

UNIVERSITY OF DERBY

It's Safe to Say? The development,
implementation and measurement of a multi-
faceted intervention to improve safety voice
behaviours amongst shop floor employees in
aircraft manufacture

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Abstract

Organisational learning is vital for improving safety performance. In order to continually enhance their arrangements for safe working, organisations must capture, analyse and act upon information regarding the adequacy and effectiveness of their existing risk control measures. One vital source of information in this regard is employee safety voice, which has been defined as “as any individual communication directed at improving safety conditions.” However, research suggests that under-reporting of safety concerns is common.

This mixed methods study aimed to a) explore the factors which influenced safety voice behaviours amongst shop floor employees in a large aircraft manufacturing organisation; and b) to measure the impact of a multi-faceted intervention that was designed using the Behaviour Change Wheel to increase employees’ willingness to express their safety voice. The study involved pre-intervention interviews and a survey that informed the design of the intervention and post-intervention interviews to evaluate the learning and impact from it.

Taken together, the findings of this research suggest that safety voice is a complex behaviour shaped by a range of individual, group, organisational and hazard factors. In particular, the study identified the importance of supervisors in facilitating safety voice and the presence of perceived in-groups and out-groups which shaped employees’ safety voice behaviours and the strategies used to express it. The intervention found that providing physical opportunities to facilitate safety voice and supervisor feedback were important elements in improving safety voice. The implications for wider industry are discussed in the context of social theory. Recommendations for future research include taking a systems approach to understanding behaviours within complex social structures.

Declaration

I declare that this thesis has been composed solely by myself and that it has not been submitted, in whole or in part, in any previous application for a degree. Except where stated otherwise by reference or acknowledgment, the work presented is entirely my own.

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1. The importance of safety voice

Hazards permeate all workplaces and are often dynamic and varied in their nature. Raising safety concerns can heighten awareness of these issues and can help organisations to identify and implement proactive measures to eliminate or reduce the risk of harm being realised (Pronovost et al., 2006). Safety voice has been defined “as any individual communication directed at improving safety conditions” (Tucker et al., 2008 p.319). According to Tucker et al. (2008), the aim of safety voice is to motivate action to improve work-related situations, processes and procedures. It includes raising safety concerns, speaking before a safety committee, reporting to external agencies or offering to teach co-workers. Indeed, Tucker et al. (2008) viewed safety voice as communication-orientated; flowing through formal and informal channels and with the potential for numerous stakeholder targets. Meanwhile, Conchie et al. (2012) defined employee safety voice as “behaviours that seek to improve safety by identifying current limitations and possibilities for positive change” (p.105). In this regard, they highlighted the dual aspect of safety voice; namely that there is a “prohibitive” element which describes employees’ expressions of concern about existing work practices or situations which may be harmful to individuals or the organisation and the “promotive” element which describes the expression of new ideas or suggestions to improve the management of risk (Liang et al., 2012). These distinctions are important because they suggest different aspects of voice are associated with different motivational factors.

Yet research suggests that a high proportion of safety issues, which include accidents and incidents, go unreported (Daniels & Marlow, 2005; Bayazidi et al., 2012). For instance, Probst and Estrada (2010) carried out a survey with 425 employees across five high hazard industries to understand the extent to which employees reported accidents to their supervisors and the factors which influenced employees’ reporting behaviour. Employees were asked to indicate how many safety accidents they experienced and reported and how many they experienced but did not report to their supervisor over the past twelve months. The authors found 71% of workplace accidents went unreported. Other researchers have demonstrated similarly high rates of safety under-reporting in a range of industries that includes

mining (Probst & Graso, 2013), construction (Moore et al., 2013), healthcare (Bayazidi et al., 2012) and aviation (Gilbey et al., 2016). However, to date, no studies have been carried out in aircraft manufacturing.

The UK aerospace industry is one of the growth sectors for the UK, employing some 443,000 employees directly in highly skilled, technologically advanced roles (ADS Group, 2025). It is also a safety critical industry which is highly regulated owing to the complex nature of aircraft, the hazards involved in manufacturing and the potentially catastrophic implications of safety failure in aviation.

Much of the existing research literature on safety voice has been undertaken in medicine, construction or has targeted particular categories of worker such as young people (Paul et al., 2025). Parallels cannot be drawn between these contexts and aircraft manufacture which is a unique environment and worthy of specific study for several reasons. In contrast to healthcare for instance, the vast majority of shop floor employees in aircraft manufacturing are male which may introduce different cultural and interpersonal dynamics. Contracts for the production of aircraft can be lengthy with multi-decade contracts being awarded in the civil, aerospace and defence sectors. Many workers in aircraft manufacturing are employed in roles that are highly skilled and specialised where they earn in excess of the average wage. As a consequence, workers in aircraft manufacturing tend to remain with their employers for long durations and tend to work in natural work teams comprising colleagues on the same site and in the same facility. This differs from construction workers, who frequently move from site to site, often working in collaboration with a range of clients and other contractors. The hierarchal structures in aircraft manufacturing also contrast with those in other industries. Many of the supervisors and management team are former shop floor workers whose credibility is built upon knowledge of processes, people skills and shop floor experience. This provides a different dynamic to the hierarchies in medicine which are often based on competence and qualifications.

In aviation, several studies have focussed on the safety voice behaviours of aircrew (Noort et al., 2021a; Gilbey et al., 2016). Whilst aircrew play a key role in protecting

the safety of passengers and public during flight operations, this focus overlooks the fact that latent defects can be introduced into the aircraft itself by workers engaging in unsafe manufacturing activities. It highlights the importance of studying the extent to which shop floor employees speak up with their safety observations, concerns and ideas.

1.1. Chapter 1: Study overview & timeline

This chapter provides an overview of the research project including the implementation timeline. The project was structured in 5 sequential phases; each of which represents a planned, chronological flow of activities as the project progressed. These are briefly described in the remainder of this chapter. Figure 1 below presents those phases and the time frames in which they were conducted.

Figure 1

The five broad phases of the research project



Phase 1: Discovery

The Discovery phase can be summarised as a period of preparation and information gathering around the topic of speaking up. Initially, there was a preliminary phase of understanding the literature around safety voice, developing my skill as a researcher (an ongoing activity) and evaluating behavioural models for applicability and use for the project. This discovery period was associated with refining my project objectives and developing the research questions that would form the basis of my study. During this phase, I also completed Motivational Interviewing training to support my skills as an interviewer, attended online seminars regarding qualitative methodologies, such

as thematic analysis, and received advice and guidance from my tutors regarding the expectations of PhD level study and the University of Derby's processes regarding regular review cycles, ethics and the University's systems.

During this early period of the project, I also engaged the local Safety Health & Environment (SHE) management team in the target organisation about the feasibility of conducting research with shop floor employees and began to identify high hazard locations where the management may be amenable to undertaking real world studies.

After an initial review of the safety voice literature (which would evolve into the current literature review see Section 3.1), the following research questions were developed as the basis of the project:

- What are the factors which influence employees' safety voice behaviours in manufacturing?
- How can researchers measure safety voice behaviour?
- To what extent is the behaviour change wheel (BCW) useful in developing a behaviour change intervention to increase employees' willingness to express their safety voice?
- What behaviour change interventions are effective in shaping safety voice behaviour?

A mixed methods methodology employing both quantitative and qualitative methods was originally deemed the most appropriate for carrying out a practical research project on safety voice. The qualitative methods were envisaged as a means of gathering rich data on real world experiences of employees and were intended to support the design of the intervention. The quantitative between-subjects measures were designed to support the measurement of change over time and to evaluate the effectiveness of the behaviour change intervention.

Phase 2: Understanding the problem

Phase 2 was associated with gathering qualitative and quantitative data as an initial means of understanding the factors which influenced safety voice behaviours in aircraft manufacture. It involved generating, analysing and drawing conclusions from a series of pre-intervention interviews and designing and implementing a baseline survey. This was intended to gain a broader understanding about the antecedents of safety voice that could be used to inform the design of a multi-faceted behaviour change intervention.

Senior managers from the target organisation were engaged on the project and three locations or buildings were approved for exploring employees' experiences of safety voice. Between Nov 2019 and February 2020, nineteen shop floor participants, including supervisors and employees, were interviewed (see section 4.1) as part of a baseline study using a semi-structured approach to explore their perceptions of safety voice behaviours and the antecedents of both safety voice and safety silence. The interview schedule was informed by the existing research literature (up until November 2019) on safety voice and the Capability Opportunity Motivation – Behaviour (COM-B) model, which provided a structure for understanding behaviour (Michie et al., 2011). The interviews were analysed using thematic analysis (Braun & Clarke, 2006; Clarke & Braun, 2017) and three themes were generated. The findings revealed that safety voice in aircraft manufacture was a complex behaviour that was shaped by a range of organisational, social, personal and hazard factors. The findings from these interviews were also used to help identify a series of behaviours that were critical to supporting safety voice. These were used to design and develop the behaviour change intervention.

The second study undertaken during the phase of “understanding the problem,” (See section 4.11) involved the capture of quantitative data to support the measurement of change and to obtain a view from a broader population of employees about the factors which appeared to influence safety voice. After reviewing the literature on the measurement of speaking up behaviours, a safety voice questionnaire was compiled, using pre-existing measurement scales, with the intention of capturing

survey data at two points. The first data point, which was conducted before the implementation of the intervention, was designed to capture a baseline measure of safety voice. Meanwhile the second data point, at post-intervention, was aimed at evaluating the effectiveness of the intervention and understanding whether employee attitudes and perceptions about safety voice had changed over time. The pre-intervention questionnaire was developed and distributed to employees within the same three locations in March and April 2020. However, the timing of the initial survey was unfortunate. This was an unprecedented time in which the COVID-19 pandemic began to impact the economic, social and political life of people in the UK. In March 2020, non-essential employees were asked to work from home by the UK government, schools closed and social distancing was introduced.

As a supplier to the defence industry, shop floor employees of the target organisation received a special dispensation which allowed them to continue working onsite to ensure that the armed forces were able to defend the nation and its interests, if necessary. However, in order to ensure the safety of its workers, the organisation was required to develop and implement a number of risk controls to protect the workforce. In the early phases of the COVID-19 pandemic, little was known about the virus, its ability to spread and how best to contain it. The target organisation was at the cutting edge of carrying out risk assessments and developing risk controls that included social distancing arrangements, hand hygiene measures and a rigorous COVID testing regime. In order to implement these measures effectively, a great deal of time and effort was spent briefing employees, working with suppliers to acquire much needed equipment and monitoring the effectiveness of these risk controls. As an employee in the SHE team, my activities were diverted from developing SHE policy and strategies to supporting these significant activities.

Employees in the target organisation were understandably concerned about the adequacy of the COVID-19 arrangements in place and, during this period, workers were regularly surveyed about their perception of the control measures, their willingness to continue working and the future of working arrangements, post COVID. Against this backdrop of repeated questionnaires, the pre-intervention survey was poorly received by employees and only 46 individuals completed it. This

number was low, considering the sample population was around 1000 shop floor workers (return rate of 4.6%). Consequently, the planned quantitative methods were inadequately powered to be as useful as needed for informing a large intervention. The findings were analysed to find trends in the data, acknowledging the sample size as a clear limitation. In view of the poor response to the survey and the ongoing challenges posed by COVID, a decision was reached to solely use qualitative methods as a means of informing the behaviour change intervention and evaluating change.

Phase 3: Intervention

Phase 3 was associated with putting in place a multi-faceted intervention with the aim of manipulating the critical safety voice behaviours that were identified following the analysis of the pre-intervention interviews (See section 5.1). In order to design the intervention, methods advocated in the behaviour change wheel (Michie et al., 2014) were used to evaluate, prioritise and further refine the target behaviours. Drawing upon the qualitative interviews carried out in in Phase 2, eight behaviours were selected as they were deemed to be practicable, offered the most potential for delivering change and acceptable to stakeholders in the target areas. They included leadership, supervisor and employee behaviours. The Theoretical Domains Framework (TDF) – an integral part of the BCW, was subsequently used to shape the design of the intervention which was further refined in collaboration with a newly formed SHE Enabler Group. This comprised volunteers from the shop floor and was established to support the deployment of the intervention.

The intervention was deployed to employees for two months during September and October 2021 in a high hazard machine shop, which was one of the areas from which employees were drawn for the pre-intervention interviews. The intervention incorporated aspects of communications, dedicated engagement activities, the formation and training of a SHE Enabler Group and a new process, known as Stop, Look, Assess & Manage (SLAM), to support hazard identification and the capture and feedback of safety-related issues.

Phase 4: Review

Phase 4 was associated with exploring employee perceptions of the intervention and reviewing the adequacy and effectiveness of the intervention design and its deployment (See section 6.1). Eleven interviews were conducted between March – April 2022, with employees from the target area who had been exposed to the intervention or were part of the SHE Enabler Group that helped to design it. The interviews were intended to capture the extent to which attitudes and perceptions about safety voice had changed and to understand which aspects of the intervention had been successful in influencing safety voice behaviour. Once again, the interviews were analysed using inductive thematic analysis (Braun & Clarke, 2006; Clarke & Braun, 2017).

From these post-intervention interviews, two themes were developed; the first of which was associated with perceptions of shop floor identity and its influence on safety voice whilst the second theme explored the influence of supervisor attitudes and behaviours on safety voice. The interview findings suggested that providing physical and social opportunities to facilitate safety voice had been effective at encouraging employees to speak up. Meanwhile, some of the communications and training aspects had been less effective. In addition, the study revealed deep-seated cultural issues associated with the way in which the organisation responded to safety voice which negatively impacted employees' willingness to express their safety issues.

Phase 5: Evaluation

The evaluation phase was associated with understanding the lessons learned from the study in light of existing research and where future research may be directed (see section 6). This phase also included recommendations for wider industry on how to effectively facilitate safety voice, based on the research findings. At key points throughout the research, personal reflections were captured about important

learning points, positive and negative unintended consequences and where aspects of the study could have been improved. These are captured in boxes at the end of each relevant section throughout the thesis.

Summary

This chapter has described the five phases of the research project including the implementation timeline. The subsequent chapters explain, in detail, the approach that was taken when designing, implementing and measuring the effectiveness of this safety voice research project. The findings, implications and impact of the research are discussed.

Glossary of Terms

Abbreviation	Description
APEASE	Affordability, Practicality, Effectiveness & cost effectiveness, Acceptability, Side-effects / Safety, Equity
BCT	Behaviour Change Technique
BCW	Behaviour Change Wheel
COMAH	Control of Major Accident Hazards Regulations
COM-B	Capability, Opportunity, Motivation - Behaviour
COVID-19	Coronavirus disease
DSUM	Daily Start Up Meeting
E	Employee
FM	Facilities Management
GROW	Goal, Reality, Opportunity, Wrap Up coaching model
HSE	Health & Safety Executive
IOSH	Institute of Occupational Safety & Health
ISO	International Standards Organisation
MSc	Masters of Science
OSHENS	Occupational Safety Health & Environment Notification System
PCSS	Perceived Co-worker Support for Safety
POSS	Perceived Organisational Support for Safety
PPE	Personal Protective Equipment
RAF	Royal Air Force
S	Supervisor
SAVE	Safety Voice for Ergonomics
SHE	Safety, Health & Environment
SIPOC	Suppliers, Inputs, Processes, Outputs & Customers meeting
SLAM	Stop, Look, Assess & Manage
TDF	Theoretical Domains Framework
TeamSTEPPS	Team Strategies & Tools to Enhance Performance & Patient Safety
TU	Trade Union
UK	United Kingdom
US	United States of America
WSUM	Weekly Start Up Meeting

2. Chapter 2: PHASE 1 - Discovery

This chapter reviews the safety voice literature in order to understand the latest research, debates and research opportunities. It introduces safety voice, explores the research literature relating to it and sets out the context of the study. This chapter also introduces my interests and motivations for conducting safety voice research.

This first discovery phase is highlighted in the diagram below and was associated with the generation of research questions that formed the basis of the safety voice study.

Figure 2

Phase 1 in context of the wider study



2.1. Introduction

In 2022/23 an estimated 1.8 million workers in the UK were suffering from an illness they believed was caused or made worse by their work and 561,000 workers sustained a non-fatal injury at work (HSE, 2023). In that same time frame, according to statistics from the UK Health and Safety Executive (HSE), 135 people were killed at work (HSE, 2023). One of the industries that accounts for a high proportion of these incidents is manufacturing. According to HSE statistics, 91,000 employees suffered work-related ill health and 15 employees were killed in UK manufacturing plants and facilities in 2023 (HSE, 2023).

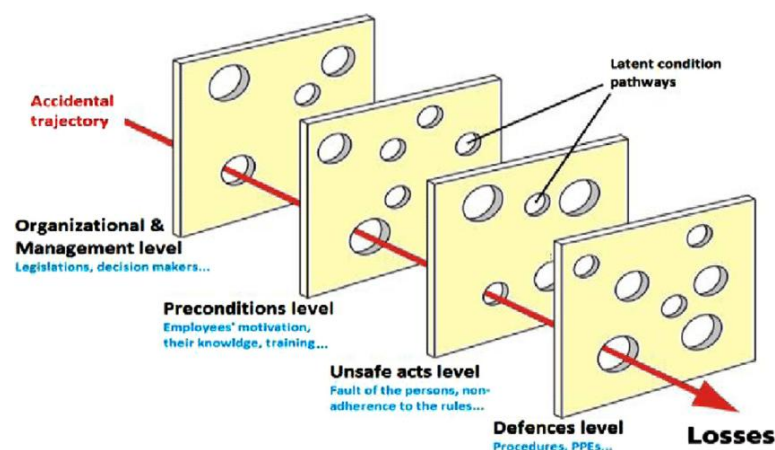
Safety researchers acknowledge that most accidents are preventable (Green, 1999). Safety management is associated with identifying hazards, assessing risks and

putting in place suitable and sufficient controls to minimise the risk of harm and prevent accidents from occurring (HSE, 2013). These risk controls often include successive layers of defences, barriers and safeguards which may include engineering controls, safe systems of work and/or behavioural controls (De Castro, 2003). These are the cornerstones of safety management and organisations are required to monitor, maintain and review the adequacy and effectiveness of these risk controls to ensure these defences remain robust (HSE, 2013).

Models of accident causation, such as Reason's (1990) Swiss cheese model, aim to provide a framework for understanding the human failings associated with safety incidents. The Swiss Cheese model (see Figure 3) assumes that accidents are caused when a hazard is permitted to slip through weaknesses or 'holes' in the organisation's defences, which explains the Swiss Cheese metaphor. These holes are characterised as dynamic and constantly widening or shrinking depending on a range of shifting conditions that can include environmental factors, the skills and abilities of the individual carrying out the task, workplace pressures as well as the adequacy and maintenance of plant and infrastructure. Reason's graphical representation of defences in depth, organisational failings and the broad range of factors which can conspire to cause accidents has enabled the Swiss Cheese model to become one of the most popular safety models (Underwood & Waterson, 2013) that is still relevant in high-risk industries today (Larouzee & Le Coze, 2020).

Figure 3

The Swiss Cheese Model (Reason, 1990)



However, the Swiss Cheese model is not without its critics. Some argue that the model is overly simplistic; it fails to show the relationships between organisational, local and individual factors and presents accident causation as a linear process. This, in turn, can lead accident investigators to focus on the adequacy and effectiveness of specific components or subsystems rather than the adequacy of the system as a whole (Leveson, 2004; Dekker, 2005). Yet, as Larouzee and Le Coze (2020) point out, the model was never intended for that purpose. Its simplicity and the fact that it can be widely interpreted from a micro and macro point of view has been enormously influential in highlighting the wide and diverse range of factors that contribute to accidents.

Organisational learning is vital for improving safety performance (Drupsteen & van Kampen, 2014). In order to continually enhance their arrangements for safe working, organisations must capture, analyse and act upon information regarding the adequacy and effectiveness of their existing risk control measures to maintain them and prevent the 'holes in the Swiss cheese' from aligning. It is when these holes line up that accidents occur (Reason, 2016). One vital source of information in this regard is employee safety voice, which has been defined as "as any individual communication directed at improving safety conditions" (Tucker et al., 2008 p. 319). Speaking up in the workplace is associated with positive organisational outcomes such as team learning, improved work processes and innovation and crisis prevention (Liang et al., 2012) and has significant relevance to safety. After all, employees are often best placed to raise safety issues or improvement suggestions regarding their work to either management or their colleagues. They are more likely to be familiar with the hazards in the workplace and often work in close proximity with co-workers which can help to facilitate work related conversations regarding risk (Dekker & Conklin, 2014). This iterative process of ongoing safety communications at all levels across an organisation constitute a safety culture and are a characteristic of high reliability organisations (Marynissen et al., 2014). Nevertheless, voluntarily speaking up to initiate safety-related change can be inherently risky for employees, given that it can be perceived as calling into question the adequacy of existing practices (Tucker et al., 2008). This has the potential to carry with it negative

consequences such as being ridiculed, criticised or sanctioned by either their peers or by management (Edmondson & Lei, 2014). These perceived fears of being rejected, isolated or ostracised by the group can lead workers to remain silent which can prevent organisations from understanding the true extent and nature of the risks to which they are exposed (Noort et al., 2019a). This unwillingness on the part of employees to express their voice and the failure of organisations to provide a psychologically safe environment in which employees can speak up about their concerns and ideas has been identified as a significant organisational failure in several high-profile accident investigation reports (Leveson, 1995).

The challenge organisations face is how to determine the specific factors which influence safety voice in their context and the practical interventions that they can implement in order to create this psychologically safe environment. Indeed, Hirak et al.(2012) called for more field studies examining the role of psychological safety in real operational settings whilst O'Donovan and McAuliffe (2020) pointed to a lack of research associated with interventions to improve psychological safety and voice. This research aims to address those shortfalls.

