Barriers to WHS Adoption in Australian Fisheries
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Fishing Industry Barriers to the Adoption of Safe Work Practices: Literature Review

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"What's stopping you from keeping yourself and your mates' safe? Identifying barriers to the adoption of safe work practices in the small-scale wild catch commercial fishing industry."

1. INTRODUCTION

The challenge of how to reduce the number of work-related fatalities has been a key issue across all industries, with increasing formalisation over the last eighty or more years. However, until recent decades, the focus has remained within corporate and industrialised industries, as opposed to that of rural industries. Fishers, as with land-based rural industry workers, have only more recently received attention in relation to work health and safety (WHS), largely due to the inordinately high rate of fatalities in fisheries; rates that are the highest of any industry sector in Australia (Brooks 2011; Safe Work Australia 2015). Specifically, rates in Australia's wild catch commercial fisheries were 22 times higher than the nation's all industry average in 2010/11 (Ruscoe 2017, p.2).

While there's been significant research and training undertaken on the implementation of safe work practices amongst commercial fishermen, these do not appear to have had any marked impact on reducing the number of fatalities (Dzugan 2010; Franklin 2015; Jarrett 2017; McBain-Rigg 2017; Thomas 2016). Consequently, this review seeks to track the evolution of the research undertaken both theoretically and practically into methods to reduce fatalities and injuries and increase work safety amongst fishermen, to identify any gaps in existing research, and uncover the most appropriate approach(es) to identifying barriers to the adoption of safe work practices amongst commercial fishermen.

There is a range of research (not fisheries specific) into WHS that identifies pathways to addressing the barriers to change, and therefore the adoption of safe(r) work practices. This work, along with fisheries specific research, identifies a general evolution in WHS focus from environmental factors (i.e. equipment, including personal protective equipment) to systems of work (i.e. training, procedures and process) (Bronfenbrenner 1977; Johnson 2011; McLeroy 1988; Prochaska 1997; Townsend 2013). To track this evolution, this review steps through commonly utilised social and WHS theoretical frameworks; approaches that have been trialled in the Australian commercial marine fishing sector; the experiences of other industries (transport, aviation, health care, and education); and research into regulatory compliance and behaviours, leadership, training and perception of risk, as they relate to potential barriers to adoption of safe work practices. We then turn to the research into the psychological factors that influence WHS, including why people do and do not adopt different (safer) practices. Finally, in the context of a discussion of the key emergent themes and theories, we posit a hypothesis as the foundation for the methodology of the project.

There is much that can be learnt from other industries in the evolution of the WHS profession. The endeavour here is to seek the cross-over between traditional research, recent theories and tested approaches, to apply to the Australian fishing industry to identify how existing barriers to improved WHS outcomes may be overcome.

2. TERMINOLOGY

The term 'Work Health and Safety' (WHS) is subjective, often used to describe the multidisciplinary field associated with managing risks to the health, safety and wellbeing of workers. Most commonly, it used in the context of legislation and regulatory compliance, the sub-term 'safe work practices' can

be interpreted as the implementation of 'risk controls'. A safe work practice(s) is a prescribed action or specified 'modus operandi'. For example, to '*implement* safe work practices' may include: a ruling not to go to sea in poor weather; the installation of a physical safe-guard; enforcing the wearing of safety harnesses; requirements to follow set procedures for specified activities; and/or the provision of WHS training for various work activities. By comparison, and as is used here, the '*adoption* of safe(r) work practises' refers to the cognitive, social and ecological factors which influence the choice to – or not to – implement safe(r) work practices.

Two terms that arise in discussions of WHS are '*incident*' vs '*accident*'. An "*accident is considered as an undesired event, which harms the individual physically. An incident is considered as an event, which may have led to an accident if the operator had not rectified it,...*" (Vidal-Gomel and Samurçay 2002). The pertinent point being that, if individuals can rectify 'incidents' they will not become 'accidents'. This distinction may have a level of relevance if the objective is to identify fault - or the source of the cause of the event. However, this technical differentiation is often ignored and these terms are commonly used interchangeably.

Seo identifies two elements fundamental to WHS outcomes; those of 'Safety culture' and 'Safety Climate'. Seo cites '*safety culture*' to be the beliefs, values, attitudes, and patterns of behaviour that a group of people share with respect to safety (Health and Safety Commission, 1993 Cited in Seo 2004), and which shapes WHS outcomes. By contrast, the 'safety climate', is a snapshot of the perceived state of safety by the participants in that industry or organisation, at a point in time. The safety climate can be used as a proxy for the underlying safety culture of a work group or organisation (Flin et al. 2000), providing an insight to the preconditions for accidents and incidents in the workplace.

3. RESEARCH INTO FACTORS AFFECTING WHS

The genesis of accident and incident causation models used in the WHS profession is generally agreed to be William Heinrich (Heinrich; Johnson 2011) in his work on industrial accident prevention from 1931 to 1959. His fundamental contribution to the thinking in relation to WHS was the assertion that accidents are caused by unsafe behaviour or human error and that removing the conditions that predispose those acts, or modifying the behaviour of the individual was the easiest and most effective way to prevent injuries (Seo 2005). In recent decades links between psychological and/or socio-ecological factors and WHS outcomes have emerged, identifying a more complex, non-linear landscape for addressing WHS. This has been summed up in the assertion that *'...accidents can be thought of as resulting from combinations of mutually interacting variables which occur in real world environments and it is only through understanding the combination and interaction of these multiple factors that accidents can truly be understood and prevented'* (Hollnagel ,2010 as cited by HaSPA (2012) p.3). Seo discusses this non-linear more complex theory of WHS causation in his work, citing research that has shown organisational and cultural factors to have a considerable effect on work behaviour and safety outcomes (Seo 2005).

A number of other industries, including aviation, healthcare, mining and the railways have undertaken extensive research into factors affecting WHS outcomes and have identified that culture in the form of overall industry/organisational context are fundamental to the improvement of WHS.

