

5.6.5.1 *Measuring anticipated regret – individual and cultural*

The *theory of anticipated regret based safety performance* posits, increasing the *frequency*, *accuracy* and *intensity* of anticipated regret leads to improved safety performance. To provide organisational scale evidence for the theory and assess the efficacy of interventions based on the theory (experimental and formal organisation initiatives) it is necessary to have instruments that can reliably and efficiently measure individual and organisational frequency, accuracy and intensity of anticipated regret. Thus, an important stream of future research is the development of instruments for measuring these three factors (frequency, accuracy, and intensity).

While recognising the identified limitations, it was possible to anticipate a leader's safety performance based on in-depth analysis of interview transcripts. Analysis that identified the presence of cognitive and affect patterns, i.e. the frequency, accuracy and intensity of anticipated regret, and tacit actions to increase this within their leadership contexts. This assessment process was time-consuming and required significant analytical skills, and so would be problematic as a methodology for assessing the individual and organisation-wide measurement of anticipated regret.

Therefore, the objective of this research stream would be to produce measurement instruments that can be efficiently administered by organisations to provide quantitative measures that indicate individual and culture-based safety risk. Thus, provide data that can inform the direction and nature of improvement actions. Additionally, through pre and post-application, the instrument(s) could deliver leading measures of intervention efficacy, i.e. changes in the three factors as a leading measure, ahead of the expected lagging effects, i.e. improvements in safety results.

The measurement of safety culture remains problematic (Goncalves Filho and Waterson, 2018) therefore, assuming the *theory of anticipated regret based performance* is validated, the development of such instruments could make a significant contribution to the measurement of safety culture that is responsive and indicates pragmatic actions.

The development of such instruments can both support and be supported by the next stream of research, i.e. the design and testing of field-based experiments / organisational interventions that develop the capability and application of anticipating regret. The efficacy of the instrument(s) can be assessed through correlation with behavioural changes identified through field-based experiments. Then when proven the instrument(s) can be used to evaluate larger-scale interventions, to support or replace sample-based testing of cognitive and behavioural change.

5.6.5.2 *Field experiments / organisational interventions*

With regard to field-experiments, it is proposed that these are designed to both test the theory and particular propositions therein and develop and test interventions that increase the capability and application of anticipating regret. Addressing dual objectives is considered important in establishing a stronger relationship between the development of theory and its understanding and application in practice (Rae et al., 2020)

Two complimentary foci are proposed. Firstly, the direct development of individual and leadership capability through a range of methods of personal development. Secondly, the intentional design of context to support and prime the activation of the process of anticipating regret.

5.6.5.2.1 *Individual and leadership development*

As described in section 5.6.4 above, it is proposed developmental interventions should be designed to establish particular cognitive and affective processes of anticipating regret. Interventions could then be assessed through lagging measures i.e. safety performance, but also through targeted assessments at the end of, or shortly after the training, targeted to evaluate the presence and application of particular aspects anticipating regret (Davis et al., 2003).

Additionally, actual behavioural change could be assessed through experimental type tests, e.g. the Good Samaritan test (Darley and Batson, 1973) in which a person is presented with a seemingly incidental situation that gives them the opportunity to demonstrate a new behaviour. In this case it could be the incidental presentation of a small risk e.g. an uncovered cable. This could be administered for example by interviewing a sample of training attendees after training, on a separate non-safety top, and have them sit in a waiting area in which a cable is left uncovered, or in which someone's bag is in a position in which it could be considered a trip hazard. Do they notice and intervene, in each type of risk, and how do they intervene with the person who has placed the bag where it may be a trip hazard?

Such experimental type tests could be designed based on the types of subtle risks identified and interventions made by high performing safety leaders, particularly those that were attended to after their formative events, and thus post adoption of the strategy of anticipating regret. The results of these experimental tests could be correlated with safety performance in the workplace

and results from measurement instruments developed (see section 5.6.5.1 above), to evaluate both the intervention and the measurement instruments.

As shown in table 23 below there are a number of concepts posited as important to increasing each of the performance variables (frequency, accuracy, intensity). These concepts were often learnt through different formative events, and it is not possible from the study data to determine what an optimum sequence of learning maybe, e.g. are some concepts dependant on others being in place, e.g. does 'lived consequences' facilitate the adoption of the concept 'risk is never zero'. Because only concepts that were present in all high performers have been included in the model, and the absence of several has successfully predicted lower performance, it is proposed that all concepts should be included in a learning intervention. However, it is also proposed that further research is conducted to understand the relationships between concepts and so to design optimum learning interventions. Additionally, that the insights from future lab based experiments regarding propositions within the theory (see section 5.6.5.3 below) are considered in the detailed design of learning events.