2.2. The context of the study

This research project into safety voice in aircraft manufacture was carried out using employees from a global defence contractor and one of the largest manufacturers in the UK. It employs some 130,000 employees around the world, of which 40,000 are UK-based. The organisation supplies a range of innovative and highly complex products and services to its global customers; many of whom are the armed forces of the UK and its partner nations. These include nuclear submarines, naval warships, and munitions.

This research took place within the Air Sector of the target organisation which is the line of business responsible for the design and manufacture of manned and unmanned air vehicles as well as the provision of supporting services such as aircraft repair and training. In its own right, the Air Sector of the target organisation

has sites across the world. However, most of its 14,000 employees are based in the UK; principally at two large sites in Lancashire as well as embedded at RAF locations around the UK.

The site for the current study was a large aircraft manufacturing plant in the North of England. At this site, components for military aircraft are manufactured and assembled. The vast majority of the circa 5000 workers at this site are either engaged in or support the activities of shop floor manufacturing tasks. Many of these tasks are hazardous and employees are regularly required to manage the risks associated with a range of work activities such as working at height, using complex machinery and working with hazardous substances.

The organisation has a positive safety record and compares favourably with other organisations of a similar size, scale and risk profile. Moreover, it has a mature safety management system that is independently certified to the International Health & Safety Standard ISO 45001, the Quality Standard ISO 9001, the Energy Management Standard ISO50001 and the Environmental Management Standards ISO 14001. As a site that is subject to the upper tier requirements of the Control of Major Accident Hazards (COMAH) Regulations 2015, it is also subject to regularly audits and inspections from the UK Health & Safety Executive, the Military Aviation Authority and the Local Authority. Consequently, the target organisation places a high priority on safety, health and the environment. Safety features prominently in its company annual reports, it is highlighted on the company's webpages and the Air Managing Director endorses the SHE Policy.

In order to ensure that safety is managed effectively, trained risk assessors from the Air Sector carry out assessments of the significant risks associated with its operations and Air Sector management are required to install a range of technical, procedural and behavioural risk controls to manage them. These include infrastructure and equipment that meets stringent safety standards, the provision of comprehensive training to its employees, safety policies and processes to guide safe working as well as a safety cultural programme of communications and engagement events to improve participation.

In addition, within the Air Sector, 25 safety, health and environment (SHE) practitioners are employed in this manufacturing plant to provide competent advice and guidance regarding the management of risk. These SHE practitioners are allocated into two particular teams; one team are embedded within the high hazard facilities across site and provide specific advice directly to the operations teams. The second team, known as the core SHE functional team, develop tools, systems, training and safety processes for the Air Sector as a whole that aligns with industry good practice and legislative requirements.

Whilst supervisors are required to ensure these SHE processes are installed, applied and maintained, employees are required to work in accordance with them. Aside from compliance, employees also have a responsibility to speak up about workplace hazards, challenges with their work and emergent issues when they encounter them. This is defined in the organisation's Code of Conduct which outlines the ethical standards to which all employees must adhere.

2.3. The Researcher

As a post-graduate researcher and full-time safety practitioner, employed within the target organisation, I have long been interested in the notion of safety culture and the factors which influence employee safety behaviours. For around a decade I have been involved in the measurement of aspects of safety culture and developing interventions to support safer behaviours amongst the organisation's employees. In this regard, I am passionate about employee engagement, understanding the barriers to safer working and designing interventions that work for employee teams. In order to better understand and support operational teams in managing their risks, in 2017, I completed an MSc in Behaviour Change at the University of Derby. This course introduced models of behaviour change, explained the importance of adopting a theory-based approach to intervention design and defined ways of measuring the effectiveness of Behaviour Change interventions. It also inspired me

to embark on further study by enrolling on the current PhD programme for which I have been studying on a part time basis since 2018.

As well as studying part-time at the University of Derby, I am also a full-time employee of the organisation, where I work as a SHE manager in the Air Sector in the core SHE functional team. My role has been principally overseeing aspects of SHE training, maintaining the SHE Management System and supporting the measurement and enhancement of the safety culture. This position provides me with a unique insight into the working lives and challenges of the shop floor employees across the Air Sector. Indeed, my interests lie in uncovering the real-world experiences of shop floor employees as well as the motivations which underpin their safety behaviours. This lends itself to a qualitative approach to gathering data which aligns with my knowledge, abilities and training as a coach and motivational interviewing practitioner.

Senior operational and SHE managers within the organisation were engaged on the project at the outset to secure their commitment to the project. This was achieved using a briefing presentation which explained safety voice, outlined the broad phases of the research and provided an indication of the support required (see appendix 1). Senior managers agreed to sponsor my study and played a pivotal role in providing access to shop floor employees. However, I recognise that my role as an employee and “insider” researcher had both advantages and disadvantages. On the one hand, inside researchers can possess a pre-existing knowledge of the context and culture of the organisation and are often better equipped to naturally interact with local teams, given they are familiar with how to approach individuals (Greene, 2014). My role as an employee certainly aided in understanding the language of shop floor employees, Air Sector SHE processes and the context of this work. It also provided access to a large population of employees for conducting applied research. However, I also recognise that being an “inside” researcher had the potential to introduce elements of bias into the study and increased the risk of being overly subjective in a way that an outside researcher may not (Greene, 2014). It is also interesting to reflect on the extent to which my role as an employee influenced the research and how I would have been perceived as an insider or outsider by the

participants involved in the study. Chavez (2008) differentiated between total insiders, who share multiple identities or profound experiences with the community, or partial insiders, who share some identity with the study population but where there is certain level of distance or detachment from the community. I would suggest that I was a partial insider, as I worked for the same company and was exposed to the same organisational processes but was not part of the shop floor community.

Given my status as a partial insider, I was conscious throughout the study, that employees may already have had pre-existing perceptions about me, either as an individual or as a member of the SHE team. At the same time, I recognised the potential of introducing my own assumptions about shop floor employees, their challenges and their views on SHE. Consequently, I was mindful of the importance of remaining impartial, providing feedback to clarify understanding and refraining from being overly defensive when SHE interventions were criticised or misinterpreted. Given the potential for insider bias, care was taken to ensure that my research was carried out in accordance with the ethics framework at the University of Derby.

The next section explores the existing literature on safety voice in order to identify the challenges and gaps associated with research in this topic area. A review of the existing literature on employee safety voice will be presented with the aim of understanding the factors which influence safety voice and the interventions which have been used to promote it. The literature review is split into two parts; the first discusses safety voice research that was available prior to the commencement of the multi-faceted intervention in 2020. The second part aims to provide an update in relation to the research that was published between the launch of the intervention in 2020 and the writing of this thesis in 2024. Initially, the context of employee safety voice and how employee safety voice differs from other expressions of voice will be described. Following this, the hazard-specific, individual, group, organisational and external factors which influence safety voice will be discussed. Finally, a review of the literature on different types of interventions that have been successfully used to promote safety voice in the workplace will be presented and appraised.

3. Chapter 3 Literature Review

3.1. What is safety voice?

It was Hirschman (1970), who first developed a theory to explain the circumstances when employees decide to speak up to initiate change. Hirschman asserted that when members of a group are faced with situations in which they perceive that the organisation is displaying a decrease in quality or benefit to the member, individuals have three options; namely loyalty, exit or voice. They can either remain loyal to the group or change one's attitude towards the social norms; they can reject and exit the group, or they can use their voice to try change the status quo. Thus, safety voice can be viewed as a response by employees who are dissatisfied or concerned about the adequacy or effectiveness of safety arrangements (Noort et al. 2019a).

Safety voice has several characteristics; some of which are shared with other types of speaking up such as whistleblowing and generic employee voice which has been described as “the expression of constructive opinions, concerns or ideas about work-related issues” (Liang et al., 2012 p. 71). Firstly, safety voice is an act of communication to address perceived organisational issues and is aimed at changing the status quo (Noort, et al., 2019a). It is also an extra-role, discretionary behaviour which stems from the fact that employees cannot be compelled to express information about the true nature of their experiences and therefore safety voice reflects a motivated, planned and deliberate decision to speak up (Edmondson, 2019). In this respect, voice can be understood as both a prosocial behaviour, associated with motives such as helping and cooperation, and a proactive behaviour that is concerned with change and challenge (Curcuruto et al., 2015).

Safety voice has other attributes. It is specifically associated with preventing physical harm or ill health (Noort et al., 2019a). In this manner, safety voice reflects an expression of concern and compassion for people within the organisation which can also extend beyond the organisational boundary, for example, to contractors or members of the public who could also be impacted by the organisation's operations. Safety voice is expressed by individuals and has the potential to damage

relationships given that parties may disagree with a particular viewpoint (Manapragda & Bruk-Lee, 2016). This potential for confrontation appears to be a significant factor in inhibiting safety voice and promoting silence. A further added dimension of safety voice relates to the notion that safety is essentially a management responsibility therefore any expressions of safety voice have the potential of being perceived as a direct criticism of management and the existing work practices that they have already put in place (Detert & Burris, 2007). This might explain why some feel it difficult to speak up about risk-related topics.

There are also challenges associated with its measurement. Safety voice is difficult to objectively study, as it relies on self-report-based methodologies, such as questionnaires and interviews, which can introduce bias around the effectiveness of memory and recall (Noort et al., 2019a). It is also important to note that safety voice is afforded legal protection in many countries including the UK (Tucker et al., 2008). Indeed, UK employees have the right to refuse work that poses an imminent threat to life, to report safety issues to the government's health and safety regulator and to progress safety issues via a mandated health and safety committee, depending on the size of the workforce (Conchie et al., 2012). Finally, safety voice can be understood in the context of a broader research literature that is associated with safety culture. This body of research which emphasises enablers like human factors, safety leadership and employee participation aims to understand the social, organisational and cultural factors that shape levels of commitment towards safety management (Zohar, 2010). The safety culture thus influences the psychological safety of employees and can facilitate or inhibit safety voice expression.

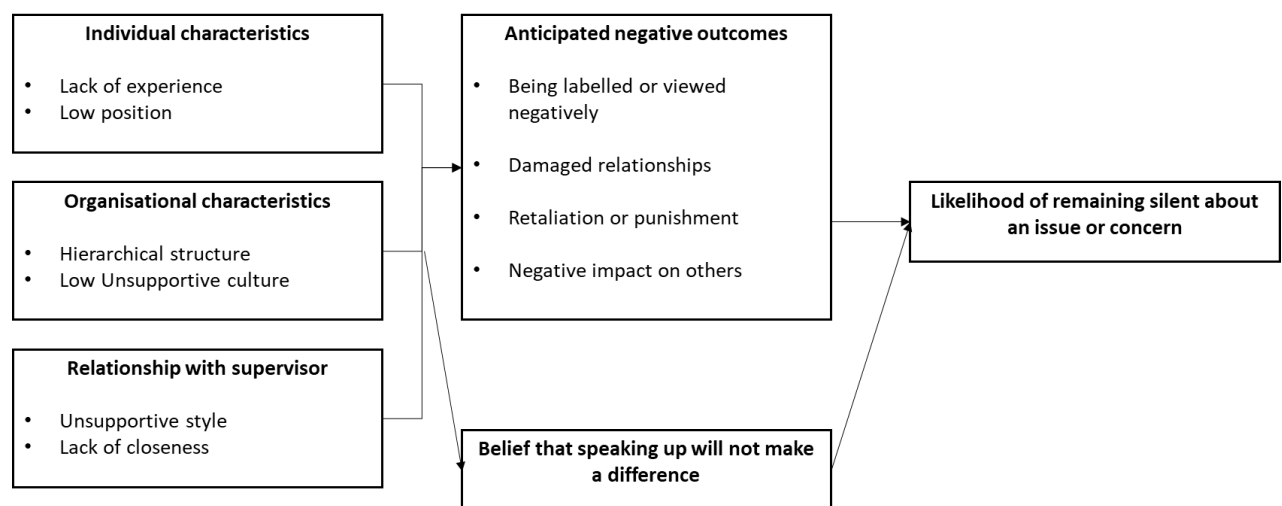
3.2. Factors which influence safety voice

Safety voice is a behaviour which is rooted in a complex, multitude of interdependent factors (Noort, et al., 2019a). Indeed, many researchers have sought to understand the conditions and motivational forces which underpin safety voice by studying the antonym of safety voice - safety silence - which is defined as "the act of withholding safety concerns about accidental harm" (Noort et al., 2021b, p. 1). In a qualitative

study which aimed to explore the types of issues employees are reluctant to raise to their supervisors and the reasons why employees prefer to withhold their voice around a variety of issues (generic voice), Milliken et al. (2003) proposed an explanatory model (Figure 4). Their model identified several constructs which, they claimed, were important in shaping whether employees would speak up or remain silent about workplace issues. These constructs comprised of individual characteristics, organisational characteristics and an employee's relationship with their supervisor. According to Milliken et al. (2003), depending on the nature of these characteristics, employees form beliefs about whether speaking up will make a difference. They proposed that employees assessed whether their voice would lead to undesired outcomes such as being labelled or viewed poorly, damaging relationships, being punished or negatively impacting others. In turn, this assessment shapes the willingness of people to express their voice. Whilst the constructs of this model can be challenged and adapted to reflect safety voice, rather than generic voice, it provides a useful starting point for identifying some of the broad factors which influence employees' willingness to speak up with their safety concerns.

Figure 4

A model of the choice to remain silent (Milliken, Morrison & Hewlin, 2003)



3.2.1. Individual characteristics associated with safety voice

Miliken et al.'s (2003) model suggests that the features of an individual, such as their levels of experience and perceived position in relation to others, is important in speaking up. Research on how younger people engage with safety voice support Miliken et al.'s (2023) model but also shed light on how demographic variables such as age and gender influence speaking up behaviours. For instance, in a Canadian study of young people aged 14-18, Tucker et al. (2014) found that females showed higher voice intentions to speak up about safety than males whilst another study, in the food services sector, found that younger workers were more likely to express their safety voice than older workers when supervisor commitment to safety was unclear (Tucker et al., 2020). In addition, job tenure has also been shown to influence safety voice. Turner and Tucker (2013) found that young Canadian workers aged 15-18 were reluctant to speak up about unsafe working conditions and practices due to a fear of being fired, their status as newcomers to the workplace, supervisor indifference and feelings of powerlessness. According to Tucker and Turner, the young workers preferred to adopt a "wait and see" approach; opting to tolerate unsafe working arrangements rather than to risk speaking up to resolve them. There are obvious limitations to applying the learning from these studies directly to aircraft manufacturing. Firstly, the participants were drawn from environments such as catering and retail which are typically less hazardous than manufacturing which may explain why the participants felt it was acceptable to withhold their safety voice. In addition, workers in aircraft manufacturing are typically highly skilled, of an older age demographic and more secure in their jobs than younger workers. Nonetheless, these studies suggest that in order to speak up about workplace issues, employees need to be convinced by their organisation that their safety voice will be welcomed. It indicates that organisations must be proactive and take the lead in urging employees to express concerns in order to facilitate and motivate employee safety voice.

A large Chinese study into the safety behaviours of construction workers also found that workers with lower education levels were less likely to use their safety voice than those with a higher education (Meng & Chan, 2020). Meanwhile, Pieterse et al.

(2009) found employees were less likely to speak up if they did not feel they possessed the ability, knowledge or resources to initiate change which highlights the importance of self-efficacy in safety voice behaviours.

The emotional state of the person with a safety issue to voice has also been shown to influence the likelihood of whether they will speak up. Kirrane et al. (2017) examined the role of emotions in decisions to remain silent or speak up and found that different motivations for silence promote different emotional experiences which can shape voice behaviours. For instance, they found that intense anger is an antecedent to speaking up about an observed transgression whereas less intense anger was associated with remaining silent. They identified three types of silence; acquiescent silence in which employees believe it is futile to voice; defensive silence in which people are scared and worried about the consequences of speaking up and prosocial silence which is associated with maintaining good group relations.

One unique feature that differentiates safety voice from generic voice is associated with the perception of hazards which is not reflected in Milliken et al.'s (2013) model. In order for safety voice to occur, an individual must firstly identify the existence of a hazardous situation and subsequently perform an evaluation regarding the extent to which they or other people might be vulnerable to that hazard. These steps are the foundation of risk assessment and help individuals determine whether they need to extricate themselves from the hazardous situation or take additional measures (such as expressing safety voice) aimed at minimising the risk of the hazard from being realised (Stanton et al., 2001). At the outset, this poses a problem for organisations seeking to promote safety voice. Studies have highlighted that risk perception varies between individuals which explains the variability in beliefs about one's vulnerability to harm (Leiter et al., 2009). There appears to be a range of factors that influence perceptions of risk such as age (Kim et al., 2018), levels of experience (Thomson et al., 2004) knowledge of the workplace and its operations (Perlman et al., 2014), employees' beliefs and perceived levels of control over the risk (Leiter & Cox, 1992). This suggests that what might be considered a hazardous situation worthy of safety voice to one individual, might not be to another.

Manapragda and Bruk-Lee (2016) carried out focus groups and interviews involving 26 participants from a range of industries in the US to understand the motivations behind safety silence. The participants were asked to present critical incidents in which they chose not to address a safety issue they had encountered in the workplace. In 39% of the incidents discussed, the participants did not believe that the issue with which they were presented warranted raising. This highlights that, to increase rates of safety voice, a first step may be to increase knowledge and awareness of potential risks and to clarify the type of issue which should promote the activation of safety voice. However, the findings of Manapragda and Bruk-Lee's (2006) study may not be reflective of all contexts. As Yardley (2000) points out qualitative studies, such as this, can allow a researcher to generate rich, in-depth insights that reflect the context in which the study is undertaken. It highlights the importance of testing the extent to which Manapragda and Bruk-Lee's (2016) findings reflect motivations behind speaking up in the context of aircraft manufacturing.

Speaking up behaviour also appears to be influenced by perceptions of the magnitude and severity of the issues faced. Burris et al. (2017) explored the content of the safety issues reported by employees in US hospitals. They found that workers not only evaluated whether or not the organisation had the financial and human resources available to deliver the required changes, but also made an assessment of who may be liable to deliver the change and the complexities in implementing the change, before deciding whether or not to escalate an idea or concern. Burris et al.'s (2017) findings therefore suggests that employee voice is a planned behaviour, involving an evaluation of the benefits and barriers of speaking out before employees decide whether or not to express their voice.

3.2.2. Organisational characteristics

The organisational context also influences safety behaviour of people at work. Mathisen et al. (2022) found that job demands negatively influenced safety voice. They surveyed over 7500 offshore employees in the Norwegian oil and gas sector

which, like manufacturing, is a safety critical environment. They found that when job demands are high, employees speak out less. They concluded that work requiring sustained physical and/or psychological effort or skills depletes an individual's resources which can lead to exhaustion. In these circumstances, employees are less likely to express their safety voice because it is an extra- role, discretionary behaviour that consumes time and energy.

Other researchers have pointed to a correlation between voice and levels of commitment to an organisation. Tucker and Turner (2015) found that young workers with improvement ideas were more likely to speak up with their safety concerns and suggestions if they identified with or had an emotional connection to their organisation. They also found that workers who lacked an emotional attachment were more likely to withhold their safety voice. Their study involved surveying individuals aged between 15-19 over a three-month period during the summer. They concluded that young workers tend to have a higher turnover rate than more mature workers and are therefore less likely to establish a sense of loyalty to the organisation and less likely to speak up to propose improvements. Workers in manufacturing tend to be older, more experienced and more secure in their roles. Exploring their sense of identity and the extent to which it influences speaking up behaviour is one of the aims of my research.

The way in which an organisation is structured and the extent to which employees feel empowered to shape their work can also increase or inhibit the expression of voice. For instance, Hechanova-Alampay and Beehr (2001) noted that in circumstances where power and authority for decisions is delegated to employees, workers were encouraged to identify with the organisation's goals and exert additional effort to achieve them. Indeed, empowerment has been linked with a range of positive safety outcomes from improved team learning and communication to an increase in safety participation (Amiri et al., 2018). It demonstrates the importance of organisational and social factors in influencing the extent to which employees will express themselves.

3.2.3. Leadership factors

Several researchers have pointed to the relevance of leadership factors in influencing employee voice. Indeed, whilst safety leadership is a nebulous concept, there are a range of safety leadership practices that appear to be important when influencing workplace safety (Pilbeam et al., 2016). Conchie et al. (2012) underscored the particular importance of transformational leadership in positively influencing psychological safety and consequently employee voice. Transformational leadership behaviours are associated with leaders increasing their accessibility to employees, whilst displaying interest in employee issues through active listening and acting on employee concerns and ideas (Bass, 1999). According to Conchie et al. (2012) this process of leaders developing affective bonds with their individual employees builds trust which supports the expression of safety voice. Others have demonstrated a relationship between managerial openness and voice behaviour (Detert & Burris, 2007). For instance, Tucker and Turner (2015) found a correlation between future work-related injuries, levels of employee safety voice and supervisor openness to voice. They asked teenagers to complete 3 surveys with a 1-month time lag and found that future work-related injuries increased when high levels of employee voice were combined with low supervisor openness. Similarly, Hirak et al. (2012) found that leadership inclusiveness was positively associated with psychological safety in the context of learning and discussing failure in a large Israeli hospital. They surveyed 277 employees over three time periods and found that when leaders exhibited openness, availability and access to employees, workers felt more able to speak up about the safety issues and problems that they encountered.