McFadden & Towell (1999), who undertook research into factors underpinning aviation accidents and incidents, identified four elements to accidents: environmental; airline specific; aircraft specific; and

pilot specific factors. The environmental elements were those of cockpit noise and temperature, with weather being a primary cause in only 5% of cases, but contributory in many (ibid, p.178). It was found that fifty percent of accidents happened during high workload phases of flights and that conversely, over-automation tended to decrease pilot situational awareness (ibid) (noteworthy in the context of auto navigation in fishing vessels). They also found that organisational decision-making processes impacted personnel through recruitment and training ethos and implementation, and that work procedures and/or training and corporate culture that focussed on team work and communication between team members, reduced errors. Given traditional aviation perceptions that accidents originate within the personal attributes of a worker or pilot (age, experience, gender, personality traits and alcohol misuse have previously been linked to pilot error) McFadden and Towell investigated this and identified that, while accidents and incidents decreased with the age of pilots and eventually level off with older pilots (and their commensurate experience), decreases in accident rates were not aligned with gender or any personality traits, with the exception of "adventurousness" (ibid p.179). A history of 'driving while intoxicated' (DWI) did align with higher risk of accidents, however pilots were sober in all cases. Therefore, it was concluded that while DWI history may be a marker of risk-taking behaviour or poor judgement that infringes upon their work environment, other internal personal attributes were not. Their study concluded that a proactive focus on the combination of environmental as well as individual factors is most effective in decreasing accident rates. Significantly, programs are now designed around changing organisational culture away from punishment, and towards a system that encourages the disclosure of errors that is free of blame (ibid, p.183, Edmondson 2004).

Another industry group active in investigating factors affecting accident and incident rates is the Australian railways, with work relevant to interests here being published between 2008 and 2013. Baysari et al. (2008) undertook research into the factors underpinning the large number of accidents that were perceived to be resulting from attention failures. They found that inadequate equipment design by the organisation frequently contributed to the large number of accidents resulting from attention failures. However, it was also found that improvement to resource management, organisational culture and processes were critical to incident reduction. Similarly, Read et. al. (2012) found that rail accidents could be understood in terms of systematic, as well as individual, contributions to their causation. They analysed 96 reports of events between 1999 and 2008 and identified that task demand factors (high work load) were significantly more often associated with skill-based errors, knowledge and training deficiencies; and where violations of process occurred these were significantly linked to social environmental (cultural) factors. Combined, this research underlines the interrelationship between social environmental factors and organisational/workplace culture and structure, rather than on individual personal factors alone.

In the area of healthcare, Townsend and Foster (2013), who investigated the promotion of healthy eating in schools, found that an individual's social environment overrides their personal traits, as articulated by healthier eating choices upon being subjected to social and normative pressures. Particularly of note, their research found that rules and policies had a greater association with students choosing to eat *un*healthy foods where the option was still accessible. Davies and Delaney (2017), also working in the area of healthcare but utilising the WHS approaches adopted in the aviation sector (McFadden and Towell above), found that directly adopting the same methods in the healthcare industry did not reproduce the same effectiveness, as the operating environments were so fundamentally dissimilar, and the approaches were consequently out of context. They did,

however, identify three concepts that provide generic guidance to the development and implementation of safety processes. These were; investment in safety; human factors[1]; and safety management systems. Human factors were articulated by the aviation expert R.B Lee, who likened the operating theatre to the flight deck in suggesting that a "patient [may be] harmed by multiple factors of 'less than optimum personnel, equipment, and working conditions, because of hospital policy, which is in turn determined by government" (Davies 2017).

The aviation industry's experience with aircraft design and manufacture that had not considered human limitations, was acknowledged to have built weak elements into WHS management systems limiting its effectiveness (Davies 2017). The health care industry's consequent focus on the introduction of processes around cognition, perceptions and ergonomics, compared to previous foci which was limited to fatigue, workload and communication, found that optimum effectiveness was achieved where all contributing factors of the work and human relationships are considered (ibid). In developing a WHS management system, Davies and Delaney noted that in both aviation and in healthcare, these systems are only effective when employees were involved in the development of all safety activities, especially reporting hazards before an incident (ibid, p.672). Specifically, that an improvement in WHS can only occur in the context of open, blame free communication of issues and events, both before and after events.

Critically, regarding the three concepts (safety investment, human factors and safety management systems) guiding the development and implementation of work health and safety approaches, Davies and Delaney found that the three factors were only effective when applied in unison, across the whole of the system (ibid, 67-671). They concluded that organisational and/or industry culture is fundamental to the nature of safety in a sector, regardless of investment in training or the development and adoption of safety management systems (ibid, 673-674).

In summary, regardless of the type of industry, the WHS outcomes are determined by not just the experience and training of an individual but the governance (as well as physical) environment in which they operate.

Furthermore, Seo (2005) identified the safety climate (perceived management commitment, supervisor support, co-worker support, employee participation and competence level at a point in time), in addition to perceived hazard levels, work pressures and risks, as key contributing factors influencing the exhibition of unsafe work behaviour. As is becoming clear, and will be further clarified in the following discussion, the social or operating environment, is posited as a key component of establishing and maintaining a safe and healthy place of work.

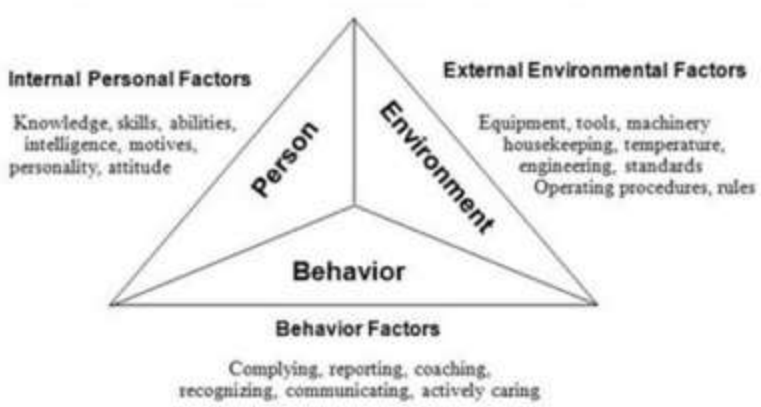
In line with these findings, Havinga et.al (2017) reported on WHS investigations of everyday work in the mining industry, identifying that WHS related administrative processes (i.e. rules, procedures or formal training) may well be invisibly 'worked around' to fit the social norms of work crews or individuals, to make 'sense' to them in their differing environments. Importantly, it found that a strong