Table 23: Concepts associated with each AR performance variable

Category/Variable	Description	Supporting Concepts
Frequency of anticipated regret	Increasing the frequency of the experience of the emotion of anticipated regret through increased identification of risks and or the increased number of simulations of different potential consequences of a risk.	<ul style="list-style-type: none"> • Extended Accountability /Accountability Through Culture • Priming agency • Risk is never zero • Grounding • Pausing/stepping back • Thinking through • Cultural indicators • Understanding • Open communications
Precision of anticipated regret	Improving the degree of correspondence between a participant's perceptions and mental simulations and the actual/potential conditions in the world. Increasing precision of perception and simulation, and accuracy of narrative/cause effect.	<ul style="list-style-type: none"> • Risk is never zero • Grounding • Pausing/stepping back • Thinking through • Open communications
Intensity/salience of anticipated regret	Increasing the intensity of the emotion experienced, both in terms of regret and in terms of the satisfaction at addressing risk, but not to excess, i.e. to the point where anxiety or stress reduces competence or capacity or is harmful to wellbeing.	<ul style="list-style-type: none"> • Lived consequences • Re-telling • Thinking through • Grounding

In this study formative events have been identified as critical in the development of the high performing safety leaders; however, the presence of such events is not desirable, furthermore as safety performance improves, such events will reduce in frequency. It has been posited that vicarious experiences of such events may be effective in developing and motivating the

application of anticipating regret. It is thus recommended that future research is directed towards understanding how to create strong vicarious formative learning i.e. learning from a deep indirect experience of a significant safety event. Again, insights from lab based experiments concerning propositions that relate to intensifying emotion may also be relevant in maximising the learning from vicarious formative events.

This research stream has the potential to be a significant further contribution as the development of anticipated regret as a capability appear to be a novel approach to performance development have not been previously researched or been part of a formal organisational development initiative.

5.6.5.2.2 Developing a context to support and prime factors of high performance

High performing safety (HPS) leaders recognised contextual factors impact the thinking and behaviours of their organisation units. For example, they expressed concern regarding the impacts of typical compliance drives, and the implementation of ‘tick box’ instructions and processes. Leaders perceived such contextual factors switched of active thinking and vigilance and reduced personal accountability.

In contrast HPS leaders described initiatives that had primed the desired thinking and behaviours, for example, the decorating of hard hats by works children, or by themselves in relation to a hobby etc. had successfully primed the concept of ‘lived consequences’. Furthermore, HPS leaders posited the ‘sanitisation’ (the removal of names) from incident reviews reduced the ‘sense of care’. Indeed, the name of the review process ‘lost time incident review’ does not refer to a life impacted, just production time lost.

Following initial feedback of this study’s findings a number of safety leaders changed the name of this process and included the narrative of the actual or potential impact of the incident on to a lived life. The review process was renamed a “lost quality of life incident review”. Anecdotal feedback at the time of writing this thesis confirmed support for this change having positive effects on safety behaviours.

Based on the above it is proposed an important stream of future research is the assessment of organisational procedures, process, templates, tools etc. with regard to the mental representations/simulations and cognitive processes they prime in comparison to those prescribed by the theory of anticipated regret based safety performance. Priming and framing have significant research histories in JDM research, however mainly laboratory type studies

(Levin and Schneider, 1998; Weber and Johnson, 2008) This proposed research stream would bring JDM priming and framing research into the field integrated with theories of embodied cognition, thus constitute a novel program of research that could contribute to organisational safety performance, and thus bridging theory and practice.

5.6.5.3 *Lab based experiments to investigate contributions to anticipated regret theory*

The table below includes the propositions that were not identified, or fully covered, within the anticipated regret literature, as discussed in section 5.5.1. Some propositions found support in research from other fields while others remained untested. Therefore, it was argued that each of the below has the potential to contribute to anticipated regret theory. Additionally, because they relate to a model of high performance identified in the field, they have practice based implications, e.g.