One explanation as to why leadership plays such a key role in safety relates to Social Exchange Theory (Blau, 1964). Blau posited that voluntary behaviours are motivated by the norm of reciprocity. If party “A” carries out a goodwill gesture that benefits party “B”, party “B” is more likely to feel socially obliged to perform a goodwill gesture to party “A” in return. This belief regarding social obligation is both generative and cyclical. In terms of safety voice, social exchange theory suggests that when organisations (through their leadership) establish arrangements for promoting and capturing safety voice and feeding back changes to employees, this

highlights to employees that the organisation is committed to employee safety and that it acts upon their voice and values their input. This, in turn may increase the willingness of employees to speak up with their issues. Conversely, when safety exchanges do not occur or when employee safety issues are ignored, it supports the belief that speaking up is futile and will decrease safety voice. These findings have been borne out in real world studies. For instance, in a study that took place during the COVID pandemic, Abrams et al. (2023) discovered that when UK nurses raised concerns regarding Personal Protective Equipment (PPE) or aspects of personal safety and they encountered deafness or hostility, nurses resorted to silence and disengagement. This study is particularly interesting as the timing and context of working during the COVID pandemic was similar to the present study. One limitation of Abram et al.'s (2022) research was that the vast majority of the sample were female which may not reflect the way in which males respond when their safety voice is ignored.

3.2.4. Social factors associated with safety voice

Employees in manufacturing organisations tend to work in collaboration or in close proximity with others. Within the factory environment they build relationships, work on shared goals and support each other to resolve emergent problems (Roy, 2006). According to Social Learning Theory, employees learn behaviour by observing, modelling, and imitating the behaviours, attitudes, and emotional reactions of others who are viewed as knowledgeable experts, or those who hold high status (Bandura, 1977). As described above, this underlines the importance of leadership role modelling desired safety behaviours in the workplace. Nevertheless, it is not solely leadership and organisational factors which determine employee safety voice. Studies have demonstrated that co-workers also play a vital role in shaping safety behaviours (Brondino et al., 2012). In a survey of 213 bus drivers in the UK, Tucker et al. (2008) sought to understand the relationship between employee safety voice and two sources of safety support; namely perceived organisational support for safety (POSS) and perceived co-worker support for safety (PCSS). Their study revealed that co-worker support for safety fully mediated the relationship between

perceived organisational support for safety and employee safety voice. This suggests that employees' safety voice behaviours are influenced by informal sources other than the organisation's safety culture. One reason proposed for this finding was that bus drivers work in relatively isolated conditions with limited contact with their managers and supervisors. Bus drivers therefore have to rely on one another in order to stay safe and may forge closer relations with one another. Research is needed to understand whether the influence of co-workers on employee safety voice is as strong as in those teams with a supervisor who works in close proximity with team members.

From a theoretical perspective, this focus around maintaining in-group relations suggests that Social Identity Theory (Tajfel, 1979) may play a role in safety voice. According to Social Identity Theory, individuals derive some of their sense of self through their membership in social groups. Tajfel (1979) posits that individuals develop feelings of belonging, purpose, self-worth and identity from their affiliation to a group which can become a source of pride and self-esteem. In order to acquire this sense of belonging, individuals undergo a process of categorisation (whereby they categorise themselves according to characteristics or behaviours associated with the group), identification (in which individuals identify with and adopt the norms, values and behaviours of the group) and ultimately comparison in which boundaries are drawn between the in-group (who are positively viewed by members of the ingroup) and the out-group with whom they do not identify.

Carmeli et al. (2009) highlighted the importance of co-workers in determining safety performance. They reported a relationship between high quality relationships amongst employees and psychological safety which has been found to be a mediating factor in employee safety voice. They surveyed part-time undergraduate and graduate students who were also in employment. This could be considered a strength of the study, given the study encompassed people who were collectively employed in over 200 workplaces. They found evidence that high quality relationships amongst employees allowed the exchange of information and ideas which creates feelings of value and connection in ways that allows them to overcome

uncertainty and problems. In turn, this increases the willingness to admit errors, voice dissent and enter potentially conflicting discussions about safety.

There is evidence that employee voice can be hindered by the desire to preserve these harmonious social relations within a group. Miliken and Morrison (2003) interviewed 40 employees from a range of organisations to understand the issues that employees were reluctant to raise, and why employees sometimes decided to remain silent rather than voice their concerns. The participants were drawn from financial services, consulting, new media, pharmaceuticals and advertising rather than high hazard industries. One of the most frequently cited reasons for remaining silent was to avoid harming relations between group members which correlates with the findings of other studies (Manapragda & Bruk-Lee, 2016). As mentioned earlier, given employees in manufacturing work closely with one another on a daily basis and rely upon each for the completion of their tasks, the evidence suggests that some employees would prefer to avoid potential conflict, especially for seemingly minor issues by withholding their safety voice. Underlying this notion of safety silence being adopted to maintain harmonious relations, is the fear of being rejected, isolated or ostracised by the group. This fear of negative social consequences has been shown to drive compliance and conformity with social norms (Bicchieri et al., 2018).

According to Hirschman's original theory around voice (1970), when members of a group are faced with situations in which they perceive that the organisation is declining, individuals have three options; namely loyalty, exit or voice. However, in the workplace, exit may not be a viable option and, as shown above, voice can also be a difficult and costly choice, since it involves an attempt to change the shared norm (Bicchieri & Fukui, 1999). This explains the predicament that some employees find themselves in when deciding whether or not to verbalise their concerns.

3.2.5. Psychological Safety

One of the fundamental conditions that appears to facilitate safety voice is a sense of psychological safety which has been defined as a “belief that the work environment is safe for interpersonal risk taking,” (Edmondson, 2019, p.8) which includes the expression of ideas, questions or concerns. Psychological safety is associated with an individual having faith that when they do speak up, they will not be blamed, humiliated, embarrassed or ignored by their supervisors or peers (Svendson et al., 2016). In environments where psychological safety is lacking, fear can inhibit voice. Fear is a powerful emotional force that encourages avoidance behaviour, inspires greater focus on perceived threats and increases pessimism about risk taking and future outcomes. It has evolved as a survival instinct to protect individuals against perceived threats and can be triggered automatically or learned as a consequence of repeated exposure to potential threats (Kish-Gephart et al., 2009). Expressing one’s safety voice can lead to uncertain consequences and is therefore a risky behaviour which highlights why psychological safety is a necessary pre-condition in facilitating safety voice.

In a qualitative study featuring 190 employees from all manner of grades at a leading high-tech corporation in the US, Detert and Edmondson (2005) explored risky voice opportunities. These were defined as “situations in which an individual is aware of an opportunity to speak up with a work-relevant observation, concern, idea or question and at the same time believes that speaking up may lead to negative consequences for him or her” (p.2). Although related to generic voice, the study encapsulated the nature of interpersonal fear in the workplace and, in particular, how it develops and its consequences. The main fears were around speaking up to authority figures and this appeared to be rooted in recollections of previous encounters which included bosses reacting with unpredictable and emotional outbursts of anger or frustration. Other participants reported stories they had heard, which reinforces that safety silence can be a socially learned behaviour. In these risky situations, silence was almost always the dominant response with 70% reporting withholding their information. Employees saw risky voice as an extra-role behaviour, which was deemed unnecessary. However, voice was more likely when they were “under the

wing” of others, such as the Trade Unions (TU’s), powerful leaders or when they perceived themselves as more competent and had earned the right to speak up which suggests self-image and experience is important in voice. According to Detert and Edmondson (2005), people felt disrespected, underappreciated and under-utilised when they felt unable to voice their thoughts. This indicates that when safety voice is hindered, it can negatively impact attitudes towards the organisation and decrease levels of morale and employee engagement.

Many withhold their safety voice to mitigate the risk of exposing themselves or others to the potential for negative judgement and negative consequences. However, the reasons that underpin these perceived fears can be diverse. Manapragda and Bruk-Lee (2016), for instance, interviewed 26 individuals about their motivations for silence; the majority of which were from health care (76%) with others drawn from construction, utility and the retail sectors. They asked people to think of critical incidents in which people chose not to speak up about a safety-related issue. They found 20% mentioned self-based silence aimed at protecting themselves or how others see them (e.g. as ‘tell tales’). 15% mentioned “other based safety silence” which was based on sympathy towards others or how speaking up could affect others. These motives were associated with preventing a co-worker being fired or staying silent because it could start a dispute, put others under pressure or hurt someone’s feelings. Meanwhile, 10% mentioned “relationship -based safety silence” which was not speaking up because it might affect their relationship with others. These findings suggest that fear of social consequences is a powerful driver behind safety silence with employees preferring to withhold their voice in order to maintain harmonious relations with their colleagues. In addition, 20% of respondents mentioned climate-based safety silence which involved staying silent because of organisational norms, managerial actions and the existence of support. Meanwhile, 39% of critical incidents were “issue based” which was silence because the incident was not severe – or did not put others at risk. Finally, 24% of critical incidents corresponded with “job-based silence” which was associated with time pressures or job responsibility; employees felt that speaking up was not in their job description. From Manapragda and Bruk-Lee’s (2016) study, it would appear that silence can be shaped by different, automatic antecedents from voice which always seems to

involve an element of conscious, deliberative decision making. This aligns with the concept of System 1 and System 2 thinking in which safety silence is triggered by an automatic, instinctive sense of fear (system 1), whereas safety voice is characterised by slower, reflective and logical thought processes that correspond with System 2 (Kahneman, 2011).

The above review has highlighted several factors which may influence employee safety voice and are applicable in aircraft manufacture and thus worthy of further study. To address this, my research project explored the antecedents of safety voice with a particular focus on the extent to which interpersonal relationships between co-workers influence psychological safety and safety voice. The project incorporates both design and implementation interventions, using the behaviour change wheel (Michie et al., 2014) and the COM-B systems model (Michie et al., 2011) to understand and then influence whether or not employees feel able to speak up about their safety ideas and concerns.

3.3. The Behaviour Change Wheel

In recent years, several frameworks have been proposed that aim to provide a systematic approach to intervention design and draw attention to a range of options that can be used to change behaviour. They include Intervention Mapping (Bartholomew et al., 1998) and MINDSPACE (Dolan et al., 2010). However, neither of these frameworks cover the full range of intervention options and are not always theory based (D'Lima et al., 2020). The Behaviour Change Wheel, (BCW) however is the exception. It is designed to be system that comprises a synthesis of the common features of 19 behaviour change frameworks (Michie et al., 2005). It is based on theory and its authors claim it can be used to inform the design and implementation of any behaviour change intervention (Michie et al., 2011).

At its heart is the COM-B model which can be used to understand the factors which influence behaviour. The COM-B model is structured by way of three conditions that are important in shaping a behaviour (B); namely: capability (C), opportunity (O) and

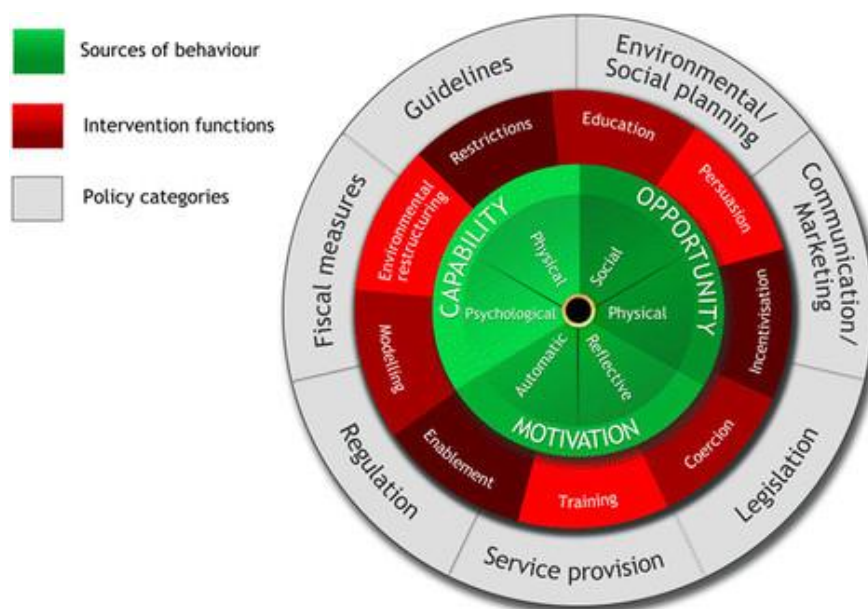
motivation (M). In order for a given behaviour to occur, individuals must possess the physical and psychological capability to perform it, the physical and social opportunity to carry it out and, at the same time, want or feel the need to complete the behaviour more than other competing behaviours. This forms the motivational (M) component of the COM-B model which considers reflective (e.g. deliberative thinking, decision making) as well as automatic (e.g. habitual) drivers of behaviour.

These three conditions of the COM-B can be broken down further for the purposes of analysing the antecedents associated with a given behaviour. The capability element considers physical factors such as reach, strength, endurance as well as psychological considerations, such as the extent of someone's knowledge or the ability to recall or apply a behaviour effectively in a given context. Meanwhile, the opportunity element considers the extent to which the behaviour is physically afforded by the environment (such as the proximity of available equipment or the presence of workplace cues) as well as the extent to which it is perceived to be socially acceptable or part of a social norm. The motivational element can also be divided into an automatic and reflective aspects. Automatic motivation takes in account habitual behaviours which are driven largely by unconscious processes. Meanwhile, the reflective element comprises a conscious evaluation in which the benefits are weighed against the risks associated with a given behaviour.

These three broad conditions form a hub around which nine intervention options can be selected when developing behaviour change strategies and interventions to address shortfalls associated with a given behaviour. They are supported by seven categories of policy which can be utilised to facilitate the intervention options. Figure 5 below shows a diagram of the BCW framework.

Figure 5

The Behaviour Change Wheel (Michie et al., 2014)



The BCW has been used to design interventions associated with a wide range of behaviours such as physical activity (Murtagh et al., 2018), weight loss (Saarikko et al., 2021), dental hygiene (Asimakopoulou & Newton, 2015), and smoking cessation (Fulton et al., 2016). According to its architects, the BCW considers conditions that are “internal to individuals and in their social and physical environment” and can be applied to “every intervention that has been, or could be, developed” (Michie et al., 2011 p. 3). In the context of safety, the BCW has been used in developing interventions to reduce risks associated with farm machinery (Surendran et al., 2023) road safety messaging (Mitchell, 2011) and non-recreational prescription medicine sharing (Beyene et al., 2019). However, it has yet to be used to develop safety interventions in aircraft manufacture or to enhance employees’ willingness to speak up. The BCW follows a systematic approach to intervention design that encompasses three steps; understanding the problem, identifying intervention options and identifying the specific content and implementation options (Michie et al., 2011).

The BCW has some clear strengths. It aids intervention design and supports evaluation and the development of theory, given it helps practitioners understand why interventions have been successful or why they have failed (Michie, et al., 2014). It also explicitly emphasises the different levels at which an intervention may need to work and includes many examples which help in understanding how the tools should be used (Hansen et al., 2017).

However, although widely used since its inception, the BCW is not without its critics. Ogden (2016) argued that the systematic approach proposed in the Behaviour Change Wheel overlooks the variability associated with the behaviours of target stakeholders in a real-world environment. For instance, target individuals involved in the intervention may have differing beliefs about a behaviour or have different interpretations about how the intervention should be delivered. This explains why some have called for an increased focus on how interventions are received and enacted, rather than a more reductionistic approach around their design and delivery (Hankonen & Hardenan, 2020; Hilton & Johnston, 2017). For instance, Pilbeam et al. (2019) identified the need for a greater understanding associated with contextual factors and the particular mechanisms by which safety interventions influence behaviours in the workplace. Ogden (2016) also questioned the broad, all-encompassing constructs of the BCW and the extent to which they can be falsified, given they cover such a breadth of behavioural antecedents. Furthermore, Ogden reflected on whether the use of a broad behavioural system hinders creativity and places limitations on the role of the practitioner by pushing them towards a generic, prescriptive intervention, rather than an approach that is nuanced and reflective of the complex paradigm or problem that needs to be addressed. Critics have also suggested that the BCW does not place enough emphasis on involving the target population during intervention development (O'Cathain et al., 2019) which suggests that co-creating interventions with the people they aim to serve can provide ownership and increases the likelihood of behavioural change.

In contrast to the BCW, other behavioural models such as Intervention Mapping (IM), draw a distinction between the methods of behaviour change (which the BCW helps to identify), the context of their application and the parameters which influence their

effectiveness. Although arguably more complex than the BCW, IM takes into account factors such as the setting, population and individual characteristics which moderate the impact of behaviour change interventions (Kok et al., 2016) and has been successfully used to develop a safety programme to prevent hearing loss among farmworkers (Fernandez et al., 2009).

3.4. Safety Voice Interventions

Despite the growing levels of research that focuses on the factors which underpin safety voice, there is a dearth of literature on interventions that can be used to improve psychological safety and safety voice behaviours in the workplace (O'Donovan & McAuliffe, 2020). Moreover, to date, the majority of this research has primarily been conducted in health care environments.

For instance, both Pian-Smith et al. (2009) and Raemer et al. (2016) used scenarios and debriefing sessions to influence speaking up behaviours amongst anaesthetists. They provided educational sessions which emphasised shared responsibility for safety and techniques for publicly testing conclusions and enquiring as to alternative points of view. Whilst one of the studies found improvements in anaesthetists' safety voice behaviours, Raemer et al.'s (2016) study found no significant changes in speaking up. Another study, which was carried out in a community-based clinic, also found that an educational intervention did not yield any improvement in safety voice (Coyle et al., 2005). The educational programme featured a lecture and video simulation, as well as case studies and debriefing sessions, that were deployed at six monthly intervals to train teams on speaking up techniques using role play. Post-intervention questionnaires revealed there was no significant change in participant's attitudes towards safety voice which calls into question the effectiveness of educational interventions. However, these post-intervention surveys revealed that the perceived barriers to medical reporting were not associated with shortfalls in education or capability but included a lack of time, extra paperwork, and concerns about career and personal reputation. This suggests that the intervention was poorly targeted and that simply providing more education may be insufficient to improve

safety voice behaviours. A better strategy may have been to understand the barriers to safety voice before the interventions were designed so that the interventions could address the perceived shortfalls. This notion of understanding the root of the problem before considering interventions is an approach that is being increasingly proposed by behaviour change models such as the BCW (Michie et al., 2011) and has been adopted in this research project on safety voice.

Other studies, which have utilised simulation exercises, have been more effective at promoting safety voice. Ginsburg and Bain (2017) used a role-playing simulation workshop as part of their multifaceted intervention which also included facilitated discussions and team climate data feedback to improve speaking up behaviours in an emergency department in Canada. During the role-playing simulations, which allowed teams to practice expressing safety voice in an environment where nobody was at harm, participants were able to role play the use of speaking up techniques and participate in debriefing sessions. While there was no significant difference between the emergency department and a control at baseline, the teamwork climate score, (which measured perceptions about cooperation and open communication and incorporated measures of speaking up) was significantly higher post intervention. This suggests that speaking up about safety can help build team cohesion and a shared expectation about when safety voice is appropriate and how it should be expressed.

The influence of leadership has also been a subject of research by those interested in increasing safety voice. Salazar and colleagues (2014) conducted an experiment in which medical students were placed at random into two groups; one of which was either encouraged by a senior surgeon to speak up (e.g. “your opinion is important”) whilst the other was discouraged by the same surgeon (e.g. “Do what I say. Save questions for next time”). The participants then assisted in supporting a simulated surgical exercise. During this exercise, the senior surgeon directed the participants to make a surgical mistake. The students were considered to have expressed their safety voice if they questioned the incorrect instruction. The results showed that employees in the “encouraged” group were significantly more likely to speak up than the “discouraged” group which demonstrated how simple messages from authority

figures can shape the environment in which communication takes place between senior and junior employees. Similarly, Sayre et al. (2012) used videos of senior staff to reinforce to nurses the importance of speaking up and to explain how sanctions had been removed for those expressing their voice. After the videos, participants discussed barriers to speaking up and developed action plans to mitigate them. The intervention group showed a significant improvement in speaking up survey scores compared to the control group. These studies highlight the role that leadership role modelling can play in encouraging employees to express their safety voice; a factor which was discussed earlier.

Other studies have found that teamwork and collaboration can improve speaking up behaviour in health care. In a US study undertaken by Henkin, et al. (2016) nurses and physicians worked as a team during designated “bed rounding” visits to minimise communication breakdowns and ensure that all involved were engaged in the conversations. The physicians and nurses completed surveys both before and after the intervention to understand its perceived impact. They found that this collaborative approach improved scores associated with their willingness to speak up about perceived problems with patient care (Henkin, et al., 2016). This study suggests that providing planned, physical opportunities for teams to collectively engage in safety conversations positively influences psychological safety and safety voice behaviours.

Other studies have sought to increase safety voice by introducing prompts or cues. Habyarimana and Jack (2011) sought to encourage mini-bus passengers to raise concerns about unsafe driving behaviours associated with long-distance road transportation services in Kenya. They installed stickers within the vehicle that urged passengers to “stand up and speak up” about poor driving behaviour. To motivate compliance, drivers who were found to have all stickers intact within their vehicles, were entered into a lottery where they could receive financial incentives. Whilst the researchers were unable to identify the specific mechanism which underpinned their safety improvements, the study was associated with a 60% reduction in insurance claims involving injury and death. These stickers appeared to provide timely cues

that reminded passengers that it was acceptable and even desirable to highlight poor driving behaviour.

Other interventions have sought to integrate safety voice into practical skills training. Away from healthcare, the Safety Voice for Ergonomics (SAVE) programme was introduced to educate masonry apprentices on the risk of musculoskeletal injuries associated with the ergonomic challenges associated with their work (Kincl et al., 2016). However, the programme also featured softer skills training in the form of vignettes that focussed on communication and problem solving. They found that, compared to controls, SAVE trained apprentices used their safety voice more and had greater safety participation.