[1] Davies and Delaney utilise the term 'human factors 'in the context of the interaction and integration of rules and policies with equipment, environment and humans (Davies and Delaney, 2017, p.670)

culture of safety (safety culture[2]) was linked with high safety performance and low risk acceptance, and that by comparing the norms amongst workers, effects of the working environment (organisational/social/structural) on behaviours can be identified. Importantly, Havinga et al., underscored the need to identify safe work practises within a business or organisation as a key component in being successful and productive, rather than 'box ticking' in administrative processes. Further Flin et al. (2000) identified that safety climate was an effective lead indicator of WHS, compared to lag indictors of accident and fatality rates (ibid, pp.177-78).

Across four industries groups, other than fishing, the research discussed here identifies that the interplay between WHS management and socio-cultural systems, affects individual behaviours (human factors) and cannot be ignored. Further, to deal with one of these alone will not optimise safe work practices in the workplace. As importantly, an industry or organisational culture of open interactive and inclusive WHS problem solving, not just the organisational or workplace structural environment, is a key factor in influencing individual behaviours, and therefore the adoption of safe work practices. Summarising these findings, Vierendeels (2017) and Geller (1994) identified this when looking to the culture of WHS in industry groups and organisations. They identified the three components - Personal (commonly focussed on as knowledge and skills); Environmental (commonly focussed on as 'equipment'); and Behaviour (see Figure 1). The key factor that both Vierendeels and Geller focus on is that the three of these factors are inextricably related and that what happens in one area affects another. To focus solely on one or even two of the elements is unlikely to create a positive and sustainable safety culture that generates a reduction in fatalities.

Figure 1; Total Safety Culture model by Geller (1994) as cited in Vierendeels (2018) p.324

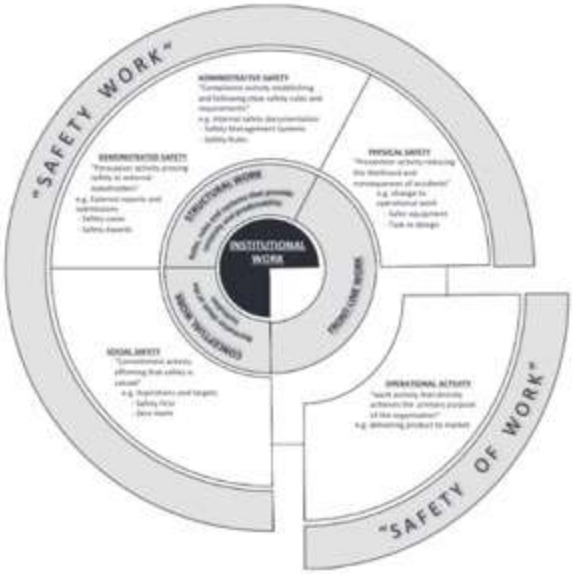


Further to this,(Provan, Rae, and Dekker 2019) posit that WHS can be broken down into two components; 'Safety Work' and the 'Safety of Work'. 'Safety Work' includes organisational performance related activities, the purpose of which is to *manage* safety. This contrasts with the

[2] Safety culture can be defined as the beliefs, values, attitudes, assumptions and patterns of behaviour that a group of people share with respect to safety; while safety climate is a "a snapshot of the state of safety providing an indicator of the underlying safety culture of a work group, plant or organisation" (Flin et al., (2000) Measuring safety climate: identifying the common features, Safety Science, 34: 177-192, p.178)

'Safety of Work', which includes goal-directed activities which focus solely on the prevention of injuries. 'Safety Work' is expressed in the development and implementation of WHS management systems that define how people should behave in order to prevent injuries, and can be related to the 'Behaviour Factors' as identified by Geller.

Figure 2: Safety Work Vs the Safety Of Work (Provan, Rae, and Dekker 2019:277)



Further, the 'Safety of Work' can be related to 'Internal Personal Factors' – e.g. attitudes, experience and motivation - to stay safe at work. Significantly, the element in Geller's model that is often missed in the adoption of these behaviour factors that comprise Safety Work, is that of 'actively caring' by all those involved in the safety of an industry - regulators as well as operators. This is the link to Internal Personal Factors; that of ensuring the relevance of compliance, training, reporting etc. to the circumstances of the individual (as found in the healthcare industry when attempting to apply aviation WHS principles directly). Without these two elements interacting the overall safety culture is minimised or fractured.

Seo, in his work to understand WHS cultures (Seo 2005; 2004) explored the interplay between different influencers in relation to WHS outcomes, and further, with the identification of five factors found to influence the safety 'climate'(and therefore 'culture'[3]) of a group (industry or organisation). This included perceived levels of commitment or ability in the areas of: management; supervisors; co-workers; participation in the development of safety programs and competence to work safely. This

[3] The term 'Climate' is commonly used to articulate a "superficial... snapshot' or state in time that is "quantitative"; whereas 'Culture' is associated with the long term lived and "stable, qualitative", experiences of individuals in a group (Seo et al. 2004). Seo identified the climate as a proxy measure of the culture of a group.

theoretical approach delivers a means to conceptualise and articulate the interplay between the three elements of safety culture as identified by Geller. The elements identified by Geller, may be crossed referenced with those of Seo's construct as follows:

Figure 3: Interplay between Safety Climate and Total Safety Culture

The purpose of looking at these two concepts together is that they clearly converge on the conclusion that a singular or only dual focus in any of these elements that comprise the WHS culture, will not optimise positive outcomes of any WHS approach. Ideally, the cross over at the centre point is optimised to maximise positive WHS outcomes, and would represent a strong safety culture.