- How to optimise the learning from vicarious experiences as formative events
{4, 8, 9, 11, 12, 13, 14, 19}
- How to develop anticipating regret as a consistently applied capability.
{1, 5, 7, 8, 9, 10, 11, 12, 13, 14, 17, 19}

Table 24: Propositions requiring future research

#	Proposition	Supported in AR Literature
1	Anticipated regret motivates vigilance to identify risks to safety by reducing the potential to experience actual regret.	Only single risk scenarios examined.
4	Comparative narratives within anticipated regret are embodied simulations	Partially
5	Mental simulation can run consciously and subconsciously.	Not discussed
6	Mental simulation can result in emotion without conscious awareness of the simulation.	Not discussed
7	Patterns of mental simulation can become more proficient through experience (conscious / subconscious simulations).	Not discussed
8	The strategy of anticipating regret is developed from significant experience(s) of regret.	Not discussed
9	Regret that initiates and or informs the strategy of anticipating regret can be a direct or vicarious experienced event.	Partially
10	The point of alleviation of anticipated regret is dependent on occurrence of risk exposure.	Partially
11	Simulating life consequences intensifies anticipated regret.	Partially
12	Increasing detail of mental simulations intensifies anticipated regret.	Not discussed
13	Additional modalities in mental simulation intensifies anticipated regret.	Not discussed
14	The perspective(s) taken within a mental simulation impact the intensity of anticipated regret.	Not discussed
17	Experiencing and alleviating anticipated regret motivates the ongoing application of the strategy of anticipating regret.	Not discussed
19	Increased detail and salience of mental simulations and anticipated regret increases the perceived probability of a risk becoming an incident.	Not discussed

The above propositions integrate three principle research topics, embodied cognition, mental simulation and anticipated regret. Experiments would therefore integrate methodologies from each field. Essentially experiments would manipulate the content and qualia of mental simulations to assess their impact on emotion, behavioural intentions and actual behaviour motivated by anticipating regret. The results of such experiments would both contribute to theories of anticipated regret and inform the design of interventions / field experiments mentioned in section 5.6.5.2 above. Thus, contribute to the final stage of the research life cycle.

6. Conclusions

Applying a grounded theory methodology and completing the first three stages of a full life cycle research program, this thesis has examined judgment and decision-making in two distinct contexts. It has done so with particular focus on the cognitive representations of decision-making problems, in response to a question raised in Hastie's (2001) review of JDM research. Firstly, the context of foreign exchange trading, characterised by risks based in intangible human constructs, i.e. money. Secondly, the context of safety leadership, characterised by tangible physical risks to plant, people and environment.

In conjunction with the organisations opening research questions were developed to ensure a strong connection between the research and practitioner needs.

1. What are the cognitive and affective patterns (heuristics) associated with judgments and decisions that diverge from trading strategy and money management? In particular, when an expected/reasonable series of losses are experienced.
2. What are the cognitive and associated behavioural patterns of consistently high performing safety leaders?
3. Can the patterns identified be used to anticipate the performance of leaders with regard to safety?

Conclusions concerning the answers to these questions have been drawn at the end of each study in turn. The conclusions that follow are focused on drawing conclusions across the studies, contrasting findings and considering their implications.

6.1 For better or for worse

6.1.1 Biased sense of probability

In both contexts, strong emotions and a biased sense of probability resulting from content and qualia of embodied mental simulations/representations were identified as important. In trading, the emotions were unwelcome, perceived as irrational, and associated errant judgment and

decision making. In safety leadership, the emotions, although unpleasant, were a positive influence, and were associated with effective judgment and decision making.

In the trader context, the repetitive mental simulation of a successful outcome from a long odds trade caused a higher expectation of success than was deemed rational in retrospect. With this biased sense of high probability inducing an irrational decision to enter into such a trade. This pattern is replicated by high performing safety leadership, here the repeated mental simulation of an outcome, albeit in this case a negative outcome, biases a sense of a higher probability of an event occurring, and so motivates taking action to address the risk.

In both contexts, the repeated mental simulation of future narratives is proposed to increase the perceived probability of an event occurring and induce action; in the safety leaders' context a resulting bias that is for 'the better', in the traders' context a resulting bias that is for 'the worse'. Such heuristics and resulting bias are often argued to be maladaptive evolutionary historic strategies (Peters, 2018) heuristics and biases that in the modern age and in relation to trading need to be transcended by rational decision methods (Oberlechner, 2004). This argument makes sense in the trading context; however, in safety, this heuristic and resulting bias is a component of high performance. Thus, in one context performance is enhanced by strengthening the heuristic, and so increasing emotion and bias, while in the other the goal would be to interrupt the heuristic, remove/reduce the emotion and bias.

Therefore, based on the studies herein, it is argued that a bias and its founding heuristics, are neither inherently good nor inherently bad, but have to be judged in context against the results achieved. Indeed, recent studies have shown that interventions designed to increase interaction with a vivid representation of a future self positively influences saving behaviours and results in financial knowledge (Hershfield et al., 2018).