One programme which has been widely used to improve aspects of safety voice is Team Strategies and Tools to Enhance Performance and Patient Safety or TeamSTEPPS (Clapper, 2018). This programme, which aims to foster improved teamwork and communication, empowers employees to speak up about risk and provides tools to help mitigate the challenges associated with hierarchy. These tools include “check back” which is associated with clarifying information to confirm that both the receiver and sender agree on an instruction or order; the “two challenge rule” which can be applied by an individual or team member to voice a concern once and then a second time in a firm and supportive manner and finally the CUS tool which uses key trigger words to escalate a concern (“I’m concerned, I’m uncomfortable, this is a safety issue, stop the procedure). In a study which offered a training intervention based on the TeamSTEPPS techniques, Johnson and Kimsey (2012) used video presentations of risk related scenarios around topics such as human error to engage perioperative teams in a clinical setting. Following attendance on the course, the majority of participants reported that they felt better able to question the decisions and actions of authority figures and were no longer afraid to ask questions. The study also found a marked decrease in the number of incidents requiring root cause analysis over the course of the following year. However, it was unclear as to whether the intervention led to a long-term increase in safety voice behaviour by participants, despite being deployed to new starters every six months thereafter. A meta-analysis of nineteen studies into the TeamSTEPPS

approach (Parker et al., 2019) also highlighted the need to evaluate the impact of this approach.

Manufacturing is a very different environment to the hierarchical medical setting. Medicine heavily relies on the competence of highly qualified experts to accurately diagnose and address complex health issues; sometimes in highly stressful, time pressured situations where decisions can have catastrophic consequences. It could be argued that, in manufacturing, there is more time for conscious decision making, employees work in less pressurised environments and the implications of decisions are more distal.

My research sought to explore the application of the BCW by using the three steps advocated by Michie et al. (2014) to develop a multi-faceted intervention associated with increasing employee's willingness to express safety voice amongst shop floor workers in aircraft manufacture. To address Ogden's claims (2016) that the BCW fails to take into account the contextual nuances that can underpin behaviour, qualitative approaches were employed to draw out the subtle factors which might influence safety voice in order to identify the particular requirements of a multi-faceted intervention using the BCW. To address O'Caithain et al.'s (2019) argument that there is not enough involvement with the target population when conducting the early design stages of an intervention, "shop floor" employees were engaged from the outset.

3.5. Research since 2020

The present study was designed and developed based on the research literature that was available prior to the launch of the intervention in early 2021. Since, 2020 the research on safety voice has grown significantly (Jones et al., 2021; Morrison, 2023). For instance, a search on the academic search engine, "google scholar" identified 928 studies when the search term "safety voice" was entered prior to 2020. Since 2020, when the same term was entered into google scholar it yielded 874 results in just four years (google retrieved 29/07/2024). Hence, this section aims to reflect the

latest academic research, drawn from psychology databases, such as “PsycArticles,” “PsyINFO” and “Psychology & Behavioural Sciences Collections” that will be used to inform the discussion.

From a measurement perspective, research has advanced in terms of developing new tools to measure the social and organisational factors which promote or inhibit safety voice. For instance, Mathisen and Tjora (2023) developed a Safety Voice Climate Scale as a means of measuring two theoretical dimensions; namely Leaders’ attitudes towards safety voice and Work colleagues’ encouragement of safety voice. Their research, which involved surveying 7642 employees in the Norwegian petroleum sector, revealed employees are more likely to speak out if the organisation encourages and supports safety voice behaviour. Their findings also suggested that leaders’ attitudes towards safety voice were inferior to colleagues’ encouragement to safety voice as only the latter was significantly associated with safety voice behaviour. This adds weight to the importance of co-workers in influencing safety voice.

Other researchers have pioneered an experimental approach to exploring safety voice. Noort et al. (2019a) developed an experimental laboratory study using of the notion of a researcher walking across an elevated plank under different risk conditions which elicited safety voice and safety silence behaviours. They later used the same experimental approach to explore muted safety voice, which they defined as the partial withholding of safety concerns (Noort et al., 2021b). During this experiment, they were able to measure the nuanced circumstances when individuals speak but do not explicitly refer to the perceived risk and the extent to which speech contains clues that convey concern. They then intervened by manipulating situational variables to increase the salience of the hazard, clarify responsibilities and encourage safety voice in order to investigate whether muted safety voice could be unmuted. They found that it was possible to unmute safety voice at unique hazard stages when people were concerned, which highlighted the importance of investigating nuanced aspects of speech and how individuals engage in safety conversations.

One of the most striking features of the latest research is the preponderance of safety voice literature in health care. The global COVID-19 pandemic appeared to have a significant influence on the increase in safety voice literature. This was an unprecedented period in which global governments swiftly imposed new safety requirements on employers in order to minimise the spread of COVID-19. Many front-line workers, such as those in health care, were asked to perform their duties and maintain services, often in challenging conditions (Falco et al., 2021). It was against this backdrop that researchers sought to understand whether employees felt able to speak up about the adequacy and effectiveness of their safety arrangements. For instance, Tedone and Lanz (2024) surveyed 152 frontline US nurses across three time points during the height of the COVID pandemic. They found that nurses who experienced a great frequency of pandemic-related demands and uncertainty were more likely to remain silent about safety issues and bypass safety procedures to get the job done. This was often due to job-related constraints or a fear of negative repercussions or a fear harming their image or reputation amongst colleagues.

Abrams et al. (2023) found similar evidence amongst healthcare workers in the UK. They interviewed 50 nurses to understand their experiences of speaking up during COVID-19 and the consequences of doing so. The nurses described a sense of futility in initiating safety related change and preferred to mute their concerns in relation to speaking up. They also feared the consequences of expressing their safety voice and described perceptions that the organisation would disregard them as pandemic response policies were implemented. This reflects the pressurised, high-profile nature of healthcare during the pandemic crisis in which key workers were perceived as heroes for maintaining their services in spite of the many challenges (Lipworth, 2020). As key workers, employees in aircraft manufacturing may also have been subject to similar pressures during this time frame.

The COVID-19 environment also provided an opportunity to identify the antecedents of speaking up in the context of perceptions of misconduct by business and political leaders. In a survey comprising 511 employees in UK companies, Cakir et al. (2023) found that ethical leadership was a vital component to promoting safety in the

workplace by encouraging worker engagement in safety voice. They found evidence that during the pandemic crisis, when leaders displayed clear signals about the importance of safety voice, it led to increased communication between employees and managers.

Away from healthcare, other studies have also sought to explore the importance of leadership on safety voice and the extent to which the climate is conducive to speaking up behaviours. One study involved aircraft maintenance technicians in Turkey, which is extremely relevant to the working environment of my research. Aktas and Kagnicioglu (2023) surveyed 359 technicians to understand how safety leadership and safety climate influence their safety behaviours. They found that aircraft technicians were less likely to report unsafe situations related to the maintenance team of which they were members which adds further weight to the evidence that employees often withhold their safety voice as a way of maintaining harmonious relations amongst their co-workers. The study also found that the controlling practices of safety leaders significantly contributed to safety reporting. They called for further studies on the relationship between safety reporting, and the importance of group norms among aircraft maintenance technicians. The present study sought to build upon this research by exploring safety voice in aircraft manufacturing which shares a number of characteristics with aircraft maintenance. Both activities are carried out in small teams, in a highly regulated environment and in which safety compliance is critical.

Mathisen et al. (2022) found that supportive leadership and possessing a degree of autonomy over work outcomes were factors in promoting safety voice amongst employees in the Norwegian offshore oil rig sector. Their survey of 7505 workers found that when the job is demanding safety voice decreases. They suggested that when work demands are high, it can lead to a state of depletion in which workers either lack the capacity to speak up or worry that speaking up about safety will add to their heavy workload. Their study also found evidence that when employees possessed a degree of autonomy over their work tasks, they felt safer to express themselves. Mathisen et al. (2022) highlighted the importance of conducting more

research into safety voice and its relationship with factors such as relationships and psychological safety.

Other researchers have found that providing physical opportunities to discuss safety yielded a range of positive outcomes. For instance, Lee et al. (2023) developed a twelve-week intervention to promote safety related huddle meetings in Korean hospitals. A huddle is a short, regular meeting that takes no more than 10 minutes at the start of each work day or shift. To launch the intervention, they engaged leaders in face-to-face workshops, provided staff nurses with online training and supported the nurse teams with regular coaching on their daily huddles. They then carried out a range of qualitative and quantitative measures to evaluate the intervention. They found evidence that regular huddles increased situational awareness amongst nurses, improved the prioritisation of risk and supported the effective communication of safety issues. Huddles also helped nurses anticipate each other's needs, led to improved patient safety and helped to support culture of speaking up, although some participants highlighted that the intervention increased the time pressures placed upon them. This study is particularly relevant to aircraft manufacturing, given that daily "huddle" meetings, called daily start up meetings are a feature of lean manufacturing practices adopted in aircraft manufacture.

Perkins et al. (2024) explored perceptions of psychological safety on the flight deck amongst aircrew in commercial and business aviation. They surveyed over 800 pilots regarding their perception of interpersonal skills in the context of existing aviation safety models such as Crew Resource Management and Threat Error Management; both of which aim to provide aircrew with technical skills to manage aviation risk. However, despite receiving this training, the pilots surveyed suggested they were less likely to express their safety voice when psychological safety is low. As well as underscoring the importance of psychological safety as a factor in safety voice, this led the researchers to recommend that aircrew training is improved by focussing on effective communication skills and the development of positive relationships. However, it could be argued that the study demonstrated the importance of variables other than psychological capability in inhibiting or enabling safety voice amongst pilots. Whilst the provision of training focuses on equipping individuals with the

knowledge and skills about when and how to voice, the study indicated the presence of other factors which motivate speaking up behaviour. These included cultural factors such as hierarchies and relationships which may be more difficult to influence through training alone.

The complex nature of the various antecedents which influence safety voice has led researchers to explore which behaviour change interventions are most effective at increasing employee's willingness to speak up about safety. Jones et al. (2021) reviewed the findings of 34 studies from across healthcare organisations around the world associated with interventions or strategies that have been implemented to promote speaking up behaviours. They found that some aspects of educational interventions, such as using scenarios, team working and assertiveness training, were found to be effective. Meanwhile, conversation training and role play exercises were found to be ineffective. Many of the other interventions reviewed as part of their research were categorised as indeterminate; they were not entirely effective or ineffective. For instance, a study by Balasubramian et al. (2010) was cited in which a staff forum was introduced for team members to speak up on safety. The intervention was unsuccessful in 7 of the 25 case study sites. The reasons attributed to these indeterminate findings were associated with cultural factors in the workplace, hierarchy and inter-disciplinary tensions. Other factors included the effectiveness and consistency of their deployment, the interplay between wider socio-economic-political factors and the local setting. Jones et al. (2021) concluded that the deployment of interventions within complex adaptive systems rarely lead to wholesale successes or failures but can lead to the partial fulfilment of objectives. They recommended that future research is needed to better situate studies within complex contexts with culturally diverse workplaces.

Violato (2022) also carried out a review of the literature regarding speaking up behaviours in health care. After identifying 14 relevant studies, the research questions that appeared to underpin the studies were drawn together. They included 1) what interventions have been used to promote safety voice 2) what mechanisms influence speaking up, 3) what are people's perceptions of speaking up, 4) how do people speak up? And 5) how effective is speaking up? Violato

concluded that, in healthcare, whilst educational interventions have been widely used to influence speaking up behaviours, very few appeared to have long lasting effects, with the exception of some aspects of team skills training and communication techniques. He found evidence that hierarchies, power dynamics and psychological safety were the biggest inhibitors of speaking up, whilst safety voice enablers included the presence of positive mentors, individual factors and the cultural climate, although the relevance of culture was unclear. The study also revealed that perceptions and experiences of safety were, on the whole, negative and that whilst health care providers frequently indicated that safety voice was valued, it was not encouraged. Speaking up behaviour was often ignored and health care workers feared negative consequences. The manner in which individuals spoke up revealed people frequently engaged in indirect methods by asking questions and offering suggestions. Where speaking up behaviours were identified, they were often preceded by a calculated evaluation that considered the utility and expectations of outcomes. Violato (2022) was unable to draw conclusions regarding the effectiveness of speaking up interventions because of the lack of research in this area. He recommended further research in a range of areas that included how speaking up behaviour occurs, its outcomes and how safety voice is received. Other areas that were identified for potential study included how safety voice is measured, the antecedents of safety voice and the effectiveness of training interventions. Violato (2022) also called for safety voice research in other workplaces and national cultures. The current study aims to fill some of those identified gaps.

This section has reviewed the recent literature on safety voice. Advances have been made in key areas associated with the measurement and experimental study of safety voice. However, a number of questions remain about the factors which shape safety voice behaviours in aircraft manufacture, how safety voice can be effectively measured, and how to develop effective interventions which positively influence employees to speak up.

3.6. Epistemology & Ontology

Before any applied research is carried out, it is important to be clear about what is being studied, the reasons why it is being studied and how the data is gathered (Braun & Clarke, 2006). Underpinning this is ontology - what we can know about the nature of reality – and epistemology - how we can know it (Devine et al., 2002).

Ontology focuses on the study of ‘the way the world is’ and psychologists have been broadly divided into two broad camps; realists and relativists. Psychologists subscribing to the realist school of thought argue that reality is fixed and independent (Willig, 2001). They posit that there is a truth behind behaviour that can be revealed through systematic observation and experimentation. Underpinning this approach, which has become the foundation of the scientific method, is the belief that objective data can be captured and used to elucidate knowledge about the reality of the world (Lawani, 2021).

Those who take the relativist position argue that reality is not fixed but is created by the human mind based on social experiences (Fletcher, 1996). Underlying this perspective is the belief that there are multiple, socially constructed, holistic realities that are derived through experience, history, values or learned behaviours (Kant, 2014). Psychologists who subscribe to the relativist view posit that reality is revealed largely through language rather than objective data.

Bridging both the realist and relativist perspectives is critical realism. Critical realists propose that there is a real world out there, which is independent of observers (Sayer, 1992). As evidence of this, they point to objects, structures and entities which are undeniably present in the world (such as the existence of supervisors or an IT enabled safety reporting system in the context of the present study). Yet they also view knowledge of the world as fallible, cumulative and socially constructed (Easton, 2010). Critical realists therefore believe our understandings and experience of reality are mediated by language and culture (Braun & Clark, 2022).

This research was underpinned by a critical realist ontology reflecting the belief that reality is unattainable because perceptions of reality are shaped by language and culture (Maxwell, 2012). It was concerned with shop floor experiences of safety voice in aircraft manufacture, as studies show the under-reporting of safety concerns by employees is commonplace in aviation (Gilbey et al., 2016). The project was initially motivated by the researcher's own personal experiences of employee engagement with shop floor employees and supervisors as a Safety Health & Environmental practitioner in aircraft manufacture. These shop floor workers were viewed, by the researcher, as skilled and talented individuals whose knowledge, skills and experience were not always harnessed to improve safety. This inspired the research question: why do shop floor employees not consistently speak up about their safety experiences and what enablers need to be in place in order to facilitate their safety voice?

This research project adopted the position that the relationship of the researcher to the researched is interactive. In other words, it was acknowledged that the investigator plays an active role in shaping the research and its findings through what is selected, edited and deployed (Fine, 2002), rather than simply reflecting simply what is said by shop floor employees. Berger (2015) noted that

“the worldview and background of the researcher affects the way in which he or she constructs the world, uses language, poses questions, and chooses the lens for filtering the information gathered from participants and making meaning of it, and thus may shape the findings and conclusions of the study (p. 2)”

The mixed methods approach adopted in this research align with this critical realist position. Mixed methods research has the potential to provide a greater depth and breadth of understanding which may not be possible by using a singular approach in isolation (Almalki, 2016). It can also provide opportunities for participants to engage and share their experiences throughout the research process (Shorten & Smith, 2017). By triangulating different sources and types of data, this mixed methods approach can provide a broader, multi-layered understanding about the reasons

behind the complexity of reality rather than simply deciphering it (Lawani, 2021; Yardley, 2000).

The quantitative methods used in this research project were designed to capture and test objective data about the mechanisms of safety voice, safety voice behaviour, the interactions between different stakeholders and their use of safety voice processes, such as safety reporting systems. Thus, this approach provides insights associated with the way in which employees interact with the structures, objects and entities of safety voice (Archer et al., 2013). However, an overreliance on quantitative methods can lead to oversimplification and the omission of other variables which were not being tested. Hence, qualitative data was used to explore meaning and the attributes of safety voice that fall between pre-assumed concepts that are established in surveys (Goertz & Mahoney, 2012).

Qualitative methods - Thematic Analysis

To explore employees' understanding, experiences and perceptions of safety voice an inductive qualitative approach was employed (Willig, 2001). Interviews with shop floor employees and supervisors were conducted to explore the factors which shaped whether they spoke up or remained silent. The transcripts from these interviews were analysed via inductive thematic analysis (Braun & Clarke, 2006, 2017) which is a method for identifying and drawing out key themes about a particular phenomenon and how they relate.

Like other forms of qualitative data analysis, thematic analysis explores repeated patterns across a data set. However, unlike, content analysis, which uses data collection techniques to quantify the presence of words to generate patterns of meaning (Vaismoradi, et al., 2013), thematic analysis enables researchers to explore and identify themes derived from coded data that represent their importance rather than the frequency with which they appear in their data (Braun & Clarke, 2006; Nowell et al. 2017). Thematic analysis enables researchers to delve beyond the surface level, to select codes, identify patterns of meaning and construct themes to help both tell a story and answer a research question. Given the nuances associated

with the expression of safety voice, this approach was selected to support the collation and generation of employee perceptions and experiences.

In summary, this mixed methods approach served a dual purpose; the qualitative methods helped to provide a better understanding about safety voice and insights about what needs to change in order to improve safety voice. Meanwhile the quantitative methods aimed to test the strength and nature of those changes over time. In this way, the critical realist and mixed methods approaches aligned to support the overarching research questions:

- What influences employees' willingness to express safety voice?
- How can researchers measure safety voice behaviour?
- To what extent is the behaviour change wheel (BCW) useful in developing a behaviour change intervention to increase employees' willingness to express their safety voice? and
- What behaviour change interventions are effective in shaping safety voice behaviour?

Chapter 3 presented the findings of a discovery phase which involved a review of the safety voice literature and the generation of research questions that formed the basis of the safety voice study. It also set out the context of the study, introduced my interests and motivations for conducting safety voice research and established the epistemological and ontological standpoint that was adopted throughout the project.

4. Chapter 4: PHASE 2 – Understanding the problem

This chapter introduces the second phase of the research which was concerned with understanding the factors which influenced employees' willingness to express their safety voice in the context of aircraft manufacture. This phase is highlighted in the diagram below and was associated with gathering data about the specific experiences of shop floor workers associated with safety voice by carrying out a series of pre-intervention interviews as part of Study 1. The findings from the interviews were used to identify three themes and several critical behaviours which appeared to be important for the facilitation of safety voice on the shop floor. Study 2 involved the development and implementation of a questionnaire targeted at shop floor supervisors and employees to acquire a baseline measure of speaking up behaviour and a wider insight into the factors which influence safety voice from a broader population.

Figure 6

Phase 2 of the study in context



4.1. Study 1 – Pre-intervention interviews

In this qualitative study, factors that influenced safety voice in aircraft manufacture were explored. Semi-structured, face-to-face interviews were conducted with 19 shop floor employees and supervisors representing three areas from a large aircraft manufacturing site in the UK. In this respect, this study is informed by Edmondson (1999) who initially used the technique of semi-structured interviews to confirm that the theoretical constructs of psychological safety could be operationalised in a real workplace environment.

The aims of this study were to explore the nature of employee safety voice in aircraft manufacturing to understand the issues that are reported and those which are withheld, how those issues are raised, when they are raised and to whom. The study also helped in understanding the experience of shop floor employees and supervisors in this context, and the factors that influence their willingness to express safety voice.

The interviews were analysed via inductive thematic analysis (Braun & Clarke, 2006; Clarke & Braun, 2017) and the findings of the interviews were used to identify key behaviours that are important to the expression of safety voice amongst shop floor employees. These behaviours were considered as the basis for the behaviour change intervention.

Three themes were generated from the analysis. These were a) Perceptions of shop floor identity and safety voice, b) Perceptions of “them” and c) Facilitation of safety voice. The findings revealed that safety voice is a complex behaviour that is underpinned by a wide range of factors associated with the nature of the situation, the availability and type of opportunities to voice, perceptions of self-efficacy and beliefs about the outcome of expressing safety voice. Findings include evidence that workers employ a range of strategies to express their voice which is a novel finding in the safety literature. Further research is needed to understand these strategies to help inform behaviour change interventions that seek to increase employees’ willingness to express their safety voice.

4.2. Methods

4.2.1. Methodology

This study used a qualitative approach to explore the multiple factors which underpin safety voice in aircraft manufacturing. Phenomenological qualitative research is concerned with gathering rich data in order to understand how individuals make

sense of the world, how they experience events and the meaning they attach to situations and phenomena (Pietkiewicz & Smith, 2014). This study adopted a phenomenological lens in order to understand the participants' perspectives and interpret their lived experiences of safety voice (Pietkiewicz & Smith, 2014; Willig, 2001).

4.2.2. Participants

The study was conducted in a large aircraft manufacturing site in the UK. Aircraft manufacturing is recognised as an environment in which many hazards are commonplace (Karanikas et al., 2018). Nineteen operational employees, who were either directly engaged in manufacturing aircraft components or were involved in supervising or supporting others in the completion of aircraft manufacturing tasks, were recruited. These were volunteers who positively responded to the researcher's invitation to take part and met the inclusion criteria. This stipulated that all shop floor workers (who will be described throughout as employees) possessed at least one month's experience of working in their present roles and were directly engaged in aircraft manufacturing activities. Meanwhile, in order to take part, supervisors (who will be referred to as supervisors throughout) were required to possess six months experience and have direct line management responsibility for the safety of shop floor employees which included capturing, addressing and escalating employee concerns and suggestions. Employees were excluded if they did not meet the above criteria or did not sign the consent form.