4. AUSTRALIAN FISHING RESEARCH, FINDINGS AND GAPS

While there has been a focus on investigating fatalities in fisheries, there has been significantly less in relation to understanding the social context in which these are occurring (person and behaviour in Geller's model; Fig. 1). In reviewing the recent literature, three pieces of work specific to the (commercial) fishing industry stand out and encompass all available past literature in their findings.

The first of these is Brooks (2011), which included a desktop review of all published academic, government (State/ Federal) and industry reports on injuries and fatalities and their environmental causes, in Australian fishing between 1983 and 2011. It identified that the rate of injuries and fatalities to be declining until 2006, when that trend appeared to begin to reverse. The reduction in fatality rates up until that point was attributed to the effects of the introduction of quotas (thus removing the 'race to fish') and an '*increasing awareness and concern for the lack of attention being paid to Occupational Health and Safety issues in commercial fishing*' (ibid, p.27). While the review noted the introduction of the Fishing Industry Advisory Committee (FIAC) in 2001, crediting it with generating a focus on building compliance with WHS legislation, the need to continue to link regulatory processes more effectively with the pressures on fishers and the context of share fishing arrangements was also recognised. Significantly, the review also identified that a strong focus had been given to research into drug and alcohol use, (commonly acknowledged by the industry as the cause of many poor safety outcomes amongst fishermen, but not found to be a unique factor to the fishing industry, in contributing to fatalities), and the lack of Personal Flotation Device (PFD) use, which was identified as

a significant contributing factor to fatalities, and therefore presented an opportunity to reduce the numbers of commercial fishing fatalities. Interestingly both factors focused on align with Heinrich's linear model of WHS causation. Academic reports however, noted that it was the lack of a *safety culture* that was the most significant factor in fatality rates in the commercial fishing industry, both nationally and internationally. *"The number of these could be most effectively reduced through an overall focus on raising the awareness and perception of real risk amongst fishermen and providing them with clear directions as to what actions will keep them safe and to avoid ending up in the water in the first place."* (ibid, p.28).

In 2015, Safe Work Australia (2015) published a report on the perceptions of WHS collated from two national surveys; the 'Work Health and Safety Perceptions Worker Survey 2012' (N=1311 workers (ibid, p.31)) and the 'Health and Safety at Work: your experience and costs 2014' (N=2350 businesses including 706 sole traders (ibid, p.33)), which were both self-reported surveys and sought to identify sources of WHS information. The report didn't disaggregate the rural industries group of 'Agriculture, Fisheries and Forestry', however is still instructive in identifying the main sources of WHS information for rural industries as the media (magazines, television, radio, newspapers)(Ibid); and for those working alone (sole traders) in addition to the media, experience/doing the job itself as the next most common source (ibid,p.12). In relation to media sources, the report notes that while workers and employers both reported that media, meetings at work and industry pamphlets were the key sources of information on WHS, *"The Internet has become an increasingly popular mode from which workers have learned about work health and safety information since 2010"* (ibid, p.16). Formal sources such as government and regulatory agencies are far less popular, and that 'walk-arounds' at work are the most common way to communicate WHS issues in the workplace.

> *"The most common process for employers to provide work health and safety information to workers in 2012 and 2014 was through walks around the workplace with managers and supervisors and information communication with work mates regarding work health and safety (for example through conversations)."* (Ibid p. 28)

The Fisheries Research and Development Corporation (FRDC) has funded and supported numerous projects focussed on improving WHS in the commercial fishing industry for many years. In 2017, the FRDC published a review of those projects funding the development of Safety Management Systems, nationally, to meet the National Standard for Commercial Vessels, Part E Operations (Ruscoe 2017, p.2). This was in effort to address training and knowledge barriers for some sectors of the industry who were unable to engage in the Australian Maritime and Safety Authority's (AMSA) workshops for risk management and Safety Management System (SMS)[4]. Barriers to engagement with these workshops were due to location, timing, language proficiency or sector specific customisation needs (ibid). The report reviewed the delivery of ten projects across six states of Australia, which reached 1,050 fishers who attended sector specific SMS training. A further objective of the funding was to build an improved culture of safety in the industry, particularly of smaller operators most at risk, through capacity and knowledge building. The premise for this approach to developing the safety culture of

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[4] A Safety Management System (SMS) is a systematic approach to managing safety, introduced in the new National standards at that time. (See, *Safety management systems* 2018, Australian Maritime Safety Authority, , <https://www.amsa.gov.au/vessels-operators/domestic-commercial-vessels/safety-management-systems> Accessed 18 January 2018.)

the industry was that industry led training on compliance would raise the '*industry's commitment to safety and to make safety top of mind in day to day operations*'(ibid). It sought to support to this objective through developing the resources and the internal capacity of industry bodies, and therefore to increase support for operators in implementing their SMS.

At the end of 2013, a fisher in the Northern Prawn Fishery (NPF) tragically died, prompting the Northern Prawn Fishery (NPF) to refocus its efforts and adopt a new approach to improving the WHS of the fishery (Jarrett 2017). The industry body for the NPF engaged Sentis Pty Ltd to roll out a cognitive-based WHS training program, which was based on the principles of applied psychology and neuroscience and underpinned by the theory that sustained behaviour modification relies upon an individual's understanding of internal motivations, knowledge, and tools for intervention. The training sought to educate individuals with a view to empower them to make better decisions, and to allow them to consciously change the way they respond to their world; particularly in relation to the adoption of safer work practices (Jarrett 2017). A review of the effectiveness of the training (which was part of the project[5]) found limited retention of learning due to a lack of contextualisation of the training to the challenges faced by the fishers. The training had not considered the environmental (vessel environment) or social and normative (crew and skipper dynamics) learning context of fishers, and hence lacked personal relevance (Sallis 2015; Sutinen 1999).