6.1.2 Emotive simulations of magnitude/number

Mental simulation of magnitude was also found to play an important role in both contexts. In the trader's context, the magnitude of a traders P&L account was mentally represented in the form of an abstract metaphoric image, with changes to this representation in response to a losing trade proposed to cause excessive emotion and as a result problematic trading behaviour. Furthermore, the proposed solution for addressing these behaviours being to remove or interrupt the traders embodied mental representations of magnitude.

In contrast, successful safety leaders seek to establish, enhance mental simulations associated with numbers and increase the emotional response. Here small numbers are brought to life, i.e. translated into a vivid mental simulation through analogy, e.g. accepting a small number of accidents is simulated as personally choosing which child in your local area will lose a limb, or worse.

As such, there is a contrast in the utility of heuristics applied to a magnitude and the resulting bias and emotion between these contexts. The trader's heuristic representation of P&L creates a biased sense of loss and accompanying 'irrational' emotion; therefore, the embodied mental simulation of magnitude is 'for the worse'. In contrast, successful safety leaders leverage the heuristic of translating numbers into embodied mental simulations, with the resulting heightened emotions and biases seen as being 'for the better'.

Again, the afore is proposed to support the argument that heuristics and their resulting emotions and biases are neither inherently good nor inherently bad. But have to be judged in context, and against the results achieved.

6.2 Qualia of mental simulation

Two forms of mental representation/simulation were identified in both contexts. Firstly, the metaphor-based representations of abstract concepts such as money, relationship, understanding, and learning amongst others. Secondly, the embodied simulation of perceptual content. In both cases, the qualia (e.g. colour, brightness, location, perspective etc.) of the simulations / representations are proposed to have important implications for resulting emotion, judgement, decision-making and behaviours, implications not been previously considered by literature relating to either context.

A broader review of psychological literature, while recognising its selective nature, identified supporting evidence for the relationships between qualia of simulation/representation and emotion and decision making. Qualia of simulation/representation is thus proposed to play a significant role in heuristics, bias and associated emotions and as such present the potential for new lines of research and solution development with regards to JDM.

This proposition is supported by the study mentioned above in which interventions were designed to increase interaction with a vivid representation and so positively influences saving behaviours and results in financial knowledge (Hershfield et al., 2018). Here qualities of mental

simulation are driving behaviour rather than increased information or rational argument. Qualities of representation are argued to play a role in our ability to distinguish between factual reality and counterfactual possibility, with factual reality presenting in more vivid detail (Kanai et al., 2019). Thus, as the vividness and detail of counterfactual thinking increases, so does its perception of the ‘reality’ of the counterfactual.

6.3 Metaphor and embodied simulation

In both contexts, variation in simulation qualia is proposed to be fundamentally metaphoric or more specifically embodied. Indeed, the mental simulations proposed to be the cause for a trader’s excessive emotional responses to small losses were explicated through the interview process and then identified as metaphor. That is to say; the simulations were not initially identified in language, the traders did not include their representations of P&L in their discourse, they were not consciously aware of them; instead, the presence of the simulations was indicated through gesture and then explored phenomenologically, and through analysis were then related to embodied conceptual metaphor. Thus, the identified metaphors cannot be argued as *literary* ways to talk about a P&L account and argued to be dead/conventionalised metaphors, but instead, it is proposed that their experience of their P&L accounts *is* their experience of these embodied metaphors, as proposed by the neural theory of metaphor;

“If the neural theory of metaphor is correct, it leads to an important conclusion concerning our functioning in the world: we do not only understand (or conceptualize or think) about target domains in terms of source domains, but we experience target domains as source domains. This is the foundational idea of accounts of metaphor processing based on perceptual simulations”
(Kovecses, 2020, p.10)

In addition to simulation of abstract concepts, the qualia of perceptual and counterfactual simulations were also identified as embodied. For example, the safety leader’s description of “*stepping back*” and “*pausing*”, referred to a shift in simulation perspective. These metaphoric terms reference online perceptual simulations (perceptual inferences) as having qualia of a wide peripheral perspective, not a narrow focus; an embodied affordance of the human eye. With narrow focus and thus narrow online simulation leading to attentional blindness, and wide perspective increasing the scope of perceptual content.

With reference to predictive processing theory in which perception is a blend of prior expectations and percepts, the cognitive process of “*stepping back*” and “*pausing*” can be seen as a mindful rebalancing of the construction of perceptual simulation away from prediction and

towards available percepts and thus addressing normalisation. Exploring how embodied concepts influence prediction, and therefore online perceptual simulation/experience, is thus posited as an important new line of research and is considered in relation to the JDM field in section 6.7 below.