The employees were drawn from three specific areas which included a modern machining workshop, a fabrication facility and a chemical treatment line (See Table 1). At least two supervisors were recruited from two of the three areas and one supervisor participated from the remaining area. Before commencing the interviews, ethical approval was obtained from the University of Derby (ETH1819-0050) and the study was conducted in strict alignment with British Psychological Society requirements (BPS, 2021).

The interviews lasted between 17-54 minutes (mean = 33 minutes). Characteristics of the participants are outlined in Tables 1 and 2 below.

Table 1

Demographics of the participants who were involved in Study 1

Characteristic		No of Participants	% of Participant Group
Gender	Male	18	95
	Female	1	5
Role	Supervisors	5	26
	Employees	14	74
Workplace	Modern Machining Facility	5	26
	Chemical Treatment Line	7	37
	Fabrications Facility	7	37

Table 2

Characteristics of the participants involved in study 1

Name (Pseudonym)	Role	Age	Length of Time in organisation (years)	Length of interview (mins)
Sonny	Shop floor worker	30-45	6-10	36
Francis	Shop floor worker	30-45	11-25	24
Adam	Supervisor	55-67	25+	40
Nick	Supervisor	46-55	11-25	38
Tony	Shop floor worker	46-55	11-25	26
Owen	Supervisor	55+	25+	54
Cody	Shop floor worker	30-45	11-25	26
Greg	Shop floor worker	46-55	25+	37
Chris	Shop floor worker	55-67	25+	24
Alan	Shop floor worker	30-45	11-25	26

Tim	Shop floor worker	20-29	6-10	17
Stuart	Shop floor worker	46-55	11-25	31
Alistair	Supervisor	55-67	25+	48
Cameron	Supervisor	46-55	25+	29
Kenny	Shop floor worker	30-45	11-25	52
Sean	Shop floor worker	55-67	25+	46
Luke	Shop floor worker	20-29	0-5	32
Karl	Shop floor worker	20-29	0-5	22
Dean	Shop floor worker	30-45	6-10	26

4.2.3. Interviews

The interviews were facilitated on a one-to-one basis by the researcher. This approach was selected to enable the participants to express themselves freely and to provide a physically and psychologically safe space where they could potentially disclose sensitive information without the undue influence of others (Willig, 2001). For example, interviews were used successfully by Milliken et al. (2003) in their qualitative study which explored the reasons why employees, across a range of industries, were reluctant to express their voice. A meeting room adjacent to the employees' normal place of work was used to carry out the interviews and participants gave their written consent to participate in the study.

A semi-structured interview schedule was used to conduct the interviews. This approach was utilised to enable the researcher to focus on the research questions, allow for flexibility and to minimise the impact on business operations by taking interview participants away from their work for extended periods of time (Adams, 2015). The interview schedule was informed by the existing research literature regarding the factors which appear to influence safety voice but included open questions and prompts designed to explore the participants' experiences and perspectives from an inductive perspective (Braun & Clarke, 2019).

In order to encourage discussion, the employees were initially asked general enquiries around their perception of the organisation's levels of safety commitment before considering the types of safety issues that they and their colleagues might regularly encounter. Employees were asked about the ways they used to express their safety voice, their perceptions of any possible consequences of speaking up and to explain their perception of the contextual factors which might influence their decision to speak up or remain silent in cases of safety breaches. Particular emphasis was placed on understanding the reasons and motivations which underpin employee voice behaviours. Finally, employees were given the opportunity to talk openly about any safety-related issues they felt were relevant to the discussion on safety voice (See appendix 2 for interview schedule).

The interviews were recorded on a secure audio device supplied by the researcher.

4.3. Data Analysis

Data analysis was carried out using a process of inductive thematic analysis which is a method for identifying, analysing and reporting patterns (themes) within data (Braun & Clarke, 2006; 2019). Thematic analysis was used primarily because it is a highly flexible approach that can be used by relatively inexperienced qualitative researchers to analyse complex data sets (Braun & Clarke, 2006). There are no pre-determined categories associated with thematic analysis and few procedures which enabled the analysis to be tailored to reflect the safety voice research questions around which this study is based (King, 2004). A key benefit of thematic analysis is that it can yield rich, detailed accounts that support the generation of nuanced findings that might otherwise have been overlooked (Nowell et al., 2017). It was therefore considered as the ideal approach for exploring safety voice which has been recognised as a complex and nuanced behaviour (Noort et al., 2019a).

The analysis followed the six stages as defined by Braun and Clarke (2006). First, the interviews were transcribed verbatim; a process which enabled the researcher to become familiar with the data. During this phase all personal identifiers were removed. A software tool known as Otter.ai, was used to support the transcription,

however, care was taken to ensure that the transcription was accurate. The transcripts were reviewed and revised several times to ensure they accurately matched the audio recording.

The transcripts were then coded using a bottom-up inductive process and organised into specific units of meaning (words, sentences and paragraphs). The focus for this coding was in identifying meanings and experiences that were related to safety and the behaviours of speaking up or remaining silent. However, other issues that were discussed in the interviews were not excluded from this coding process. Initially, 201 codes were created across the full data set. These codes were then reviewed and re-coded several times as part of an iterative process to ensure the codes were created consistently. Potential themes were then developed from the codes to capture important findings or patterns across the data set which appeared relevant to supporting or hindering safety voice. These themes were revised over time to reflect emergent new coding and to eliminate or merge others. The qualitative research software package, Nvivo was used to initially support this activity but was later transitioned to an Excel spreadsheet for ease of data capture (see Appendix 3 for an example).

Initially, the coding was carried out on a descriptive semantic level to capture and categorise the output of the interviews. However, over time, these were further refined into latent themes of meaning as the researcher became more experienced and confident with thematic analysis.

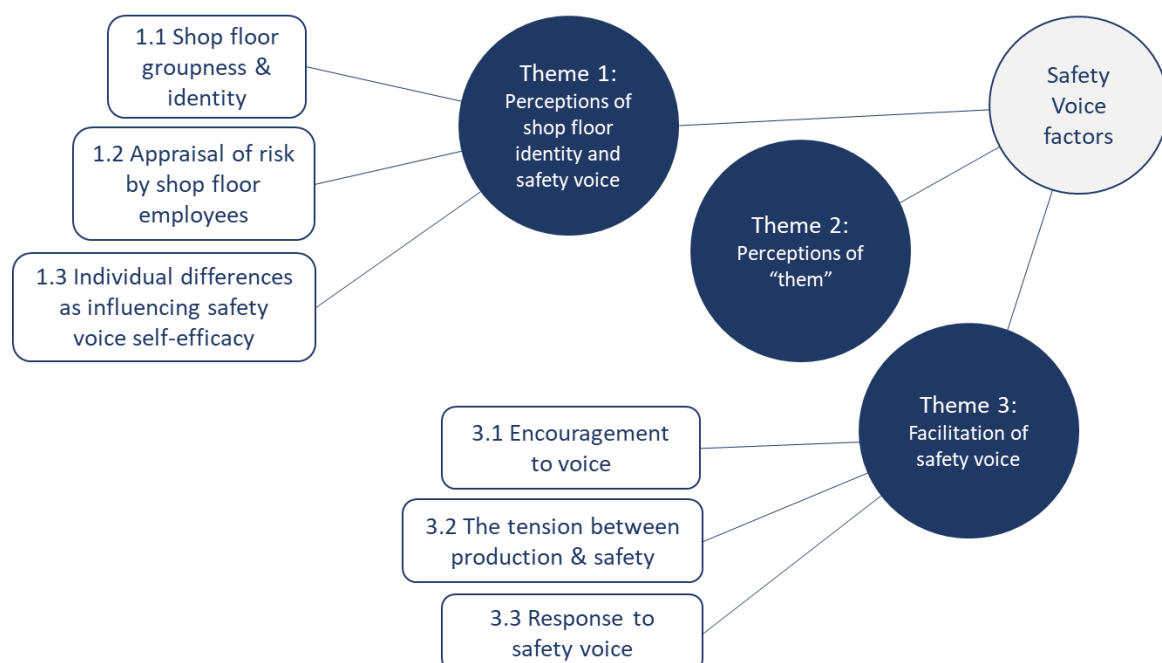
A final code structure was developed to reflect a number of overarching themes and sub themes and these were named. For the purpose of this analysis, the structure aimed to reflect the factors which influenced employees' decisions to voice safety concerns. Representative quotes were then selected to illustrate the final themes. See figure 7 below for a thematic map which aims to highlight the four main themes that were generated.

4.4. Findings

Participants reported a broad range of safety related issues that were organised into three conceptual themes with a number of supporting sub-themes. These were a) Perceptions of shop floor identity and safety voice, b) Perceptions of “them” and c) Facilitation of safety voice. The following diagram highlights the themes and supporting sub-themes:

Figure 7

Thematic map showing the three themes generated in the pre-intervention interviews



4.5. Theme 1 – Perceptions of shop floor identity and safety voice

The first theme explores a shop floor identity which shaped the type of safety issues that were raised, the means by which employees expressed their safety voice and the personality and confidence factors which influenced which employees were more likely to speak up. It is divided into three subthemes; the first of which considers shop floor groupness and identity, the second discusses how risks were appraised by shop floor workers and the third focussed on how individual differences impact

safety voice. Quotations are provided with an indication of whether they were from a supervisor (S) or employee (E).

4.5.1. Sub theme 1.1: Shop floor groupness and identity

“You don’t grass your mates up!”

This subtheme explores the sense of identity which shop floor workers working directly in aircraft manufacturing activities appeared to share. The interviewees who worked on the shop floor (both employees and supervisors) indicated that shop floor workers were viewed collectively as a distinctive in-group with shared attributes, characteristics and values. They were perceived as a close-knit community of pragmatic, hands-on workers who applied common sense principles to practical problems. They were described as possessing integrity and honesty; they were persistent in raising issues, where management had failed to act, and would help each other in achieving their tasks. For instance, shop floor workers described themselves as:

invested in the work they do; (Owen – S)

honest in here; (Alistair - S)

independent minded; (Greg - E)

aware of what’s right and wrong; (Tony - E)

They will definitely speak up if anything bothers them. (Alan - E)

These comments indicate that shop floor workers valued honesty, integrity, hard work and speaking the truth. Competence was a key component of this shop floor identity. The participants, who were in shop floor roles themselves, were in agreement that these workers were highly skilled individuals whose talents and opinions were worthy of respect. According to the interviewees who worked on the shop floor:

...the people in here, they're all top people at their jobs. (Greg - E)

...the masters of their trade and have done it for a long time (Kenny - E)

...very well educated and very well trained. (Tony - E)

They know the risks they're dealing with. (Nick - S)

These comments highlight how interview participants viewed shop floor workers as highly capable experts with extensive knowledge and skills. Many shop floor participants saw this part of the workforce as indispensable to the achievement of production targets and there were frequent references regarding their collective ability to overcome challenging obstacles in order to complete tasks. A typical quotation was from Greg who commented about his co-workers, "If we've got a job; we've got to get this job out – they'll move heaven and hell to try and get it out," (Greg - E).

This proactive attitude indicates an awareness of the importance of achieving production targets and suggests that both employees and the organisation placed a high value on those who possess a 'can-do', solution-orientated attitude. The comments also highlight a commitment, amongst some, to achieve delivery targets at all costs.

Participants talked with a sense of pride about their role, their skills and their achievements which was summarised by Kenny who described:

a huge passion and pride from the shop floor workers that this is our shop and we are proud of what we do; the level of output from our facility. And there's a lot of pride and self-ownership on the machining areas that, you know, the bits that I do. So there's not many people you'll find that are willing to let things go to rack and ruin in here. (Kenny - E)

This extract, which reflects the sentiment across the group, indicates that employees personally cared about their workplace and were proud of the work they delivered.

Interviewees repeatedly referred to the camaraderie of shop floor life and the close bonds which had formed between co-workers. The interviewees described how employees enjoyed one another's company and how the shop floor environment was a fun place to work. The shop floor was described as:

having a laugh and taking the mick out of each other and not taking yourself too seriously; that kind of atmosphere. I wouldn't say that's true on every shift, but on my shift we're mates. That's the sort of relationship we have. We're mates. It's good. (Kenny - E)

These close-knit relationships appeared to influence their perceptions of safety and several participants made explicit reference to the importance of looking out for each other:

There's a lot of people like me who look after, not just themselves, but they want to go home safe. (Cameron - S)

They won't want to see anyone going home injured. (Tony - E)

They will help each other with things that will potentially hurt them. (Dean - E)

Yeah, everybody's health and safety centred. We all wear our gloves when we're on the shop. We all wear glasses when we're doing anything what would go in our eyes. So yeah, I'd say everybody is health and safety conscious – course they are. (Sean - E)

These quotes suggest that shop floor workers saw their co-workers as a highly talented, skilled and 'safety conscious' band of brothers' who would intervene to protect each other in a complex and high hazard working environment. The interviews also revealed that shop floor workers were acutely conscious of the need to maintain these highly valued relationships and avoid the potential for in-group conflict, wherever possible. This had consequences for safety voice. None of the participants reported publicly discussing the unsafe behaviour of their colleagues in

the Daily Start Up Meetings (DSUM) meetings and were viewed by most participants as the ideal opportunity to express safety issues. This failure to report the unsafe behaviours of their co-workers could have been due to the timing of the meeting and the fact that very few workplace behaviours would have been witnessed by employees at this early time in the working day. It might reflect a low number of unsafe behaviours occurring in the facility as a whole or it could reflect a general reluctance to publicly question the unsafe practices of group members. Some participants revealed there were certain circumstances and situations in which it was socially acceptable for employees to challenge their colleagues' safety behaviour and other situations in which speaking up might incur negative repercussions.

This was revealed by two participants who declared their willingness to challenge and confront their colleagues if "it was something really stupid," (Tony - E) or "if it was something really silly." (Alan - E)

This low number of examples highlights a reluctance to challenge their colleagues on safety grounds and, even then, they would not approach them unless their behaviour passed a perceived threshold of recklessness ('silly' or 'stupid'). The interviewees argued that directly challenging their peers over minor issues had the potential to result in conflict which they wanted to avoid:

You don't want to be doing that as it could go either way couldn't it? They could go and say 'Go on you're right' or they could get a bit mad and 'what's it got to do with you?' kind of attitude. (Alan - E)

This comment revealed the uncertain, potentially negative consequences that might arise for employees if they challenged their peers. The fear of being embroiled in conflict with an in-group member appeared to influence the extent to which employees expressed their safety voice with several interviewees reporting that they would err on the side of caution and remain silent, especially on seemingly minor issues. At the heart of this decision to remain silent was the desire to avoid being ostracised by the group and to maintain their harmonious relations, as evident in the following quotes:

In this environment, you won't make many friends by getting them in trouble.

(Francis - E)

You have, like, good relationships with people. You don't want to annoy people

by raising concerns about the way they work or their working practice. (Karl - E)

This reluctance to 'annoy people' or the need to protect their colleagues from 'getting into trouble' highlights the powerful influence of social factors on safety voice and suggests that individuals carried out some form of evaluation when considering whether or not to express their voice which weighs the safety risks against the need to maintain harmonious relations with the group. Indeed, one employee argued that this workers' code was deeply ingrained:

There's a culture or subculture, you see, in all Engineering – you'll talk between yourselves but you wouldn't go and grass someone up! (Greg - E)

This comment about 'grass[ing] someone up' highlights an in-group social protocol namely that employees expected their peers to refrain from reporting things to their supervisors or management that could get a colleague into trouble.

However, it was not just the reporting of unsafe behaviours of their colleagues which had the potential to lead to conflict. Several of the shop floor interviewees intimated that speaking up about workplace issues generally had the potential to damage close working relationships too, given that any subsequent safety 'improvements' could have an adverse impact on well understood and accepted working practices. Indeed, employees cited many examples where well-intentioned safety interventions had made their tasks slower, more difficult or rendered their highly prized skills as redundant. These included the removal of knives from the shop floor, the enclosure of machinery and the requirement to wear PPE for handling cutting equipment. Often it was the person who initially raised the issue who bore the brunt of the employees' frustrations. This was revealed by an interviewee who took particular pride in his positive attitude to reporting issues both from a quality and safety perspective. However, this had a downside for him within the group:

I get called names. I know I do. To me it's just funny. I get called a few names - I may not get me a lot of friends in the long run but I'm happy with the people I do get on with. (Tony - E)

This reference to not having 'a lot of friends' indicates that the social consequences of being viewed by shop floor workers as a frequent reporter were real and that individuals negatively labelled or shunned those whose behaviour did not align with the unwritten protocols of the shop floor in-group. Another label that employees feared was being viewed as incompetent which threatened their identity as skilled and talented workers. When asked why employees remain silent about minor issues, some participants suggested;

They feel foolish. (Stuart - E)

I think people get a little bit embarrassed. They might think 'Oh, I've just cut myself' and try and hide that. (Karl - E)

This sense of embarrassment suggests that employees remained silent on perceived minor issues to avoid being ridiculed or perceived as incompetent by their peers, which may be especially relevant in a team that prided themselves on excellence. Another interviewee described how injured employees were teased by their work colleagues for sustaining cuts when not wearing the required PPE:

So a guy would have picked up a bit of a cut of something - and literally just cut his finger a tiny bit. Still needs a plaster and still needs cleaning. No problem.

It's an injury that shouldn't have happened; he should have had his gloves on.

Well then the lads on the shop will call it 'the naughty boy club.' (Nick - S)

Labelling injured employees as part of a 'naughty boy's club' appeared to be a way that shop floor workers teased their colleagues for being 'caught out' by their supervisors and subjected to an investigation relating to the causes of the injury. This may have been intended as light-hearted but may also have served to deter some workers from reporting minor cuts and injuries altogether.

Nevertheless, silence was not just associated with the avoidance of conflict or being teased. It also served to protect colleagues from being disciplined by the organisation for safety breaches. The best example of this was an employee who described encountering a colleague who had alcohol on his breath. Although he was aware that being under the influence of alcohol was against company policy; rather than report his colleague to a supervisor, he reportedly suggested to his co-worker, “you better go and brush your teeth or get some sweets or something.” (Greg - E)

Clearly, he perceived that speaking out about his colleague to a supervisor could have negative consequences for his co-worker as well as for their relationship. He therefore preferred to help his colleague conceal the smell of alcohol and allow him to work on highly complex aircraft under the influence of alcohol rather than report his behaviour, despite the potential that impeded workmanship could result in a significant risk to flight safety. This appeared to be a risk worth taking for the employee, so long as his colleague was not investigated or disciplined.

Nevertheless, this example warrants further consideration as it illustrates the nuanced, complex nature of safety voice. Greg, the employee who detected the smell of alcohol on his co-worker’s breath could have remained silent if he truly wished to avoid any potential for conflict. However, he did not do that; he said *something* to him directly, which could be perceived as indirectly challenging his unsafe behaviour. In so doing, he made it clear to his colleague that he was aware of his errant behaviour and suggested that he concealed the smell of alcohol. In effect, it could be argued that Greg was advising his potentially impaired colleague to be extra vigilant and to avoid ‘drawing attention to yourself’. In other words, be extra careful in your work, do not have an accident, comply with processes and avoid attracting the unwanted attention of supervision to prevent both parties from getting into trouble. This could be inferred as a veiled safety voice strategy that met several objectives; it helped to look out for a colleague, relieved Greg of any guilty conscience that may have been associated with silence and went some way to protecting others in the workplace. At the same time, it potentially served to protect Greg’s relationship with his colleague and may even have created closer bonds

between the pair owing to their shared secret. It demonstrates, in a microcosm, the multi-layered aspects of safety voice, the challenges associated with its measurement and how in-group relations impact what and how it is expressed.

The interviews revealed a number of safety voice strategies that shop floor employees used to address the unsafe behaviours of their colleagues, without incurring negative repercussions. These ranged from raising issues in a light-hearted way to liaising with supervisors informally. For instance, if it was a peer, one advocated talking directly to the transgressor, in a non-threatening manner, "I'd actually speak to the person. I might casually say, 'put your glasses on; watch your fingers there.'" (Francis - E)

The 'casual' way in which this individual approached the conversation is important because it allowed him to express concern but also provided the flexibility to downplay the situation if conflict arose. Meanwhile, another participant described how, on a previous occasion, he had clandestinely warned a supervisor about the conduct of a colleague to avoid being embroiled in interpersonal conflict or being viewed negatively by the group for calling out the behaviour of an in-group member. He reportedly said to his supervisor, "I'm just, off the record, telling you - you need to watch out for it." (Cody - E)

The need to keep the conversation about a colleague 'off the record' highlights that shop floor workers did not want to be identified as the person who called out a colleagues' unsafe behaviour. Supervisors who were interviewed, also confirmed that employees regularly took them to one side to alert them about unsafe behaviours they had witnessed:

I have been tipped off in the background as well because someone's not been overly keen on - you know, saying to his colleagues, "Look you shouldn't be doing that." I've been tipped off in the past to say "look, you know, you need to keep an eye on this as such and such a body is doing that and I mean that I don't want to make a scene of it." (Adam - S)

These safety voice strategies were a way of employees raising safety concerns without the transgressor knowing. It also highlights the challenges associated with measuring safety voice behaviour, as some voice behaviours are expressed informally and confidentially.

This wariness about the social consequences of speaking up also appeared relevant to the expression of safety ideas. One employee suggested that he wouldn't want to 'go in with all guns blazing' with his safety ideas. He advocated speaking to colleagues first as a means of securing support in order, "to see what they might think. And then you might, say, get their opinion on it and then go "yeah" and go in with that." (Karl - E)

This notion of running safety ideas past colleagues and gaining social support before advancing them further, might be considered a way of proactively mitigating any perceived social consequences associated with escalating partially developed ideas that might not be acceptable to the group.