The research undertaken in the fishing industry identifies a contribution to downward trends in fatality rates from changes in operating environments and an increased focus on compliance through the introduction of FIAC. Compliance was again the motivator for the range of projects funded by FRDC and reported on by Ruscoe (2017). To date, no further work been done on the issues raised by Brooks (2011) regarding the lack of understanding around the safety culture of the industry, or the effect of the nexus between regulatory arrangements and pressures (perceived or real) on fishers. Further, the findings of Jarrett and Laird (2017), which focussed on the implementation of cognitive-based training with fishers (skipper or crew) without consideration of their overall social and operating environment (social, business, and regulatory influences), was not progressed. Interestingly, the research undertaken by Safe Work Australia (2015) highlights that procuring and absorbing WHS information is highly socially contextualised, for both employers and workers in the rural industry sector.

The key gap that emerges from this body of work, in combination with the research undertaken in the WHS space, is that WHS guidelines and training in general, have not been contextualised to include how fishers perceive and respond to their environment and its risks (with the exception of the Spencer Gulf Working Code of Practice', but which is restricted to weather alone), nor by the socially constructed normative and experiential learning that frames their behaviour. This suggests that the inability to achieve lasting benefits through WHS training programs (a focus on the 'person' per Figure 3) is likely associated with rational cognitive approaches (Kajewski 2012) or paper based certification requirements. The lack of relevant contextualisation of WHS compliance and reporting processes covered in training regimes, to the informal experiential learning gained by fishers through performing tasks in relevant every day contexts (Clardy 2018) is likely to be a key contributing factor to current WHS outcomes.

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[5] The NPF project was funded through a Research Project grant (PRJ-010060) through the Rural Industries Research and Development Corporation (now Agrifutures Australia).

5. FISHING INDUSTRY WHS

5.1 Regulatory compliance:

Traditionally, governments have used regulations as a means to manage the behaviour and nature of an industry, including the WHS of people within that industry ('Behaviour' in Geller's model, Figure 1 or 'Personal' in Figure 3). The fact that the Australian commercial fishing industry is a largely disconnected and non-corporatised industry with a high rate of injuries and fatalities has inclined previous regulatory bodies, such as state safe work agencies and Safe Work Australia to reinforce the use of regulatory frameworks in an attempt to manage industry compliance. However, as indicated by the Health and Safety Professionals Alliance (HaSPA, 2012, Introduction p.11), the structure of factors influencing WHS outcomes is far more complex than regulation and compliance enforcement.

Driscoll et al. (1994) researched (via coronial files) investigations into work-related fatalities in the Australian commercial fishing industry. As the research was undertaken on the basis of coronial files, it was only able to identify environmental factors such as weather, non-seaworthy vessels, availability of PFDs etc., presenting a valuable example of the traditional focus of WHS incident and accident investigations as implemented in the fishing industry. That is, examinations of accidents and incidents have focused the on the environmental factors ('Environment' Fig 1) and where included, the behaviour of the individual involved ('Person' Fig. 1). However, in regard to behavioural, due to their deaths, individuals involved could not provide any commentary on the social/ecological or psychological factors that may have led them to the choices they made. The investigation into the foundering of the RV Returner (Jess 2016) followed this pro forma, concluding that a rapid deterioration in weather conditions challenged the unstable condition of the vessel, which subsequently capsized (ibid, pp.3-6 & 60). The report commented on the circumstances that contributed to the accident, being the design instability of the vessel; the weather; and qualifications of the master and crew (which were all current and appropriate to the operation per the Regulations relevant to their operations). What is evident from the report was that there were a number of opportunities for different decisions to be made - by the vessel owner and the Surveyors of the Western Australian Department of Transport ('Behaviour' Fig. 1) - however, none of those factors were able to be investigated in this post facto context.

The nature of these types of research and reporting preclude any thorough examination of human factors in these events, such as attitudes, communication, or compliance parameters for example, and appears constrained by traditional models of causation applied in the investigation of incidents and accidents, as identified by Hovden et al (2010, p.953). They do not seek to integrate human factors[6] to any great degree, playing into basic interpretations of WHS causal factors that, unintentionally or otherwise, place fault solely with individuals who made choices that contributed to their deaths - i.e. going out in bad weather, not wearing a PFDs etc. - assuming it was a conscious and deliberate choice to engage in 'excessive' (as assessed by an observer) risk-taking behaviour, and after the fact. It should also be noted that fishing is commonly acknowledged to be a high-risk activity. However, as with any high risk activity (farming included) risk becomes 'normalised' with familiarity, and the risk taker's

[6] Human factors being the interaction and integration of rules and policies with equipment, environment and humans' attitudes.

perception of risk becomes altered compared the 'onlooker', by choices such as voluntary versus involuntary activities, and demonstrable benefits (Botterill and Mazur 2004).

As a corollary to this, in its recent report, the European Commission (2016) found that in order to gain compliance with regulatory WHS requirements amongst small fishing vessels, information had to be contextualised to fisher specific circumstances for them to identify any relevance to themselves. This finding comes some fifteen years after it was identified by Sutinen and Kuperan (1999). Sutinen and Kuperan sought to investigate why people do and don't comply with regulatory requirements, and why the pure deterrence model - based on instrumental models of personal benefit/self-interest - do not generate high levels of compliance (ibid, p.174). They posited, through a literature review and deductive reasoning, that the use of Cognitive and Social Learning theories explains the existing formally learned knowledge of systems, compared to the effects of environment (social norms) which shapes actual behaviour. Further, they identify that while instrumental motivations to avoid penalties may make sense individually, normative motivations transcend these. That is, what is considered 'just', 'moral'[7] or normal, in the social context or group in which the individual operates, will override personal gain in order to maintain a social position or approval, even unconsciously. Significantly, Sutinen and Kuperan identified that compliance behaviours are predicated on whether regulations are considered *equitable* (rather than simply applied 'equally') and make 'sense' in the context of the individual's prior lived experiences.

In summary, Kuperan and Sutinen (1999) identified that social learning (based on group norms) has a greater effect on the behaviour of individuals when it comes to compliance with rules and regulations, compared to cognitive/rational training or pecuniary measures. They conclude that social norms define how individuals perceive and personally define legitimacy and fairness, significantly affecting the response of individuals to compliance measures.