While the focus of analysis in the safety leadership study was on perceptual and counterfactual simulations that comprised anticipated regret, safety leaders also used embodied metaphors when referring to more abstract concepts, for example when describing having an understanding of current site conditions, e.g. “being *grounded*”, “*seeing past the paper*”, and significant learning, e.g. “that really *shaped me*”, “that made a *big impact on me*”, “I can *never see it that way again*”, amongst other concepts. The metaphors associated with learning were used to identify formative events. The metaphors of “*grounding*” and “*seeing past the paper*” were identified as representing changes in perceptual and cognitive process and so explicated through deepening interview questions, the result being a concept included in the personal intervening and cultural leadership core categories.

As per the first study, the linguistic intuitions of the interviewer, combined with theoretical sampling, focused the direction of interviews, i.e. where and when to drill down into more detail; thus every metaphor uttered was not examined. In contrast, Study 2 looked at every word in discourse to identify the presence of metaphor, some of which were then postulated to have the potential to influence trader decision making. However, as an analysis of discourse and not an active interview, it was not possible to explore the mental simulations associated with the identified metaphors. If mental representation / simulation is fundamental to emotion, judgement, decision-making and behaviour, and embodiment as signalled by metaphor is fundamental to the nature of representation and simulation, then there are implications for the metaphor research methodology. These implications are discussed in section 6.5 below and also relate to recommendations for future research, i.e. the potential value of conducting a MIP analysis of the safety leader interviews.

6.4 Anticipated Regret

In Study 3 anticipated regret was identified as a key factor in differential safety performance. Indeed, it is posited that the development of anticipating regret as a capability could contribute to enhanced performance across contexts. The question thus arises what role does or could anticipated regret play in trader performance.

Study one identified excessive emotional responses to small losses, excessive because traders described the losses as typical and their emotional response as irrationally strong. The study proposed excessive emotion was caused by disproportionate changes to their embodied mental representations of P&L. As such, the losses are not regretted, and the anticipation of such losses does not cause emotion, it is only when the losses take place, and the embodied representation plays its role, does the emotion escalate. None of the traders in the study described this emotion as regret, or expressed regret for the trades, the trades were seen as part of an ongoing strategy that they did not intend to depart from.

However, once the negative emotion is experienced, and the traders depart from strategy and money management and losses escalate as they over trade and take longer odds, perhaps they anticipate the regret of taking the larger loss. This anticipated regret may then work with the biased sense of probability described in section 6.1.1 above to motivate making retrospectively considered poor trades. This was not examined in the study as the solutions to the traders' performance problems were focused on the earlier cause i.e. their mental representations of magnitude. Although a secondary solution could be the deliberate processing of a counterfactual mental simulation of losing the long odds trade, thus developing an anticipated regret of taking such a trade.

Anticipated regret was identified in two studies in relation to investor decision making. With one supporting the afore proposition, i.e. a reduction of anticipated regret leads to decisions that result in actual regret. Regret that is greater for holding onto losses, rather than selling too early in a gain situation (Fogel and Berry, 2006), thus increasing the salience of counterfactual thinking could have a positive impact on performance. Qin (2015) explored the differences between regret for inaction versus action, concluding anticipated regret for inaction supporting the development of herd behaviours and thus resulting in the formation of bubbles and crashes.

Neither study (Fogel and Berry, 2006;Qin, 2015) explored the content or qualia of mental simulations that underlie the emotions of regret and anticipated regret. Study 3 in this thesis suggests that content and qualia are important in terms of the salience of the emotion; therefore, important information is argued missing for supporting improvements in practice and thus points to a potential line of future research.

6.5 Methodology – metaphor identification and analysis

Metaphor analysis emerged as a methodology within this thesis in response to the identification of mental simulations posited as metaphoric representations of abstract concepts, i.e. trader

P&L. As previously described, the identification of such metaphors was not made through analysis of language, but through gesture and phenomenological exploration of what was associated with these gestures. In contrast, Study 2 comprised a word by word systematic identification of conceptual metaphors in language, a typical approach to studying metaphor (Steen, 2007). The study identified metaphors that may have effects on trader decision making, however, as a result of analysing discourse data, the possibility of producing detailed insight into mental representations / simulations associated with such metaphors was severely limited. The detailed insight that Study 1 and Study 3 has shown to be significant both in terms of explanation of emotion and JDM, and in the design of interventions and changes in practice.