This subtheme has explored how shop floor saw themselves as a distinct group with an identity based upon shared attributes, characteristics and attitudes that were universally positive. Shop floor workers were conscious of the need to protect each other's safety but were also careful to maintain their close-knit relationships by avoiding the potential for in-group conflict or being ostracised by the group. This often involved erring on the side of caution by remaining silent on perceived minor safety issues or resorting to particular voice strategies in order to raise issues about unsafe behaviours or unsafe conditions without incurring negative social consequences.

4.5.2. Sub theme 1.2: Appraisal of risk by shop floor workers

“It depends on what you call unsafe and someone else calls unsafe”

This sub-theme draws together the ways in which shop floor workers, carrying out manufacturing work, appraised hazard-related situations and their perception of the consequences of expressing their safety voice. In order for an employee to contemplate speaking up, they reported that there needs to be an initial recognition that an issue or situation exists that has the potential to cause harm and can be improved or mitigated through the expression of safety voice.

Employees appeared to make a distinction between insignificant issues which they felt did not warrant safety voice and significant issues which did. The issues which were deemed significant and worthy of safety voice related to accidents requiring first aid, machinery issues, problems with PPE or activities where employees deemed the risks to be high. The following quote captures the sentiment across the group:

I raise anything that I see to be a potential for any form of accident damage.

You know, damaged parts, goods, machinery – anything that I see could cause any kind of either personal harm, harm to anybody else – even financial loss to the business. (Kenny - E)

These included emergent or unusual workplace hazards or instances where employees strayed too close to hazardous equipment and processes. For example, one employee described how colleagues would challenge those who came within close proximity of the hot form presses, “which are 1000 degrees; they’re red hot. The guys on there are very conscious about it. If they see you coming they’ll say “don’t come here!” (Cody - E)

Employees in these situations appeared to be willing to challenge others in the vicinity because the risks to safety were so high and could not be left to chance. Several of the interviewees suggested that in order to determine whether a situation

was worthy of safety voice, they perform a type of micro assessment of the learning potential of the incident before speaking up:

If you have an incredibly minor accident; you've knocked your hand on a part - people probably aren't going to be driven to raise that. There's no first aid needed. There's no consequence to it. There's no learning to come from it.

(Kenny - E)

Participants appeared to learn how to appraise whether a situation was worthy of voice by using their own intuition, by observing how the organisation addressed issues raised by their colleagues or through consultation with their co-workers. This was revealed by Luke, an apprentice, who described how he would defer any queries to a "skilled man" who was an experienced worker, to whom he'd been assigned. "As an apprentice at first, I'd tell my skilled man to make sure that they were aware of the situation and then it'd get escalated into a supervisor." (Luke – E)

Another interviewee recalled how he had advised a new starter:

We had a new lad, not too long ago – and one of the things I said to him is what we're gonna now tell you. 'If you mess something up – put your hand up. Just tell us. It doesn't matter what it is; doesn't matter how stupid it is or whatever.

You're not gonna get in trouble for putting your hand up and telling people right?" (Cody - E)

This comment suggests that some of the messages about what to report, how to report it and the consequences of reporting were communicated informally through worker conversations which suggests that safety voice is culturally learned and also indicates that shop floor workers cared about others. Given the informal nature of this guidance around safety voice, several participants reported that the circumstances when it was appropriate to speak up was open to interpretation and subject to differing perceptions of risk. One participant captured this sentiment clearly, stating, "It depends on what you call unsafe and what somebody else calls unsafe." (Chris - E)

Other situations which appeared to elicit safety voice from shop floor workers related to competence and, in particular, employees who were deemed vulnerable on account of their lack of experience or knowledge of the workplace. For instance, several employees in the machine shop described an incident in which a team member reported unfamiliar workers from the office areas (such as design engineers) who wandered onto a machine and disabled its operation by breaking an infra-red safety beam. This appeared to serve as an example about the circumstances when challenging unsafe behaviours is appropriate:

We had an issue where somebody came on the section; didn't introduce themselves or anything and actually ignored safety signs and things and just wandered onto the machine. It was an office side rather than the management side. (Chris - E)

This quote, which emphasised the fact the individual was not from the shop floor, suggest that it was acceptable for shop floor workers to directly challenge people who were unfamiliar with the workplace. Several interviewees also described incidents in which they had verbally challenged apprentices for approaching tasks unsafely. The extract below is a typical example:

I told him how to put it on the machine to make sure it's sat right. And I was doing it once and he was putting his hands in between to see whether it was sat right. So I told him, in no uncertain terms, 'Don't do that again,' because I didn't want to get his fingers broken. (Stuart - E)

This may indicate that employees were particularly conscious of the need to protect those who were unfamiliar with work practices. However, it could also be viewed as a way of teaching shop floor etiquette to those who were not yet considered part of the shop floor in-group.

One area which was viewed as particularly important for the expression of safety voice, was associated with reporting human performance errors or mistakes that

could negatively impact the safety of the aircraft further down the line. Almost every interviewee described the importance of speaking up about these issues and there was a widespread sense that the organisation's leaders were particularly eager for employees to raise product-related errors and mistakes so they could be investigated and rectified. This reflects a culture of confidence amongst employees that product safety issues would be taken extremely seriously, "I think everyone knows or sort of realises that if you make a mistake, you hold up your hand and say I've messed up." (Cody - E) Many of the interviewees reported instances of making mistakes or knew of colleagues who had made errors; some of which had resulted in expensive parts being scrapped:

I've always encouraged [reporting mistakes] because of where I was at Woodford [site] on Nimrod. I don't care what you've done. Just tell me what you've done. It won't matter. If you've scrapped something off, just tell me - it's a bit of metal. (Cameron - S)

This experience of making or observing others' errors appeared to reinforce the importance of reporting mistakes and issues; not least of all because employees were acutely aware of the consequences. "If that's not been picked up at any point in the future you can then end up shipping a million-pound defective product – it could bring an aircraft out of the sky." (Kenny - E)

This prospect of catastrophic failure motivated employees to express product safety-related voice and the majority of shop floor workers recognised the importance of raising product safety mistakes as they did not want this on their conscience. Many participants reported that maintaining a safe working environment resulted in a number of positive consequences. Aside from providing the organisation with valuable information about safety-related issues, safety voice also served to relieve employees of feelings of guilt that may come from withholding information about an issue that may cause harm in the future. This was revealed by one participant who described the motivations behind challenging colleagues: "they could hurt themselves can't they? And you don't want to be - I'd be thinking I could have stopped them doing that." (Alan - E)

The issues which were perceived as insignificant were largely associated with minor injuries or situations which did not excessively hinder work tasks. These issues were often deemed inevitable by the participants due to the nature of the tasks performed or the condition of the workplace infrastructure. These included cuts to hands, uncomfortable PPE and leaking machinery. One participant commented:

...you're supposed to report every incident but people just put plasters on and move on because it's just a tiny little cut. Like we get splinters sometimes.

Sometimes, like maybe on a monthly basis, you'll get things that'll go through your gloves – like a tiny splinter. You just pull it out, wipe away the blood and then away you go because you don't want to just like have all these repeated incidents just for these little things. (Karl - E)

This comment indicates a perception that reporting minor issues on a frequent basis can result in negative consequences for the individual that exceed the benefits of speaking up. This highlights that the appraisal of safety voice involves a wider set of factors than solely the hazard or situation with which an employee faces.

In summary, the appraisal of the situation involved employees working directly in manufacturing activities carrying out an evaluation as to whether a hazardous situation was deemed worthy of voice. This appraisal was influenced by individual perceptions of risk, by organisational and work group-related norms and previous experience over time. Some significant risks, particularly associated with the safety of the aircraft in manufacture, newer workers and vulnerable people, were viewed by all participants as serious and worthy of safety voice. However, other risks involving workplace issues or minor accidents were more open to individual interpretation and less likely to be reported. The variety and nature of the risks that employees were required to manage was significant, from small cuts to hands through to mistakes and errors that could lead to catastrophic flight safety events. Employees appeared to play an active part in teaching newer employees about the significant risks that warranted safety voice, particularly those associated with aircraft-related issues and

errors. In addition, employees appeared to weigh up the hazard or situation in the context of other factors before deciding whether to express their safety voice.

4.5.3. Subtheme 1.3: Individual differences as influencing safety voice self-efficacy

“Everybody’s different”

This subtheme explores the extent to which participants felt able to express their safety voice and how individual factors, such as confidence, experience and age shaped safety voice behaviours. Many interviewees suggested that one of the key factors which determined whether or not employees spoke up about safety concerns was associated with an individual’s personality, perceived status and levels of confidence. This was best encapsulated by a supervisor who commented,

...everybody’s different. You can have vocal people, you can have people genuinely concerned who may mention it in private and then you have people who just walk by. You can’t stop that. You can’t change it. You can only engage as much as you can. (Cameron - S)

Most participants indicated that their co-workers’ possessed the self-efficacy to speak up about safety if the conditions were in place for them to do so. For instance Luke estimated that, “90% of the people would say they’re more than happy to go to their manager and, if need be, put a stop to the job.” (Luke - E) However, there were several references that suggested that a minority of shop floor workers lacked the self-efficacy to speak up about safety. Factors such as a lack of confidence and introversion were perceived to increase the likelihood of safety silence. Tony argued:

You’ve got some very strong characters with the lads down here. Some will just tell you to your face exactly what they’re thinking about - exactly what they think about the job and the procedures and the process. Others are very quiet and meek. So there’s a whole range of people here. And not everyone feels

comfortable confronting people about issues and they just want to just get on with their work. Do what they're supposed to do. They say "Yes, boss. No boss" and get on with their work. And they're quite happy doing that. But not everyone's is prepared to stand up and say, "Hold on a minute. This is not right." (Tony E)

This account indicates that some employees were so uncomfortable about speaking up that they were willing to comply with their managers' requests even if they believed it was incorrect or unsafe. Indeed, many employees knew of co-workers who preferred to avoid standing out wherever possible:

I think some people fade into the background a little bit don't they? And you don't want any spotlights on them or anything. (Greg - E)

You do get a lot of people who just want a quiet life. Just do anything to get on with it. Just bury their head and get on with things and not say anything. (Tony – E)

The context appeared to play some part in intimidating people and influencing silence. One employee described his discomfort at speaking out in a meeting earlier in his career in front of his fellow colleagues: "Some people are a little bit nervous, some don't want to highlight themselves. I was quite nervous the first few times; everyone's looking at you." (Greg - E)

This comment demonstrates that the proximity of others and the desire to avoid unnecessary scrutiny by peers may be one of the reasons why employees preferred silence. It may also explain why participants preferred to focus on infrastructure and equipment issues in the public forum of the DSUM, rather than open up a discussion around the unsafe behaviours of their colleagues.

Age and experience were also perceived to be important factors in influencing safety voice. Several employees argued that inexperienced new team members, such as

apprentices, possessed less confidence and were more reluctant to express their safety views. For instance, the following quotes are from employees who had worked with younger people or had experience of working in the company as an apprentice:

Some have come from private school and public schools and some of them find interpersonal skills hard. (Luke - E)

When I was younger I would have probably been more inclined to keep my mouth shut. (Tim - E)

When I when I first started here I think it was shyness really, but now I will speak up. (Chris - E)

One participant suggested that it can take time for inexperienced team members to become part of the shop floor in-group and were therefore at a higher risk of being ostracised: "I'm not as experienced as some people. I sort of feel it's not my place to question someone who's been doing the job for 25 years or whatever. You wouldn't like to do it." (Karl - E)

The phrase "it's not my place' to question experienced workers indicated that the individual did not feel they had yet earned the right to challenge their colleagues and therefore did not feel they were considered an in-group member. Moreover, they anticipated that challenging an in-group member could lead to the potential for conflict which they clearly wanted to avoid. In contrast, older, more experienced workers were more willing and able to speak up about safety. This was highlighted by Greg: "I've been here 40 years, so I'm not bothered going to see a manager or anything – but younger blokes and some people don't like conversing with them." (Greg - E)

This suggests that confidence to express safety voice grows with experience. However, it also highlights that perceptions of the voice target and their perceived status in relation to that target may be important in shaping whether or not people will express their safety views. It also indicates that newer and perhaps more introverted employees often avoid raising safety issues altogether.

Inattention and a lack of care for colleagues appeared to be other factors which determined whether or not participants spoke up about safety. Several participants made reference to some of their co-workers who they saw as being blasé about workplace risks and were content to walk past hazards without raising them.

Cameron, a supervisor, commented:

Some people will walk past something and not say anything. And if somebody slips over and bangs his head, they'll go 'he had a bad accident and he fell over.' And they may have walked right past it! (Cameron - S)

This general sense of complacency or the failure to take responsibility for reporting hazards was evident in a number of the interviews. However, these were a minority. Almost twice as many references were made to employees possessing a positive attitude towards safety which was associated with a sense that employees can and should speak up about work related problems and issues that could impact co-workers. For instance, an employee commented:

If I, or anyone else, saw someone doing something and they were concerned. You will look out for your mates and say 'whoa – I don't think you should be doing that. (Cody - E)

This concern for work 'mates' suggests that a 'brothers in arms' type understanding existed, and care was taken for those who belonged to their in-groups. This complex set of intra- and interpersonal factors influenced participants' willingness to speak up.

This sub-theme highlighted how individual factors such as confidence, experience and age influenced employee's willingness to speak up about safety. It also revealed how confidence to speak up in certain situations is shaped by group social norms and expectations, situational factors, such as the presence of others and perceptions about the consequences of speaking up.

Summary

In conclusion, theme 1 explored perceptions of the shop floor identity. Shop floor workers were viewed positively by the interviewed participants as possessing a 'can do' attitude, a commitment to safety and were part of a close knit 'band of brothers' that looked out for each other. Shop floor workers were keen to maintain these harmonious relationships and, wherever possible, avoided directly challenging each other on safety grounds or publicly raising safety issues that might damage their relationships. To avoid conflict, shop floor workers employed safety voice strategies that included raising issues clandestinely with supervisors or making light of their intervention. Employees typically raised a range of issues to their supervisors that were associated with the infrastructure of the workplace, machinery and the unsafe behaviours of those who were unfamiliar in the working environment. They also raised aircraft related issues and mistakes that could lead to catastrophic outcomes. The shop floor workers were a diverse group and there was a perception that younger, inexperienced or less confident employees were less likely to express their safety voice than their older experienced or more assertive counterparts.

4.6. Theme 2: Perceptions of "them:"

"On the offensive around ensuring our workplace is safe"

This theme explores how leaders were viewed by the interview participants and how leadership attitudes towards safety were perceived to permeate through the organisation into the shop floor environment via management and the site SHE team.

In contrast to the perceived close-knit brotherhood of the shop floor described in theme 1, many participants made a distinction between the shop floor workers and a perceived out-group of managers and leaders. This out-group was viewed as a largely unseen entity comprising elements of senior management who were able to exert their influence through the organisation's wider health and safety department. They belonged to an influential group that were perceived by the participants as wanting to portray an image that safety was a top priority and the interview

participants described how safety messaging was prominent around the site. The following extract was typical across the dataset highlighting the prevalence of visible safety messages: “There’s signs and everything all around.” (Greg - E)

Safety was reported to be discussed in team meetings, it featured in senior management communications and participants were familiar with many of the promotional campaigns on risk-related themes. The interviewed shop floor workers also highlighted investments in safer equipment, high standards of PPE and access to Occupational Health provision as further evidence of the organisation’s commitment to employee health, safety and wellbeing. For instance, Karl commented:

Every business I’ve worked in across [the company] has been the same. It’s massively conscious about health and safety. You’ve always got everything you want like PPE wise – you can get that. And everywhere I’ve been – if it’s certain jobs that needed breathing apparatus they get it to you straight away and there’s things down to gloves and glasses, ear defenders – you can get new ones regularly. It’s easy! (Karl - E)

From small issues, such as PPE improvements to large scale infrastructure investments in safer equipment and machinery, several employees described recent safety-related improvements that the business had introduced:

We’ve got machines out there; they’re all interlocked; they’re all safe. They’ve all got bulletproof glass so if something shatters – it doesn’t get anywhere near you. (Sean - E)

These comments suggest that the organisation’s leaders placed a very high priority upon safety and were willing to invest in safety facilities and infrastructure. Some participants reported that this powerful out-group of senior managers, supported by the wider site health & safety team, were motivated to protect the reputation of the organisation at all costs, regardless of the level of risk posed or whether the safety

measures they introduced would be acceptable to the workforce. This motivation was described by Owen, an experienced supervisor, who stated:

The company is acutely aware of the role it plays within the local community and environment. And I think that, as a company, we are incredibly risk averse to reputational damage. And I think one of the biggest elements of reputational damage are when you see these headlines in the national press about fatalities or serious injuries and such. And I think that the company, because it's a defence organisation, is hypersensitive to any form of reputational damage or bad press and therefore, it goes on the offensive around ensuring that our workplace is safe. (Owen - S)

According to some participants, this aversion to risk prompted decisions about some work practices that were perceived by employees as disproportional, belied common sense and ran counter to the perceived identity of shop floor workers as practical problem solvers.

The safety is greater than the job in a lot of occasions. So by the time you've got your permits – you can't use a ladder, you can't do this, you can't do that. So I think sometimes we lack common sense. But the company adheres to the process but it's at a massive cost to it. (Alistair - S)

According to the shop floor participants who were interviewed, this out-group did not understand the challenges of their work and were divorced from the reality of shop floor operations. They reportedly imposed impractical site-wide safety interventions on the workforce without consulting the teams who were required to implement them or who were affected by them. The following quotations reflect the views of many of the participants:

The thing that used to get me was people coming, not knowing the job, not knowing how the machine works, but then saying 'you need to stop this and you

need that', you know. And to put some safety devices on would have actually been dangerous. (Chris - E)

We sometimes get improvement ideas put down on us. Well, supposedly improvement ideas put down on us. (Stuart - E)

These comments indicate that shop floor workers felt they were being patronised by the out-group and that the interventions developed and promoted by leadership and the site SHE teams reportedly increased the safety risks to employees and hindered their work. Consequently, many of the interventions attributed to this outgroup were unpopular amongst the interviewees who felt that their high levels of competence was being ignored and even disrespected. The participants reported that the safety opinions of the shop floor counted for little:

The health and safety can get a little bit carried away and they take away the fact that we're skilled, skilled people/ (Sonny - E)

I think there's a view from the shop that we are skilled, competent people that have been doing this job for many, many years. Why do you suddenly want to guard the machine that I've never had an accident on? (Adam - S)

I think sometimes it just goes a little bit too far. They'll probably shoot me for saying that but I think they do. I think we upset the person more than we need to. (Alistair - S)

The expression, 'they'll probably shoot me' for daring to question the adequacy of a safety intervention shows that it was considered almost taboo to criticise the interventions installed by the out-group, presumably because the focus on safety originated from influential leaders. Participants described the attempted removal of traditional knives from operations, the enclosure of machinery, poorly sited disabled signage in the car parks and the mandatory requirement to wear hard hats during lifting operations as evidence of these unpopular interventions. Moreover, several

interviewees referred to the futility of attempting to challenge these processes, given that they were imposed across the site:

People have raised issues about not being able to see things with these hard hats on, and it seems to have been brushed under the carpet. Nothing - you know? That's the policy. Something's not right. I see nothing about seeing things from our point of view. (Stuart - E)

This comment about shop floor issues being 'brushed under the carpet' suggests that interview participants felt their issues were being wilfully ignored by the site SHE team and leadership who had the power and authority to overlook their concerns. According to some shop floor participants, this lack of empathy and respect for their wealth of knowledge and experience encouraged some to adopt shortcuts rather than attempting to speak up and challenge these imposed interventions. This unwillingness to conform could be viewed as a deliberate act to reassert shop floor values and to passively highlight the unpopularity of the measures that had been imposed upon them. Indeed, some participants were aware of the shortcuts that were taken from time to time, which included not consistently wearing PPE when required and bypassing guarding on machinery. One participant angrily described how he intended to overcome the removal of knives from the shop floor in a bid to minimise hand injuries:

So if I can't have a knife and then I need a knife for something, I'll go and get an old hacksaw blade, snap it, wrap a bit of masking tape round to make a handle, sharpen it. And then I've got a knife. Now if I'm going to injure myself on anything it's going to be that. Because it's not a proper knife. That's where - when I said, they can go a bit too far in some ways with health and safety. (Cody - E)

This comment reveals the frustration that some shop floor workers felt about the removal of knives on safety grounds. Moreover, his threat to create his own sharp

tool in the absence of any approved equipment, can be viewed as blaming the out-group for their 'ill-considered' action which left him no alternative.

This perceived excessive response to health and safety issues also appeared to extend to accident investigations. Some participants described how employees withheld their safety voice after sustaining minor injuries in order to avoid being drawn into lengthy investigations and having to bear the brunt of extra attention, unnecessary paperwork and additional safety measures which they believed might hinder or slow their tasks. This was especially pertinent for perceived minor issues such as cuts, burns or uncomfortable PPE. For instance, Cody bemoaned: "the whole stigma that if you start raising issues, people are going to get involved and try and wrap you in bubble wrap and make your job hard work," (Cody - E). This comment about 'being wrapped in bubble wrap' again points to employees feeling patronised and overly protected by the out-group. According to some, it was common practice for colleagues to clandestinely maintain a stock of plasters just so they could treat their own injuries rather than reporting minor accidents. This could also be viewed as behaviour which exemplifies the shop floor ethos of problem solving and pragmatism. To illustrate this sentiment, one supervisor recalled an exchange in which he had challenged an injured employee for failing to speak up about his accident:

I went to him and I said to him 'why did you not come to me [about your issue]?' And he said, 'I didn't want all the paperwork; I don't want all the hassle.' And I went 'Really?' He said, 'yeah it's just easier done that way.' What he said to me was, 'it should be my choice. It should be my choice whether you investigate me. I will put a plaster on if I've cut my finger. It's nothing to do with you.'