When investigating Australian fisheries risk assessment procedures in national compliance programs Sarti (2006) came to the same conclusions as Kuperan and Sutinen. Sarti highlights the ineffectiveness of *forced compliance*, and the need for fisher cooperation / voluntary compliance (ibid, p.1). In exploring the factors associated with why people choose to breach fisheries regulations, Sarti identifies that *'Peer pressure and social influence can play a significant role in influencing an individual's attitude toward compliance'* (Ibid). Sarti concluded that while compliance requirements and risk management tools may exist and fishers be aware of them, the challenge remains cultural:

> *'Acceptance and implementation of risk assessment procedures within fisheries compliance now relies on breaking through some cultural barriers and encouraging the use of the resource package as a regular component of fisheries compliance management.'* (Ibid, p.31)

Similarly, Roberts (2017) , while concluding that 80 to 90% of incidents are caused by individual behaviours (despite rigorous WHS management systems), posits that fisher behaviour is not a conscious cognitive process, and that fishers may re-interpret events to externalise or justify their behaviour around events. This research further identifies the likely ineffective result of cognitive/training approaches, and posits that focus should be given to balancing cognitive training

[7] 'Just' or 'Moral' are defined by Sutinen and Kuperan as those behaviours or actions that are extrinsic to personal material benefit, but intrinsic to personal non-material rewards and equitable behaviour (ibid, p.180).

with developing relevance of safety regulations. Roberts also suggests that connecting social networks of influence between regulators and fishers to bridge the social normative gap would be beneficial. This equates to building bridges of communication between the 'Personal' and 'Behaviour' in Geller's model (Fig 1.).

From this literature, a conclusion emerges that cognitive (or conscious intellectual) approaches (e.g. WHS management systems or 'Safety Work', training, regulation and compliance enforcement) to effecting safe work practices are unlikely to succeed where they conflict with the lived experiences of individuals in their work environment. If the regulation or process doesn't 'fit' with their world view they will find it hard to adopt altered behaviours, or may even actively violate regulations though undertaking 'work arounds', in order to stay, what is in their minds, 'safe'. These findings resonate clearly with the experience of the aviation, healthcare, rail and mining industries, and point to seeking further understanding as to how the fishing industry can move beyond this structural cultural impasse, caused by the lack of connection between the three elements of culture - Personal; Environment; and Behaviour - as identified by Seo's work (2005; 2004) (Fig 2).

5.2. Industry leadership:

As noted by Sarti (2006), the culture of industry and organisations is considered a key element in effecting a change in practices, which according to Geller, can only be brought about by ensuring equal focus on and interaction of the three elements - Personal; Environment; and Behaviour. An extensive amount of work has been undertaken in Norwegian fisheries in this area, and more generally in Australian rural industries. This body of work is useful in examining the common themes and conclusions it makes about the role of leadership, and in what forms it is most effective in influencing improved WHS outcomes.

Lindøe (2007) undertook a comparative analysis of fatality frequency rates between the petroleum and fishing industries; including the similarities and differences in how internal, external and regulatory stakeholders responded to major and fatal incidents and accidents. The research findings emphasised the importance of established 'feedback loops' between stakeholders, to ensure learning and continual improvement and furthermore to reduce the likelihood of recurrence. In this context, it identified the role of culture in each of these industries and how leadership in connected social networks can foster helpful WHS norms (and therefore compliance) (ibid, p.37). In a similar desktop analysis of fatalities of the Norwegian fishing fleet alone, which highlights a significant reduction in fatality rates in the period between 1990 and 2011, McGuiness et al. (2013) identified the importance of collaboration between stakeholders in order to promote changes in fisher attitudes and a safer work culture (ibid, p.346). They identified that during this period there were significant legislative and regulatory changes to direct the desired behaviours, however they noted that:

> *'...the various fishermen's organizations have contributed strongly to changing and evolving attitudes and increasing safety culture ...in the fleet. This role of the fishermen's organizations has increasingly led to a stronger and integrated safety focus in the management of the fisheries and fleets in Norway'*. (Ibid)

Further to this, Thomas (2016) found that upon transitioning from a disaggregated fleet to a cooperative business venture, a key factor for success was in the demonstration of industry leadership; not only economically, but in improving the culture of WHS. The study identified that aside from legislation, regulation and enforcement; the combination of industry leadership and leveraging

economic sustainability were fundamental in facilitating the adoption of safe(r) work practices, which are subsequently viewed as a key element in achieving the hallmarks of a sophisticated and trustworthy business.

In Australia, Kilpatrick et al. (2012) and King et al. (2014) undertook research to explore how farmers and fishers stay healthy in times of stress and to discover the causal factors for prominent health issues. The authors each noted that fishing industry organisations have considerable scope as a conduit of health and safety information and support to generate benefits, due to the positive perceptions of fishers. Together, this research identified a link between job insecurity due to the nature of fishing, mental health issues and the ability of fishers to engage with regulatory requirements (and to adopt safe(r) work practices), underlining the socioecological effects on individual behaviours.

In summary, while research findings, regarding the nexus between industry leadership and the adoption of safe work practices, is largely deductive, when combined with the research by Geller in regard to ensuring equal focus on the personal, behavioural and environmental factors to ensure a safe and healthy culture of work, the role of leadership – in the tapestry of elements that either facilitate adoption, or generate barriers to it – is evident.

5.3 Training

In all industry sectors, training (whether it be content or the methods used) is seen as fundamental to the facilitation of positive WHS outcomes, however it is often perceived as the key and only element required to achieve both positive outcomes and to be compliant with WHS legislation. Training is, however, only targeting two of the three elements of culture identified by Geller (1994) and Vierendeels (2017) ignoring the role of how regulatory, reporting and compliance elements are developed and implemented in the element of 'behaviour'. A large amount of research has been undertaken into WHS training in both fishing and rural industries more generally (as noted in regard to FRDC investments and the work of Ruscoe (2017)). In the context of understanding what the barriers are to the adoption of safe(r) work practices, it is valuable to look specifically at what the research into training tells us about the effectiveness of these approaches to date.