In section 6.3 above, it has been argued that metaphor relates to the content and qualia of mental simulations. Thus, it could be argued that the absence of a systematic metaphor identification in Study 1 and Study 3 risks missing some examples of metaphor and so insight into content and characteristics of mental simulations and associated emotions. Instead, only those noticed through the interviewer's observations and linguistic intuitions were explored in depth during the interviews. Moreover, even as an experienced interviewer, the possibility of identifying every relevant metaphor real-time in an interview could be challenged.

It is argued, therefore, that methodology needs to be developed to address the limitations of systematic metaphor analysis of discourse but take advantage of its coverage; and at the same time incorporate the opportunity presented by interviews to explore the phenomenology of mental simulations associated with metaphor, without sacrificing appropriate coverage.

It is therefore recommended that a stream of future research, conducted alongside stage 4 of the research life cycle, is the incremental exploration of the interview transcripts utilising systematic metaphor analysis. With the aim of assessing any incremental value of such analysis, and how best to derive this; assuming and testing the hypothesis that approaching full word by line analysis of all transcripts will result in diminishing returns of insight.

The incremental stages of systematic analysis of transcripts to inform the development of methodology are proposed as follows: Analysis of;

1. Segments of transcripts coded against concepts within the core concepts/theory for highest performing participants.
2. Segments of transcripts coded against concepts within the theory for average performing participants.
3. Samples of segments not meeting the above criteria.

Each stage would answer the following questions;

Stage 1: are there additional insights/details that can/could have been derived in relation to concepts already identified and included within the core categories /theory?

Stage 2: do transcripts indicate additional differences in simulation qualia and content associated with the concepts within the theory that may further differentiate high performance, that have not been explored in the interviews?

Stage 3: do transcripts include conceptual metaphors that may indicate additional concepts not included thin the core concepts or theory?

Stage 3 would be applied to the high performing participant transcripts as they have provided the richest content, and thus gaps would have more significance and value.

To fully evaluate any potential insights from the above analysis/questions follow up interviews will be required to explore the simulations associated with metaphors identified. Thus, the new methodology developed would by necessity have to consider a two stage interview process, with its opportunities and access/commitment challenges.

6.6 Glaser's grounded theory

As previously discussed there diverging opinions regarding aspects of conducting grounded including when to conduct a literature review. Glaser argues a prior literature review risks redundancy of literature reviewed, while others argue that by ignoring the literature studies risk redundancy by covering well-trodden ground.

Study 1 & 3 followed Glaser's philosophy and explored their contexts without prior literature reviews. Study 1 identified novel propositions regarding the causes of trader behaviours that connected to and across literature that would not have been anticipated in advance and therefore would not have been included in a prior literature view. As a consequence, a prior literature review would have been largely redundant and may have distracted the attention of the researcher away from noticing the metaphoric representations.

Study 3 again studied a well-researched context without a prior literature review and again produced novel theory. Previous grounded studies in the area started with a prior literature review and explored the field with prior concepts in mind, and it is argued as a result missed the opportunity to identify the patterns of anticipated regret. Indeed, the study previously discussed that identified chronic unease as a construct was conducted within the same organisation as Study 3. The chronic unease findings included concepts can be seen to align to anticipated regret, however, it is argued because concepts had been defined a priori through a literature review the presence of anticipated regret was obscured from the researchers.

Additionally, it is argued because the concept of anticipated regret was not covered by a upfront literature review the analysis produced propositions that if proven through future research enrich the theory of anticipated regret. If anticipated regret had been conceptualised before the research the researchers may have been focused on the concepts within the current theory and so missed observations that have led to the new propositions.

Glaser's maximal openness approach has been criticised on the basis that many fields are already saturated, and hence to leave out a literature review almost certainly condemns some researchers to accidentally duplicate (rather than intentionally replicate) studies that have already been conducted (Thornberg, 2012; Suddaby, 2006). On the basis of the research conducted as part of this thesis, it is posited that this criticism may not be relevant if Glaser's maximal openness approach to grounded theory is augmented though the application of the lens of embodied cognition, i.e. embodied simulation, and situated and extended forms of cognition (Clark, 2015) This is because even if a subject area is saturated, the new lens that embodied cognition provides is highly likely to lead to the identification of new distinctions and novel theory. Embodiment is argued to be a unifying theory (Matheson, 2018) which is supported by the integration / connections across a broad literature arising from the studies herein, again pointing to a high risk of redundancy of a prior literature review.