(Alistair - S)

Clearly, the administrative burden and additional scrutiny which followed the reporting of an accident was perceived to be such a barrier to their work, that some injured employees preferred to self-administer first aid and continue their work without notifying their supervisor.

Interviewees reported that this 'excessive response' to accidents was driven by leaders who wanted to ensure that the immediate and underlying causes of incidents were understood and that comprehensive measures could be put in place to prevent the incident from recurring. However, as well as protecting employees, some suggested that the leaders were also motivated by financial bonuses that were awarded to them for achieving accident reduction targets:

Yes, we do have, you know, targets for accident rates and they do affect bonuses and financial rewards for people. So, you know, people can feel the weight of consequences of reporting a very minor accident. (Kenny – E)

Safety is safety, and I think we get into this - senior guys and women have bonuses calibrated against safety results, and we're talking a lot of money. It can drive down a culture that's a little bit questionable. (Owen - S)

These comments indicate that some interviewees were cynical about the safety motivations of their leaders and this perception may have been reinforced by the imposition of safety solutions which they deemed to be impractical.

Employees appeared to have techniques for reinforcing this perceived division between themselves and the perceived outgroup (managers, leaders and SHE team members). An example of this was highlighted by a supervisor who made reference to workers taking delight in reporting senior managers who occasionally broke agreed protocols by entering safety critical zones without the requisite PPE or were caught walking and talking on mobile phones.

So if you're on the section you need to have your safety boots on. But then they [shop floor workers] get playful if any of the leadership team walk onto their area with no safety boots on. They're the first to kick them off the section. (Nick - S)

This willingness of the shop floor workers to report those who might be considered as out-group members could be perceived as evidence that the expression of safety

voice also serves to reinforce and distinguish in-group norms and their shop floor sense of identity. The supervisor's use of the term 'playful' also indicates that shop floor workers were aware that, by reporting members of the leadership team, they were placing both supervisors and the leadership team in potentially embarrassing situations, as the leaders should know better and were expected to model the desired behaviours. At the same time, they were conveying to leaders the message that leaders did not understand the shop floor rules and protocols and were therefore "outsiders" in "their" workplace.

During the discussions around the mechanisms available to report safety concerns, a minority of the interview participants referred to two formal online company systems (known as mems and OSHENS) for reporting safety concerns which directly alerted both SHE professionals and some members of the leadership team (i.e. the out-group). However, these were not widely perceived by the shop floor participants as viable options for employees to express their safety voice. Interviewees appeared to prefer voicing their issues informally and in person, through their supervisors wherever possible. Several reasons were highlighted for the unpopularity of the online systems. They were generally perceived by employees as the ultimate backstop which should only be used when other avenues for safety voice had been exhausted. For instance, one participant described the online systems as a vehicle:

...where you can raise issues anonymously - if you see something that's safety critical; something that's happening that shouldn't be; if you've raised issues and they've haven't been actioned. (Kenny - E)

Another highlighted the additional effort it takes for a shop floor worker to access and raise a concern via an IT system, given that their role is predominantly manual and away from technology because "it's one more thing you have to do electronically on top of the day job." (Karl - E)

However, a supervisor highlighted how raising an issue electronically, rather than informally through local supervision, can create the potential for division between the individual raising an issue and their immediate supervisor, because this was

perceived by supervisors as a means of undermining their position by going behind their back and involving the out-group.

What I don't like is this fire and forget mentality in other areas where they'll raise an OSHENS - rather than going to talk to somebody – they'll do this whole fire and forget. They'll put it on OSHENS, fire out an email, walk away from it. Now that just forces - it becomes a self-fulfilling prophecy with this whole 'us and them.' (Owen - S)

The supervisor had a perception that reporting the issues electronically would sidestep his involvement and trigger the involvement of the out-group. This latter example also highlights how the choice of mechanism for expressing safety voice has the potential to negatively impact relationships between supervisors and shop floor workers. Moreover, using the IT system as a strategy for expressing safety voice may indicate the extent to which participants feel they are in a psychologically safe environment, given that the use of anonymous IT systems may help employees circumvent the need to engage in interpersonal contact with their colleagues, supervisors or managers. This is perhaps why the supervisor in the extract above appeared so frustrated. It may highlight an underlying failure on his part to provide a climate in which team members would speak openly about their issues and problems.

Summary

This theme identified perceptions of out-group identities by employees on the shop floor. The out-group were viewed as an unseen entity representing management and the organisation's wider health and safety team which imposed unacceptable and excessive site-wide safety interventions on the shop floor teams without their agreement. The out-group were viewed by the interviewees as being motivated partly by a desire to prevent injuries but also to achieve financial bonuses for achieving accident reduction targets. In order to avoid the involvement of this out-group, some employees preferred silence to speaking up and challenged their authority by deliberately adopting shortcuts or calling out the unsafe behaviours of the out-group.

4.7. Theme 3: Facilitation of safety voice

A third theme which was developed from the interviews was linked to perceptions of the shop floor supervisors. Supervisors appeared to play a critical role in facilitating safety voice and this theme is divided into three subthemes; the first of which is associated with the extent to which supervisors were open, approachable and welcomed safety voice from shop floor workers. The second is concerned with how production pressures influenced supervisor behaviours and its influence on employees' expression of safety voice and the third describes perceptions of how supervisors responded to employees' safety voice.

4.7.1. Subtheme 3.1 Encouragement to voice

“You’re always told to stop the job, if there’s something unsafe!”

This subtheme explores how the interviewees who were shop floor workers viewed their supervisors as a target for their safety voice. It considers the enablers put in place by supervisors to encourage employees to share their safety concerns, their efforts to promote safety voice and the extent to which the attitude and style of supervisors supported safety voice.

The participants reported several ways that they were afforded the opportunity by the organisation to express their safety concerns, ideas and observations. The most frequently cited mechanism for expressing safety voice was via their supervisor. Many highlighted the importance of the daily start up meeting (DSUM) as a structured face-to-face opportunity at which employees could express and discuss safety issues with their supervisor and work colleagues. The DSUMs, which were facilitated by supervisors, were summed up by one employee as:

..a get together. You know, is everybody alright? Is everybody here for a start?

You know, straightaway the first thing they ask is ‘right – any health and safety issues? (Tim - E)

People use that [the DSUM] because it's a position where you've got your supervisor's attention. (Francis - E)

These comments reveal that upon encountering a safety-related issue, some employees preferred to wait until the opportunity of the next team meeting before raising it as they had their "supervisor's attention" (Francis). This appeared to be a safety voice strategy for non-urgent issues or challenges they could foresee looming in the future.

However, across the three areas, both supervisors and employees also highlighted the importance of dynamic safety-related exchanges that could occur at any point during the shift where supervisors were visible and accessible to employees on the shop floor. These opportunities were frequently sought out by employees to raise high severity issues or issues that impacted their work. They were also used opportunistically to physically show supervisors the challenges they were experiencing as supervisors passed by their workstations. For instance, one employee commented:

I could go to any of the supervisors and say, "Look, I've you know, got a problem with this or, you know, I'm not happy about blah, blah, blah. I think that over there is dangerous." (Tim – E)

Supervisors also reported that employees proactively sought out their support in order to highlight unsafe situations which could be viewed as further evidence of the "can do" attitude of the shop floor. One supervisor explained that:

Anytime during the day, they'll come and see us to raise issues; they will come into the office – come and grab me straight away. We'll walk to the actual issue and have a look at it straight away. (Nick - S)

This could be viewed as evidence of a particular safety voice strategy adopted by employees based on the severity of a given situation. It also highlights that

supervisors welcomed employee interruptions on safety grounds and were willing to investigate potential safety issues as a priority.

Similarly, the local Safety, Health & Environment (SHE) representative was also highlighted by employees in each of the three areas as an effective target for their safety voice. The SHE representative is an appointed competent person who is based in the facility and responsible for ensuring that effective SHE governance systems are locally in place. Each of the three facilities had their own SHE representative and many employees reported that these individuals were particularly visible and proactive in responding to their issues. One participant stated: “[Our SHE rep] is brilliant. If you raise anything to him – he won’t let it disappear. He’ll pester people until it gets sorted.” (Francis - E)

This positive perception of their local SHE representative was in stark contrast to the dim view interview participants had regarding the wider site SHE team, described in Theme 2, who were viewed as working in conjunction with leadership. The local SHE representatives appeared to be considered in-group members, owing to their experience and knowledge of local shop floor processes and people:

We have a SHE associate in here who’s just leaving. But [name of SHE rep] came from the shop floor so he's got a detailed understanding of the people their processes. And if you can get that and you're approachable, then I think it goes a long way. (Cody - E)

To help encourage the expression of safety voice, several participants referred to company processes and procedures facilitated by supervisors that were designed to help employees identify, discuss and share safety issues. These included dynamic risk assessment tools, hazard spotting exercises, team meetings and employee engagement initiatives:

Whether it's a SIPOC meeting or a DSUM or anything like that they'll speak up or it's just a general walk around the shop, “oh, this is broke.” (Adam - S)

There are other vehicles such as the monthly SHE review, where certain things can be escalated and the cascade can come back down from comms in a team briefing. (Owen - S)

We've had them sheets out where you have to think what the next accident would be. It's a sort of - engagement thing. (Sonny - E)

These comments highlight that supervisors used a range of enablers such as SHE reviews, team meetings or engagement activities to discuss safety issues with their teams. In addition, the interviewees also noted examples of positive supervisory practices which appeared to encourage safety voice. These included providing feedback to teams about their issues, having mechanisms in place for capturing and tracking actions and urging team involvement in meetings. For instance, an experienced supervisor described how he created interactive DSUM meetings by asking the team questions about their readiness for the day and encouraging them to respond which helped him gauge their understanding of workplace hazards: "I can probably see it – but I want them to tell me!" (Adam - S)

When asked where they acquired these skills from, none of the supervisors reporting having received any consistent formal training regarding how to have a safety conversation. Their engagement skills appeared to be gleaned from years of experience, observing others or trial and error. Adam's quote below is indicative of the sentiment across the supervisors:

So there is various courses you go on through health and safety and things like that, but for actually having a discussion? A lot of its just common sense, isn't it? (Adam - S)

Several shop floor participants spoke positively about their supervisors' commitment to safety and reported that they were explicitly encouraged by their supervisors not to take risks and speak up about their safety issues:

We actually get told every morning, if you're not happy with anything - do not carry on; to go and get someone. (Tim - E)

You're always told to stop the job, if there's something that feels unsafe, that kind of thing. (Alan - E)

These quotes illustrate that supervisors consistently reminded their teams about the importance of working safely, not taking risks and speaking up. Interviewees also made frequent reference to the approachability and openness of supervisors. Almost three quarters of the participants from the shop floor reported that their local supervisors welcomed issues and wanted to hear their ideas, concerns and observations. In many cases, this also extended to supporting employees who stopped the job on account of unacceptable risk:

I don't think there's ever been a case of where I've raised something with supervision and I've ever got the attitude that 'I can't be doing with that at the minute – I've got too much on.' I've never had that response. (Kenny - E)

Whenever I've raised something or the people I work with have raised something, they [the supervisors] always engage and say 'yeah no problem. We'll speak to the relevant people. (Alan - E)

Clearly these interviewees had a perception that supervisors were willing to hear their safety concerns. Nevertheless, not every employee felt they had the opportunity to access competent support to express their safety voice when it was needed. Some argued that supervisors were occasionally inaccessible on the shop floor because they were either dealing with other production issues or because some shifts had less supervisor support:

There is supposed to be some supervisors there. But they're very few and far between. (Sonny - E)

If you're on nights or working on Sunday or working on a Friday they're not always there. So [the SHE representative] is only really approachable sort of Monday to Friday office hours – whereas we're working around the clock. (Karl - E)

This lack of an outlet for safety voice, particularly on the night shift, appeared to create a climate in which employees, motivated by a can-do attitude, were willing to take risks. For example, supervisors recounted an incident in which night shift employees were faced with an issue associated with the failure of a door on a press which operated at over 900 degrees Celsius - a significant safety risk. Without the ability to acquire help, proactive employees took it upon themselves to take calculated risks in order to safeguard the equipment and salvage the component. Nick described:

We've got this press that's got the door wide open and the tool is rapidly cooling. And what we're going to do is - we're going to either thermal shock the tool or get the tool stuck in the dog bones in the press and rip the press to bits. So the guys decided to build a wall. We have things obviously – you know the fire bricks? Yeah, so we have a lot of fire bricks that we use to put components on to keep them off – like raised steel. So the guys basically got a pallet of bricks; wheeled them to the machine, formed a bit of a line and started placing these bricks in front of the press. And then, when one guy had too much heat when he got towards his heat limit exposure, he would then switch – take his gear off and let someone else take over. (Nick - S)

The safest approach in this situation would have been to sacrifice the component and allow the press to cool. However, rather than stressing the safety message, the night shift employees were subsequently rewarded and praised by the local leadership for their commitment to overcoming adversity and taking risks, as their supervisor described:

They got a safety award for this. And it was a very strange message for me to give them to say, 'Look, you did a fantastic job.' Whereas I never asked you to do that. And I thought it was right thing. So I didn't want to criticise them. (Owen - S)

Recognising and praising this type of employee behaviour could be viewed as sanctioning risk taking and reinforces the notion that production is more important than safety.

This subtheme explored how supervisors were considered the primary target of safety voice for employees on the shop floor. On the whole, the interview participants viewed supervisors as accessible, approachable and encouraged employees to share their safety concerns. Supervisors also maintained a series of opportunities for employees to express themselves although some shifts and supervisors afforded fewer opportunities than others. Where employees felt unable to raise safety issues, this appeared to create a climate where risk taking could occur.

4.7.2. Subtheme 3.2: The tension between production & safety

“Getting bits out the door”

This subtheme explores the tension between production pressures and safety and the extent to which production delivery influenced safety voice on the shop floor. As described in Theme 2, leaders were often viewed by participants, who were both employees and supervisors, as the significant driving force behind many of the organisation's safety standards and there was a perception that supervisors and middle management were expected to exemplify this safety ethos through their communications and actions. This was revealed by one supervisor who responded in the following way, when asked about the extent to which safety is prioritised in the organisation:

I look at the two major things I get my hand slapped for; one is obviously delivery so I've got to keep on pace, we've got to keep schedule adherence and make the customer happy and the other one is safety. We are not allowed to let safety actions for instance dwell or any safety issues so they are dealt with pretty quick. So if we have any incidents they're generally looked at, like I said, in a timely fashion. (Nick - S)

This reveals the two fundamental priorities in operational areas; namely production and safety.

Although every interviewee recognised the organisation's overarching drive to improve safety, it also became apparent that participants perceived there was a focus on achieving production and delivery targets which created competing tensions. The following quotations are typical of the shop floor participants who were in no doubt that the organisation placed a higher value on production delivery:

Getting bits out the door. Shipping bits – that's all the focus is on. (Tony - E)

I spent 12 years being bollocked for not delivering on time. (Cameron - S)

Numbers on the door; gotta get the job shipped; they're constantly on your back! (Greg - E)

These comments highlight how leaders reportedly used negative behaviour and communication styles to motivate shop floor workers and employees to achieve delivery targets. Rather than being exposed to explicit company-wide messages about production targets, employees inferred the importance of production demands by observing the behaviours of their colleagues and their supervisors in meetings and in high pressure situations. This was revealed when interviewees who were on the shop floor described how occasionally supervisors "slightly ignore things" (Sonny - E) and sanctioned shortcuts and out of sequence working in order to achieve particular production targets. "The term 'using the back door' is what they'd say." (Sonny - E)

Others cited examples of supervisors ignoring safety rules or displaying a blasé attitude towards safety in general. This included walking and talking on mobile phones, despite clear rules prohibiting it, failing to wear PPE in certain high hazard working bays and breaking rules regarding the transportation of components:

All of a sudden, you get supervisors – now I'm not telling tales – you get supervisors driving bits from treatments down the road in their own vehicles which you know you shouldn't be doing. (Tony - E)

It is interesting that the shop floor worker felt the need to stress that he was being truthful in his account. It may have been that he was either trying to convince the interviewer that supervisors were capable of breaking rules to get the job done or perhaps it was an admission that shop floor workers have the potential to fabricate their accounts of supervisor behaviours in order to make a point about the differences between supervisors and shop floor workers.

Employees recognised that supervisors were frequently pulled in different directions by the organisation and that some supervisors were more proactive on safety issues than others. According to employees, and this quote summarises their shared sentiment, “it depends on which supervisor you go to” (Francis - E) as to whether their safety voice would be taken seriously which suggests that supervisors had varying levels of commitment to safety.

Other employees reported how supervisors failed to support safety initiatives beyond their initial launch. Indeed, many interviewees described how safety interventions had a tendency to quickly peter out as the organisation's focus shifted to other more pressing priorities:

Every year something new comes out and then after a month or so - it's all forgotten again. And next year, another one comes out, and after a month or - it's forgotten about. And it happens every year. Every year – without fail. (Tony - E)

They run these initiatives every so often and they sort of go by the wayside.

Sometimes things lose momentum without somebody driving it. (Tim - E)

This inability to sustain safety interventions, coupled with the tendency of some supervisors to take shortcuts, gave some employees the impression that some supervisors paid lip service to safety. This may, in turn, have had the effect of discouraging employees from speaking up about their issues, as they may lack confidence that their views would lead to action.

There was also a perception, amongst some participants who worked on the shop floor, that safety voice had the potential to interrupt production which would then have knock-on effects for senior managers and supervisors. For instance, one interviewee described how, in their view, people in management positions threaten those who identify and report issues which might hinder production targets:

Some of the lads are on nights and they feel pressure to do what they're told.

Otherwise they get brought back on days and lose that extra money they're on nights for. (Tony - E)

According to Tony, managers used the allocation of shift patterns to motivate employees to achieve production schedules, as working on the night shift paid more than working during the day. This was one example, yet others also commented that managers look unfavourably on those who raise safety concerns. However, when probed, participants struggled to identify the basis for these perceptions. Some described incidents and stories from thirty years ago in which workers were blamed and castigated for making errors which resulted in components being scrapped. Others assumed there might be consequences of speaking out but couldn't clarify what these might be. It is also revealing how several employees, jokingly commented that even being involved in the interviews for the research project may be career limiting in some way:

I hope there's no bugs in here. (Francis - E)

I hope I haven't dug a grave for myself. (Owen – S)

Although these comments were intended to be light-hearted, they do highlight that being open and honest carries with it the perception of putting oneself at significant risk for the individual voicee.

This subtheme highlighted how production pressures and leadership threats influenced supervisors to prioritise activities associated with production. These were noticed by employees who inferred that production was more important than safety on account of supervisor shortcuts and the failure of supervisors to sustain and embed safety interventions. Some employees suggested that managers punish employees that raise production-limiting safety issues although little evidence was provided to substantiate this.

4.7.3. Subtheme 3.3: The response to safety voice

“They’ll listen but won’t implement anything”:

This subtheme is concerned with the extent to which employee’s safety voice was addressed by supervisors. One factor which appeared to be instrumental in shaping whether or not employees expressed their safety voice was associated with their perception of how organisational leaders and facilities management contractors might respond. Some employees expressed confidence that their local supervision team would respond swiftly to their safety ideas, concerns and observations:

There has been issues with tooling on the section I work with. It's been reacted to quickly. (Kenny - E)

I think management do on the whole – if you bring something up, they will act on it. (Greg - E)

Some employees highlighted that supervisors were quick to resolve issues when they were within their control. This included issues such as housekeeping issues, low stocks of PPE or machinery problems:

If the things are in our control we can deal with them very quickly. (Alistair - S)

So for example, there's a coolant spill where you spin out too much coolant, they're generally call out [name of contractor] and sort it out. And if you need more PPE, they're generally spot on with ordering it. (Luke - E)

However, an overwhelming majority of the participants argued that the organisation had a history of failing to respond appropriately to their safety issues:

They tend to take quite a while before we get resolutions. We're still waiting for things like safety knives and things are getting brought in and that was months and months ago. (Tony - E)

They'll listen, but they won't implement anything. They'll say 'Oh yeah it's a good idea.' Nothing ever seems to get done. (Greg - E)

Quite often, you'll go through a supervisor - it's easy enough to raise but it'll just get forgotten about. (Francis - E)

These accounts reveal that most supervisors were open to hearing employee issues but then failed to follow up with any concrete action. Shop floor participants frequently complained about a lack of feedback regarding the issues that they had previously raised with their supervisors, which gave them the sense that their issues had been forgotten. This led to frustration and for some to argue that it was a futile exercise even to highlight safety problems, especially for relatively minor issues.

The main issues are that when people raise things nothing comes of it. So they get fed up and we think what's the point? (Kenny - E)

It just feels like you're banging your head against a brick wall sometimes.
(Francis - E)

Employees suggested there were several reasons for the supervisors' often slow and inadequate response. Some pointed out that supervisors were extremely busy

and often prioritised those production-related tasks which received the most management attention.