Franklin et al. (2015) undertook a study to establish why existing WHS solutions had not been implemented across the various sectors of rural industries. Significantly, their research, undertaken via a series of Delphi surveys and focus groups, found that WHS training has to be contextualised by industry sector (a factor also recognised by the European Commission (2016)). The report focused on the need to understand the external political and economic factors that contribute to attitudes and beliefs about the environment, and therefore the relevance - or legitimacy (Sutinen 1999) - of regulations and associated training. Of the ten key barriers identified by the report, only two (20%) were associated with training requirements in the form of access to information or improving knowledge about WHS requirements. The remaining 80% related to leadership, environmental relevance, costs and time to undertake implementation of legislative requirements (Franklin 2015). Rather, they found that the role of social networks and personal connections were fundamental to the development of a safety culture and the credibility of safety messages, despite the fact that risk perceptions didn't appear to change:

> *"...development of a social network of farmers focused on risk manageability (through regular gatherings to analyse incidents and accidents, while a further set of farmers also received*

information about risk and accident consequences), indicated that the support of others led to increased safety activity and a concomitant reduction in stress and risk acceptance among the total sample." (Ibid, p.17)

This conclusion, that training alone is inadequate to effect change in WHS behaviours (Clardy 2018), was also endorsed by Dzugan (2010). Dzugan identified safety training as inadequate to effect changes in behaviour as it did not embed, or build upon, the normative and social learning of work practices. Further, Hall-Arbour and Mrakovichich (2008) and Levine (2010) identified that amongst US fishers, while training increases awareness of risks (as perceived and articulated by the trainer), a number of factors - social endorsement, maintaining a natural environment, leadership, participation and timing - are essential elements that determine the effectiveness of the training offered. They also found that the perceptions amongst fishers of, risk (denial, trivialisation, fatalism) and control (locus of control being perceived as external) were significant contributors to their receptivity to safety training (ibid, pp. 202-204). Within the same vein and in the context of Australia, both Braithwaite (2011) and McBain-Rigg et al. (2017) identified the importance of social influences on adopting and embedding WHS behaviours, whilst conscious intellectual learning processes were recognised to contribute positively, but to a lesser extent. Across a variety of sectors and fishing industry groups, it is repeatedly identified that training or other classroom processes are contextualised by social relationships which play an essential role in the adoption, facilitation or blockage of safe work practices. That to ignore these influencers, is to risk the effectiveness of that training.

5.4 Perceptions of Risk

As noted above, the perception of risk amongst fishers and farmers and how they construct their perception of their environment is not necessarily a conscious process, but rather a combination of rational and limbic (emotion and memory) responses to experiences, current situations and social expectations (Botterill and Mazur 2004). Törner and Eklöf (2000) and Eklöf and Törner (2002) discuss how mitigating risk cannot be effectively achieved through intellectual processes of awareness raising, but rather is more effectively achieved through active learning and experimentation to learn to control risks. They identified that when fishers perceive risk factors to be out of their control (i.e. fatalism) and/or the value of risky behaviour outbalances the risks they mitigate; then it's 'worth taking the risk' – a finding endorsed in research by Bottrell and Mazur (2004) into risk perceptions in farming. They further endorse previous findings, that open communication and experimentation in a blame free atmosphere are necessary to generate fisher engagement with alternative WHS behaviours that may be less 'risky'. In the context of fishers perceiving that the risks they face are out of their control, risk management (or the 'Safety of Work' per Rae and Provan's (2018) discussion) is identified as an ingrained and integrated part of fishers' work and is a culmination of shared (normative) beliefs and practices (Thorvaldsen 2013; Thorvaldsen 2015; Thorvaldsen 2014).

This understanding of the risk perception of fishers (and consequent behaviours) conflicts with the view that fishers – based on scientific and technical understandings of safety – are intrinsically 'not safe'. The result is often heavier compliance measures or greater training; neither of which according to the previously discussed authors are proven, academically or in practice, to be effective in altering the overall culture of WHS (and resultant WHS outcomes) in the long term. A further potential danger of a regulatory approach, is that pressures of greater compliance with behaviours that are counter intuitive to fishers, introduces active non-compliance because of social and learned norms of behaviour that override instrumental motivations (Christiansen 2017; Sutinen 1999).

6. FACTORS AFFECTING BEHAVIOURAL CHOICES.

6.1 Psychological Factors

There are agreed fundamental principles of neuroscience in the adoption of safe(r) work practices. These include locus of control; risk awareness; operating attitudes; stress management; attention regulation; professional orientation; self-efficacy and active care (Sentis Pty Ltd 2011). However, there is also the element of psychological safety that underpins the ability to optimise these functions (Edmondson 1999; Edmondson 2004; Frazier 2017; Hirsch 2017), being: role clarity; peer support; experimentation and information sharing. Psychological safety is established through a combination of both structural factors (e.g. context support and team leader support) and interpersonal characteristics (e.g. beliefs, attitudes, feedback, support). In combination, these influence learning and performance in a team, and are particularly relevant in circumstances where new or alternative behaviours are being introduced (Edmondson 1999).

Hopkins (2011) demonstrates in his case study of the Gulf of Mexico Oil Well Blowout, that psychological safety is dependent upon the construct that WHS exists within. In that instance, the focus of the informal WHS audit being undertaken was given to personal safety issues (generally considered as high frequency, but low impact events such as slips, trips and falls) rather than on process safety issues (i.e. the verification of risk controls to prevent low frequency, high impact events). Senior management and supervisors relied on administrative controls to ensure certain conditions existed, rather than checking on the behaviour undertaken to achieve those conditions and whether or not 'work arounds' or short cuts were being taken to achieve process milestones. When supervisors asked if things had gone well with tests, they were given the expected answer, and any work arounds were ignored to achieve the expected outcome (ibid, pp.5-8). While the team leaders and senior personnel believed they were being supportive and respectful of the status of the on-site rig manager by asking a relatively closed question ('if the reduced pressure test had gone well') and not enquiring as to the details of the results of the test, they set up the subsequent disaster at a point when there was a clear opportunity to prevent it. This was because of the hierarchy of the organisation and they didn't want to disrupt their workflow or imply there was doubt as to the professionalism of the operators (ibid, p.8). The psychological safety induced by very clear boundaries that no one expected to be crossed, prevented open and blame free communication. In the case of fishers, the psychological safety of industry members may be based upon an acceptance of the risks, ignoring the effects of individual work arounds that fishers find to save time and/or money This is further embedded by an enforced adoption of process/administrative controls such as Safety Management Systems (SMS's) which ignore work arounds. Combined, these two factors may be contributing to a 'blindness' of fishers to focus on effectively improving management of risk on board their vessels.