While a prior literature review is argued to be at risk of redundancy, a post-analysis literature also carries risk. As highlighted in section 2.3 a post-study review risks confirmation bias, particularly when drawing literature from a broad range of fields and theories. Firstly, the terms used to search the literature are drawn from the propositions which are developed in the absence of reference to prior theory. Therefore the search may be biased to find literature that matches the study's conclusions, with contrasting theories using different terms and therefore not identified. To partially address this, in study 3, the definition of anticipated regret developed from the analysis was checked for compatibility against definitions in the literature. However, even on this single topic, numerous alternative terms are used in the literature, e.g.

counterfactual thinking, prefactual thinking, etc. Considering the breadth of theories explored against the different propositions within Studies 1 & 3, the potential to identify supporting and challenging literature and critically evaluate the items identified is a limitation. Indeed, a detailed and extensive literature review could be conducted against each proposition, similar to the critical review of CMT in sections 4.2 - 4.4, this would clearly be prohibitive. To address this limitation, the literature review focused on higher-ranked peer-reviewed journals and critical literature reviews therein where available.

It's also important to balance the criticism of prior literature review with that of a post-analysis review. The former is argued against on the basis that it may bias the researcher's observations in the field. To be balanced, it can't, therefore, be argued that such unconscious bias does not occur when reviewing the literature, particularly as by that time, significant effort and resource will have been deployed. Concepts will have become established and perhaps have been to some extent committed to in the researcher's mind. Publishing for peer review is one process that may motivate reflection to reduce such bias. Equally, through field engagement in a full life cycle approach, the researcher is committed to a client organisation to produce insight and value. Thus the final stage becomes the test for the validity of findings and quality of research. As such, the motivation for consulting the literature is accuracy rather than confirmation as the results will speak to the accuracy of the theory rather than the volume of supporting literature put forward.

6.7 Findings in relation to the field of JDM research

Section 2.4 characterised the JDM field as comprising three main perspectives, utility and bias, heuristics, and naturalistic decision making. This section considers the findings in relation within in each perspective.

6.7.1 **Utility and bias**

Two contributions are considered from this perspective. Firstly, Kahneman (2003) used visual illusion as a metaphor for decision heuristics and the stubbornness of observed bias, Study 1 provides a novel theory for trader behaviour that proposes embodied mental simulation as the underlying basis for bias, i.e. the proposition that bias behaves like a visual illusion because its basis is embodied representation. Study 1 thus posits a new line of research into the nature and

structure of bias, one of embodied mental simulation, and importantly for the design of interventions.

Secondly, and associated with the first, the traders' embodied mental simulations were identified as compound metaphors. The phenomenon of metaphors priming bias in judgement and decision making is a recent line of research in JDM (Lee, 2016), however the metaphors being explored are single conceptual metaphors. Study 1 suggests that metaphors applied in practice are compound and thus research, to enable generalisation, should be exploring metaphor blends. This is further confirmed by the multiple metaphors that associated with the qualia of simulations that underlie anticipated regret in Study 2.

6.7.2 Heuristics - in context

The FFH (fast and frugal heuristics) movement decision-making argues that research needs to respect context, and that when research is conducted in context it shows people to be ecologically rational as opposed to being economically irrational (Gigerenzer, 2008), and that ecological rationality has been essential in the success of our species, has been made for some time (Brunswick, 1956).

Study 3 is seen to support this argument with a bias in perceived probability of an event occurring producing contextual high performance. In contrast, Study 1 identified an initial heuristic, i.e. the mental simulation of a change in P&L, as being ecologically irrational in that it led to errant judgement and decision making, which was compounded by a bias in perceived probability of success of high risk trades.

Context is therefore argued as critical in judging the efficacy of a particular heuristic, as posited by FFH, but with the perspective that a heuristic can found to be ecologically irrational as opposed to ecologically rational, as discussed above in section 6.1. Furthermore there is value in exploring both on the basis that insights into ecologically irrational heuristics inform the need for and design of novel forms of intervention as per Study 1; and insights into ecologically rational heuristics of higher performers provide the basis for designing interventions that develop and prime such heuristics in the broader workforce, and importantly enable the identification of organisational practices that may unintentionally detract from the development of such heuristics, e.g. basic compliance initiatives.

In addition to context being important in judging the efficacy of a heuristic and its resultant bias, research in context is also posited as beneficial as it leads to the identification and

development of propositions, hypotheses and theory that are unlikely to be developed via reductive lab based experiments as argued in NDM (Klein et al., 2010).

6.7.3 Naturalistic decision making (NDM)

Naturalistic decision-making research is firmly placed in context as such the studies herein are closely related to this field of research, however a number of important differences emerged through the studies, in addition to initial methodological differences.

With regard to initial methodology differences NDM methodology includes a set of predefined codes which mark out particular types of cognitive processes, codes that are used in the process of Cognitive Task Analysis (CTA). The studies methodologies in studies 1 & 3 did not use any predefined codes as per Glaser's version of grounded theory.