Consequently, while factors such as non-questioning reliance on administrative controls can deliver a level of psychological safety (i.e. regulatory compliance and avoidance of penalties), they must be monitored for the issues of open and transparent, blame free communication, before any incident, to build collaborative awareness of risks and potential responses, if they are also to deliver an effective implementation of WHS.

6.2 Environmental Adoption Factors

As identified by Giveng et al.(2006) there are fundamental physical environmental issues that affect adoption rates of new equipment or changed behaviours to improve safety. Buoyancy is one such

instance, which, when fishers were asked to identify the most important features of safe and functional work clothing, integrated buoyancy was 10th on the list of user requirements (Ibid, p. 99). If the equipment they are supplied - clothing or Personal Flotation Devices (PFDs) - don't meet the nine more important criteria (waterproof, reinforced, warmth, freedom of movement, good visibility, resistant to fish hooks, ventilation, light to wear, and reduced risks of hook ups on equipment) they will not be adopted. However, where such factors were taken into account, adoption of new equipment immediately improved (Ibid,p.101). These parameters may have been real or perceived with existing equipment, or, as likely, in relation to only one type/style of equipment, resulting in a complete disengagement with all safety equipment. A lack of communication prior to the design of the safety measure, is likely to result in a non-adoption of the end result.

The work of Sallis and Owen (2015) and Prochaska et al.(1997) shed further light on the issue of why adoption does/doesn't or can't occur, and also aligns with the work of Geller(1994) and Seo (2004; 2005), with the development of the Social Ecological Model (SEM) and its potential use in uncovering the barriers to adoption of safe work practices by Australian fishermen. Sallis and Owen (ibid) discuss five principles of ecological perspectives on behaviours: multiple levels of influence; environmental context determination; influences interact across levels; ecological assessments have to be context specific; and that multilevel interventions are the most effective in changing behaviours (ibid, p.48-49). These multi and interacting levels are depicted in the following figure (**Error! Reference source not found.**). This relates to Geller's work in terms of identifying that the culture of an individual or group can be seen as sitting within the nested influence of the Community/ Organisation/ and Policy regulatory environment, and that must interact in ways that make sense to all parties for the whole to function effectively. Alternately, they become separated units operating independently and with little regard for the other(s).

Figure 4: "The Social Ecological Model"[9]

[9] Source: https://www.google.com.au/search?q=SEM+Unicef&ie=utf-8&oe=utf-8&client=firefox-b-ab&gfe_rd=cr&dcr=0&ei=aZgWve8EIvr8weG9aI8g (Retrieved, Dec.1, 2017) Adapted from the Centres. for Disease Control and Prevention (CDC), The Social Ecological Model: A Framework for Prevention, http://www.cdc.gov/violenceprevention/overview/social-ecologicalmodel.html

7. DISCUSSION & CONCLUSIONS

The awareness of, and attention to, the issue of safe work practices has come some way since the mid 90's as reported by Driscoll et al (1994), yet, the rate of fatalities in commercial fisheries compared to that of other Australian industries has continued to increase. As noted by Brooks (2011) a downward trend of reported fatality rates, has reversed since 2006. At that time, it was identified that a common lack of awareness or concern about WHS was a key factor, with it generally being agreed that the risks of the industry were accepted as part of the culture, and were consequently not questioned (ibid). Moves by corporate fishing enterprises to formalise procedures and require compliance from its workers may have contributed to a positive, albeit small, shift in the WHS culture of the industry. However, Safe Work Australia (2015) identified that the majority of WHS information sourced by sole traders in rural industries (including the majority of inshore fishers) was from the media; through 'experience/doing the job itself'; industry associations and family and friends (ibid, p.120). These findings further highlight the social construct of how workers in this sector seek, and what they perceive as, reliable sources of information around which to inform their behaviour; consciously or otherwise, and potentially due to a lack of relevance of formalised WHS processes and procedures to the lived experiences of fishers.

Aside from technical knowledge, experience and access to safe equipment, the literature reviewed here highlights the following key factors as noteworthy influencers of WHS attitudes and behaviours which, according to the SEM, are 'nested' within a range of other influences that stretch far beyond the traditional, physical parameters of a fisher's 'workplace':

- level of psychological safety - positive or negative;
- social norms and expectations;
- previous experience;

- levels of fatalism and perceptions of their locus of control;
- supportive social and industry networks of positive WHS behaviours;
- open and 'blame free' communication and conversations at all levels; and
- contextualised training to individual operating environments and experience.

Given the lack of focus on this range of factors and, contextualised by interpersonal and community constructs, this discussion leads the project to the following hypothesis:

> *Barriers to the adoption of safe work practices are related to the influence of interpersonal community, organisational and policy regulatory factors, which shape fisher attitudes and beliefs about WHS. Therefore, identifying the key elements of interpersonal and community factors affecting attitudes and behaviours within fisher groups, will provide clarification in how to best affect adoption of safe work practices of fishers.*

This hypothesis directs this research toward a methodology, that investigates the factors contributing to their workplace safety climate. The methodology will seek to identify not only the climate but also the context of how such socio-ecological factors may be either influencing or better utilised to positively affect fisher behaviour regarding the adoption of safe work practices.

ABBREVATIONS:

AMSA	Australian Maritime and Safety Authority
DWI	Driving while intoxicated
FRDC	Fisheries Research and Development Corporation
FIAC	Fishing Industry Advisory Committee
NPF	Northern Prawn Fishery
PFD	Personal Flotation Device
SEM	Social Ecological Model
SMS	Safety Management Systems
WHS	Work Health and Safety

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