An important development during the studies was the identification and analysis of metaphor, first noticed through gesture. NDM methodologies do not normally include observation and analysis of gesture or of linguistic metaphor. NDM does explore mental simulation, however based on the absence of analysis of metaphor in relation to simulation, and together with the absence of observation of nonverbal indicators of cognitive process/content, is proposed that many of the insights developed during the studies in this thesis would not have been identified through the application of CTA. By way of example an NDM study of offshore drilling did not explore the qualia or content of mental simulations of the drilling operators even though it was exploring the intuitive decision making of such operators and identified the cognitive task of mental imagery (Roberts et al., 2015).

This suggests a contribution arising from this thesis being the development/enhancement of NDM methodology to ensure important heuristics are identified in expert performance. The value of which could be assessed through the replication of previous NDM studies but with the methodology applied herein to see if additional insights are produced. The value of such insights could then be tested through lab or field experiments.

7. Recommendations for future research

Both Study 1 and 3 comprise the first three stages of full-life research projects, and both have resulted in findings that, via literature review, have been argued as providing plausible explanations for the judgment and decision-making behaviours or performance under

investigation. Thus, the primary recommendation for future research is the design and completion of stage 4 of each life cycle in the form of field based experiments and organisational development interventions.

As described in section 3.5.1 for the trader's this involves testing methods for interrupting and or adapting their unconscious representations of their P&L accounts. With regard to safety leadership the scope of Stage 4 is significantly greater as described in section 5.6.5, and includes developing a methodology for measuring the presence and quality of anticipated regret within organisational culture, interventions to develop the identified cognitive patterns within leaders and wider workforce, and to review existing practices for their support or disruption of such patterns.

Beyond completing stage 4 of the research cycle, three additional categories of future research are recommended for consideration. Firstly, research associated with the development of methodology. As discussed within the conclusions section this includes approaching metaphor research through phenomenological type interviews and assessing the value of full MIP in the subsequent analysis of interview transcripts (see section 6.5). Additionally, exploring the value of adding the coding of gesture and metaphor within NDM methodology as mentioned in section 6.7.3. Secondly, research questions associated with the propositions developed in each of the studies, these have been described within each study and are summarised below.

Study 1: FX Traders

1. How are the particular abstract mental representations of P&L initially derived?
2. Does the emotion, drive the representation and its qualia? or does the qualia of the representation drive the emotion experienced? or does it cycle?

Study 2: Metaphor in Trader Discourse

1. What mental representations/simulations or qualia thereof are associated with the metaphors identified?

Study 3: Safety Leadership (anticipated regret based safety performance)

1. Experimentation to test the propositions that were made in relation to anticipated regret theory. Do each of the propositions of explain/produce variation in the experience of anticipated regret?
2. What is the value of developing anticipating regret as a general capability? In which contexts does the capability of anticipating regret positively impact performance? Are there in which contexts anticipating regret negatively impact performance?

The final future research recommendation for consideration is for the exploration of mental simulation in connection with the classic biases identified in traditional JDM research. Kahneman (2003) referred to bias behaving like visual illusions in terms of their intractability. Study 1 posits visual simulation as the cause for a bias thus suggesting that Kahneman's metaphor contained some intuitive insight and it is therefore suggested that the possibility for mental simulations to play a role in bias is actively explored. There are examples of such research e.g. the work on mental number line and decision making (Dehaene, 2003). However, there are also examples of work associated with embodiment and decision making, e.g. work on metaphor priming ((Lee, 2016) in which the nature of associated mental simulations are not explored. For example, does the smell of fish change the qualia mental simulations operating during a trust game in ways that may explain the lowering of trust, i.e. how does the metaphor of "if it smells fishing it is" operate to change judgments and decisions.

Furthermore, the representations used by traders mental representations differed in content and underlying primary schema, while priming experiments and surveys of metaphor usage and impact use single metaphors selected based on assumed conceptual matching to the form of the decision being tested. The trader examples suggest that the selection of metaphors for use in experiments should be made by exploring those in actual use in such contexts, and also account for individual difference else studies run the risk of experiencing replication issues.

Based on the results of the studies herein it is suggested that decisions within lab environments could be treated as critical incidents with the interview and analytical approaches used within studies 1 & 3 used to explore the mental simulations and representations and qualia thereof of participants. The findings from such analysis could then inform manipulations in experimental presentations to prime or interrupt aspects of such simulations and therefore provide evidence for the presence and role of such simulations, which could measure both decision outcomes and perky type effects (Bergen, 2012).

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