I don't think it's the case of them [supervisors] shirking their responsibility. It's just constantly being knocked down the pecking order by bigger, more high pressure and more consequential things in terms of business output. (Kenny - E)

It is revealing to note that employees consistently reported that safety actions would take priority when senior managers become involved:

The problem that I've got with safety sometimes is that it sometimes takes an escalation – quite a few times of, you know, senior level to get something done. (Cody - E)

This reinforces the notion that leaders in the organisation were committed to safety and played a key role in driving safety change. Other interviewees attributed the lack of an effective and speedy response to the size of the organisation and the multitude of processes and departments that could be involved in procuring new equipment or acquiring budgetary approval:

There's that many people involved in everything isn't there? Sometimes people don't know who's responsible for what. (Stuart - E)

Meanwhile, both supervisors and employees suggested that the involvement of facilities management (FM) contractors often led to delays in response times and unsatisfactory outcomes. Although local issues within the team's control were reportedly tackled swiftly, there was a perception that issues requiring the support of the outsourced facilities teams took time and needed constant chasing. One example of this was associated with an unresolved heating maintenance task that had been ongoing for some time:

We've been told numerous times now [the name of the FM Contractor] have fixed it, and then it's a reoccurring thing. So they're either [the FM Contractor]

are making up that they've fixed it, or they're just saying it to get rid of the ticket or - But nobody ever actually tells us that. We only find out that when we ask, 'how it's going?' (Adam - S)

This involvement of FM contractors in addressing infrastructure-related issues may explain the variety of views from the participants regarding the speed at which safety actions were addressed. As the individual directly responsible for engaging their team, supervisors often bore the brunt of employee frustrations and were perceived by employees as one of the blockers for failing to respond appropriately to their concerns. This was revealed by one supervisor who commented that he'd received a notification from the FM contractor that a facilities request he'd submitted to replace a switch on a machine had been completed:

It says completed. So why has no one...? We've just got this email saying it's completed. The reason it was completed is the switch was obsolete. So you get the full backstory that it's of sort of obsolete. Meanwhile the shop floor are thinking we're not doing anything. (Cameron - S)

This highlights that supervisors frequently had to justify the lack of an adequate response to frustrated shop floor workers, despite the fact that some issues were beyond their control and supervisors were under the impression it had been resolved. The sense of discouragement and frustration was evident in the supervisor's account. This breakdown in communication might, in the future, have prevented the escalation of issues as the futility of their request was apparent.

In summary, this subtheme identified that the perceived response of the organisation to safety voice influenced employees' willingness to speak up. Employees reflected upon their prior experiences of raising safety issues to anticipate whether the organisation would respond productively or not, which in turn determined whether or not they thought it was worth speaking up. Several reasons were proposed as to why the organisation's response to safety voice was so inadequate. These ranged from

the supervisor's workload through to the size of the organisation and the poor handling of issues by FM contractors.

Summary

In conclusion, this third theme revealed the dilemma faced by employees in determining the desired behaviours required by the organisation in the face of conflicting production and safety pressures. It highlighted the importance of explicit and implicit messages in shaping what is perceived as important in the organisation which, in turn influenced safety voice behaviour. Levels of participant cynicism with regards to the organisation's safety motives were revealed. This cynicism was rooted in the organisation's drive to achieve production goals and appeared to reduce confidence levels amongst employees that their voice would be taken seriously.

4.8. Discussion

In this study, the numerous factors which influenced safety voice within aircraft manufacturing were explored and three themes were generated. These comprised a) perceptions of shop floor identity and safety voice, b) perceptions of 'them', and c) the facilitation of safety voice.

Participants reported numerous examples of circumstances in which either they or their colleagues had spoken up about safety-related situations in the workplace. However, they also described many instances in which they had decided to remain silent. The unpacking of these allowed for more nuanced understanding of their lived experiences and the many factors which influenced shop floor workers' safety voice behaviour.

The primary motivation for shop floor workers speaking up behaviour was to protect either themselves, their colleagues or those further down the chain whose safety could be impacted by their work activities, such as pilots. In this regard, employees appeared to carry out an appraisal of the situation and formulate a voice strategy that reflected the perceived severity and nature of the hazard. The critical importance of the hazard in shaping safety voice aligns with previous research into safety voice

and safety silence motives (Manapragda & Bruk Lee, 2016; Tucker et al., 2014). If the hazard was perceived as presenting an urgent or significant threat to people or the integrity of the aircraft, this voice strategy might include challenging a colleague or raising the issue immediately with a supervisor.

Shop floor workers appeared to pursue a different voice strategy for perceived minor issues. This often involved withholding their safety voice until a physical opportunity arose in which individual employees felt comfortable speaking out, such as at the DSUM or when a supervisor was passing. This could be construed as evidence of a relationship between voice behaviour, the perceived nature of the hazard, the levels of self-efficacy of an employee and the availability and type of voice opportunity presented. This is a novel finding as in Milliken et. al's (2003) model of safety silence, the nature of the hazard is omitted as a construct.

However, it is not clear whether employees deliberately and consciously pursue a strategy of withholding safety-related information with a particular voice opportunity in mind or whether the presence of a voice opportunity triggers the release of concerns and ideas which would not otherwise have been expressed. Nonetheless, the findings suggest that providing regular and clearly visible opportunities to express safety voice is critical in supporting the motivation of employees to speak up about their observations, concerns and ideas.

The study also revealed how safety voice behaviours are learned through prior experiences and interactions with others, which highlighted how peers on the shop floor influence whether or not people speak up and how they express themselves. This points to the importance of Social Learning Theory (Bandura, 1977) in both safety voice and safety silence. It is recommended that further research is conducted on how employees develop safety voice strategies in aircraft manufacturing and how organisations can influence these strategies. In order to increase rates of safety voice, organisations may need to ensure they provide a range of different mechanisms to allow employees with different levels of confidence the chance to express their ideas and concerns.

Participants also described several barriers to safety voice which often culminated in silence. These barriers reflected the findings of previous research into safety silence and include the perception of the situation, a lack of opportunity, a lack of self-efficacy (Morrow et al., 2016), perceptions of negative consequences (Biyazidi et al., 2012), supervisor openness (Tucker & Turner, 2015) and the futility of speaking out (Abrams et al., 2023). These barriers were apparent as employees seemingly developed conscious strategies in which they appeared to evaluate a particular safety related situation against the perceived benefits and consequences of speaking up.

The interviews particularly revealed the powerful influence of organisational climate and group factors in motivating silence which is consistent with the findings of previous research in other settings (Brondino et al., 2012; Tucker et al., 2008). Although participants recognised the organisation's commitment to safety, many interviewees remained cynical about whether their safety concerns, ideas and observations would be taken seriously, citing that it was futile to speak up, especially associated with perceived minor or infrastructure issues. This reflects the importance of Social Exchange Theory (Blau, 1964) in shaping safety voice behaviours. One of the principles, underpinning Social Exchange Theory is reciprocity; namely in social exchanges people are motivated by obtaining something of value in exchange for forfeiting something of value (Redmond, 2015). In the context of safety voice, it could be argued that people are more likely to reciprocate and speak up if they believe their safety voice is valued and welcomed by the organisation. However, if they believe speaking up is futile, they are more likely to withhold their safety voice. Most employees placed a high value on forging close working relationships with their co-workers and being seen by both their colleagues and the organisation as a productive worker with a 'can do' attitude towards achieving delivery goals. Whilst production targets were not explicitly communicated as the organisation's priority, participants perceived that safety reporting could initiate lengthy, bureaucratic investigations which could introduce alternative working practices which might not be as efficient or as acceptable to their colleagues as their existing working methods. Employees therefore sought to maintain these harmonious relations and reinforce their beliefs about themselves as proactive workers by overlooking perceived minor

safety issues and the occasions when their colleagues took risks. This supports the findings of Manapragda and Bruk-Lee (2016) who found evidence that silence is a strategy used by employees to avoid being labelled by the group as a troublemaker, to minimise conflict and to reduce the likelihood of being ostracised. Indeed, the findings of this study underscore the importance of Social Identity Theory (Tajfel, 1979) in understanding safety voice and safety silence. It was evident, from the language used by shop floor workers, that they categorised themselves as separate from a perceived outgroup comprising those in leadership and SHE roles.

Employees reinforced this boundary by negatively labelling shop floor workers who repeatedly reported issues up the management chain and taking pride in exposing those in leadership roles who breached safety rules. This perceived outgroup were associated with adopting an excessive approach to safety issues that hindered the work of shop floor teams. Consequently, employees used safety silence to limit the involvement of this perceived outgroup, where practicable. This study also revealed that employees adopt informal or clandestine safety voice strategies in high hazard situations in order to raise safety issues whilst, at the same time, protecting their colleagues in a bid to mitigate the risk of these negative social consequences which appears to be a novel finding.

This study confirmed safety voice in aircraft manufacture is a complex behaviour that is underpinned by a broad range of factors which occur across multiple levels. This supports the findings of Noort et al. (2019a) who argued that safety voice can be viewed in terms of an ecological system. There were several factors that appeared to influence safety voice in aircraft manufacturing. These included 1) the nature of the situation which triggers the contemplation of safety voice; 2) individual factors associated with the knowledge, understanding and self-efficacy of the voicee 3) group factors associated with the social consequences of expressing voice 4) the openness of supervisors and 5) organisational factors relating to the climate of the organisation, the provision of opportunities to voice and the anticipated response to employees.

One of the challenges associated with safety voice appear to be the difficulties associated with capturing and measuring it (Noort et al., 2019b). Indeed, the

interviews revealed that safety voice on the shop floor often occurs informally as an exchange between two or more people as opposed to the reporting of an issue via an IT system. Aside from highlighting the importance of self-efficacy as well as relational and situational factors in determining voice strategies, these often informal exchanges are difficult to capture and this suggests careful consideration is needed to measure safety voice accurately.

4.9. Applying the interview findings to the COM-B model & identifying behaviours

After analysing the interview transcripts inductively to generate themes, a secondary level of analysis was conducted to identify the critical behaviours that are deemed important to safety voice. Defining the problem in behavioural terms is a first step in developing a behaviour change strategy as defined by the Behaviour Change Wheel (Michie et al., 2014). In order to extract important safety voice behaviours from the interview transcripts, the following methodology was adopted: firstly, where interviewees described positive enabling behaviours which supported safety voice, these were captured as a behaviour impacting safety voice. Examples of positive enabling behaviours included the way in which supervisors used DSUM meetings to engage employees in safety discussions, conducted regular walk rounds to allow employees to discuss workplace issues on a one-to-one basis and were available for employees to escalate emergent safety incidents. These behaviours were collated into a long list of target supervisor behaviours that included 'facilitating team discussions where safety issues can be raised', 'checking in with team members individually about their safety issues' and 'making themselves available for employees to raise emergent issues.' Secondly, where interviewees highlighted a behavioural gap or deficiency in the way safety voice was facilitated, the obverse target behaviour was identified. For example, where interviewees felt demotivated to express themselves because the organisation's response to safety voice was perceived to be ineffective, several target behaviours were identified. From a supervisor perspective this included 'listening, capturing and acting upon employee

safety voice', 'providing feedback to team members' and escalating issues up the management chain.'

Initially, a long list of 32 behaviours was generated from the interview themes and particular emphasis was placed on identifying which stakeholder would need to exhibit them. This initial list, including the theme from which the behaviour was identified, is shown in table 3 below:

Table 3

Initial list of safety voice behaviours identified in the pre-intervention interviews

Behaviour impacting safety voice	Theme 1			Theme 2	Theme 2		
	Subtheme 1.1	Subtheme 1.2	Subtheme 1.3		Subtheme 3.1	Subtheme 3.2	Subtheme 3.3
Leaders to • promote the importance of safety voice & when voice is required • promote the importance of proactive safety behaviours • Verify that safety interventions are being completed • Provide sufficient resources & support for addressing issues raised by teams • Role model effective safety behaviours • Treat people fairly and justly when errors & violations are highlighted						✓ ✓ ✓ ✓ ✓	✓
Supervisors to • set clear expectations to employees regarding safety voice • proactively consult with teams on safety issues and improvements • encourage and remind teams to express safety voice • facilitate team discussions where safety issues can be raised • check in with team members individually about their safety issues • ask the team for their input regarding safety at team meetings • make themselves available for employees to raise emergent issues • listen, capture and act upon employee safety voice • provide feedback to team members about their safety voice		✓	✓ ✓	✓	✓ ✓ ✓ ✓ ✓	✓	✓

Behaviour impacting safety voice	Theme 1			Theme 2	Theme 2		
	Subtheme 1.1	Subtheme 1.2	Subtheme 1.3		Subtheme 3.1	Subtheme 3.2	Subtheme 3.3
- recognise positive safety behaviours when individuals have raised issues - escalate issues up the management chain that are beyond their ability to address - promote the importance of proactive safety behaviours - communicate key workplace hazards & risk controls		✓ ✓			✓ ✓		✓ ✓
Employees to: - identify hazards - carry out pre-work checks of their working environment - stop work if they feel it is unsafe - attend team meetings at which safety is discussed - speak up if they encounter unsafe conditions / acts / make mistakes - challenge co-workers and others who are working unsafely - check in with co-workers about their fitness / competence to work - welcome challenge from their co-workers - report accidents, incidents and near misses - speak up with safety ideas to improve the safety of their workplace	✓ ✓ ✓	✓ ✓ ✓ ✓ ✓ ✓ ✓					
Safety Health & Environment teams to: Investigate emergent safety issues in a manner that is proportional to the incident severity				✓			
FM teams to - Respond swiftly to infrastructure issues raised by teams - Supply feedback about progress, expectations and when actions have been closed satisfactorily							✓ ✓

This initial list of 32 behaviours was subsequently refined to reflect only those behaviours that had a direct influence on safety voice and to amalgamate behaviours that were similar in nature. This helped to establish a manageable list of 12 behaviours that could be considered for the design of the intervention and supported the creation an interconnected 'system' of behaviours in which each stakeholder had a clear specific behavioural contribution to speaking up on the shop floor. This refinement of the initial long list is shown in table 4 below:

Table 4: Refinement of the safety voice behaviours for the intervention

Stakeholder	Initial long list of safety voice behaviours	Direct influence on safety voice	Refined list of behaviours to be considered during the design of the intervention
Leaders to	promote the importance of safety voice & when voice is required	Y	To reinforce to teams the critical importance of safety and its priority in relation to production
	promote the importance of proactive safety behaviours	Y	
	Verify that safety interventions are being completed	Y	To verify that safety actions have been completed
	Provide sufficient resources & support for addressing issues raised by teams	Y	To provide sufficient resources for addressing safety issues raised by the team
	Role model effective safety behaviours	N	Not a direct influence on safety voice
	Treat people fairly and justly when errors & violations are highlighted	N	Not a direct influence on safety voice
Supervisors to	set clear expectations to employees regarding safety voice	Y	Communicate clear expectations to their teams about the issues that warrant safety voice
	Encourage & remind teams to express safety voice	Y	
	Proactively consult with teams on safety issues and improvements	Y	Proactively consult with teams on safety issues and improvements
	facilitate team discussions where safety issues can be raised	Y	To provide employees with a range of formal and informal opportunities for teams to express their safety voice
	check in with team members individually about their safety issues	Y	
	ask the team for their input regarding safety at team meetings	Y	
	make themselves available for employees to raise emergent issues	Y	
	listen, capture and act upon employee safety voice	Y	To visibly capture track and provide timely feedback to their teams on safety issues
	provide feedback to team members about their safety voice	Y	
	recognise positive safety behaviours when individuals have raised issues	Y	
	escalate issues up the management chain that are beyond their ability to address	Y	To proactively address safety issues raised by the team
	promote the importance of proactive safety behaviours	N	Not a direct influence on safety voice
	communicate key workplace hazards & risk controls	N	Not a direct influence on safety voice
	identify hazards	Y	

Employees to	carry out pre-work checks of their working environment	Y	Identify, appraise and speak up about hazards or issues
	stop work if they feel it is unsafe	Y	
	report accidents, incidents and near misses	Y	
	speak up if they encounter unsafe conditions / acts / make mistakes	Y	
	challenge co-workers and others who are working unsafely	Y	
	check in with co-workers about their fitness / competence to work	Y	
	speak up with safety ideas to improve the safety of their workplace	Y	
	welcome challenge from their co-workers	Y	To accept safety challenge from their peers
	attend team meetings at which safety is discussed	N	Not a direct influence on safety voice
SHE to	Investigate emergent safety issues in a manner that is proportional to the incident severity	Y	To investigate emergent safety issues in a manner that is proportional to the severity of the incident
FM to	Respond swiftly to infrastructure issues raised by teams	Y	Respond productively in a timely manner to Facilities issues raised by the team by closing down actions and providing feedback on progress at each stage
	Supply feedback about progress, expectations and when actions have been closed satisfactorily	Y	

Specifying the refined list of safety voice behaviours

The refined list of 12 critical safety voice behaviours was considered in terms of where, who and how they would be exhibited so that they could be targeted as part of an intervention. The behaviours were also considered in the context of the COM-B model to capture the capability, opportunity and motivational factors that need to be in place in order for each of the behaviours to be effectively realised. See Table 5 for this breakdown. The twelve safety voice behaviours and the interview themes from which they originated are elucidated below.

Theme 1, “Shop floor groupness and identity,” was divided into subthemes.

Subtheme 1.1 – “Shop floor groupness and identity,” underscored the concept of a shop floor identity based upon positive shared attitudes, values and behaviours.

Shop floor workers placed a high value on safety but were also mindful to maintain harmonious relations with their peers. This often resulted in safety silence, especially in relation to perceived minor issues or in circumstances where speaking up had the potential to create animosity and ill feeling amongst shop floor co-workers.

Therefore, an employee behaviour which was critical to enhancing safety voice involved *employees accepting “challenge from their peers”*. This behaviour was also

categorised as building psychological capability amongst shop floor workers to support safety voice.

Subtheme 1.2, the “appraisal of risk by shop floor workers,” highlighted the importance of shop floor workers identifying what constitutes a hazard, carrying out an appraisal to determine whether the issue warranted escalation and recognising how it should be reported. Some of the interview participants noted that this was learned informally through experience and interactions with their peers rather than through formal instruction and training from the authority figures in the organisation. Therefore, the two behaviours that were deemed relevant to influence safety voice were a) *for supervisors to “communicate clear expectations to their teams about the issues that warrant safety voice,”* and b) *for employees to “identify, appraise and speak up about hazards or issues.”* Both behaviours were categorised as building psychological capability for safety voice.

Subtheme 1.3 - “Individual differences as influencing safety voice self-efficacy” highlighted the importance of individual factors in expressing safety voice. Interview participants described how confidence levels, age, experience, perceived status and a lack of attention and care can influence their decisions to speak up. In particular, this theme identified that employees are unique and have different preferences regarding how, where and when they express their safety voice. Some participants even highlighted that, unless prompted or provided with a conducive environment, some employees withhold their safety voice altogether. Therefore, the behaviours that were important to support employee safety voice related to supervisors a) *“proactively consulting with employees on safety issues and improvements;”* and b) *supervisors providing “employees with a range of formal and informal opportunities to express their safety voice.”* These behaviours were categorised as providing physical and social opportunities to express safety voice in addition to building reflective motivation.

Theme 2 – “Perceptions of ‘them’ contrasted the shop floor perceptions of the in-group (as identified in Sub theme 1.1) against attitudes towards the out-group. The outgroup was viewed as an unseen entity representing management and the

organisation's wider health and safety team which reportedly imposed unacceptable and excessive site-wide safety interventions on the shop floor teams without their involvement. Participants withdrew their safety voice, on occasions, to limit the involvement this out-group who reportedly did not understand the negative impact of their rigorous safety investigations and the interventions they imposed. A behaviour deemed important to safety voice relates to *supervisors "proactively consulting with employees on safety issues and improvements."* This is linked to providing physical opportunities for positive interactions with employees on safety. Another important behaviour for safety voice involved *members of the SHE team "investigating emergent safety issues in a manner that is proportional to the severity of the incident."* This behaviour was categorised as building psychological capability amongst SHE professionals about how to conduct an incident investigation with empathy and sensitivity.

Theme 3 "Facilitation of safety voice" reflected the extent to which employees felt they were presented by the organisation with the physical and psychological opportunities to express their safety voice.

Subtheme 3.1 – "Encouragement to voice" highlighted the critical importance of supervisors providing psychologically safe opportunities for shop floor workers to express their safety voice. A critical behaviour relevant to safety voice was associated with *supervisors "providing employees with a range of formal and informal opportunities to express their safety voice."* This was categorised as supporting physical and social opportunities for employees to speak up.

Subtheme 3.2 "The tension between production and safety" drew together the conflicting tensions between achieving production targets and safety. Shop floor workers described how supervisors and leaders often communicated mixed messages about the priority of safety on the shop floor through their words, their behaviours and where they placed their focus and resources. This created a climate in which employees would evaluate and make their own assumptions about whether it was more acceptable to stop the job and express their safety voice or to take a risk in order to support production goals. A behaviour that was considered important to

safety voice was *“leaders reinforcing to teams the critical importance of safety and its priority in relation to production.”* This was categorised as targeting employees’ psychological capability and reflective motivation. A second important behaviour was *“leaders providing sufficient resources for addressing safety issues raised by the team”*. This behaviour was categorised as improving reflective motivation for safety voice amongst Shop floor workers.

Subtheme 3.3 – “Response to safety voice” explored the extent to which supervisors and the facilities management organisation captured, monitored and progressed actions from employee observations concerns and ideas. The subtheme also highlighted the importance of ensuring that supervisors provided feedback to their teams. These key factors appeared to influence the extent to which employees felt motivated to speak up. The critical safety voice behaviours that were relevant to this theme were: a) *supervisors visibly capturing tracking and providing timely feedback to their teams on safety issues*, b) *supervisors proactively addressing safety issues raised by the team*, c) *leaders verifying that safety actions have been completed*, and d) *Facilities Management contractors responding in a timely manner by closing down actions and providing feedback on progress at each stage*. These behaviours were categorised as influencing employees’ reflective motivation to speak up. The behaviours identified as important to safety voice and the theme from which they were generated are summarised in table 5.

Table 5. Table analysing “what needs to happen” in order for the target behaviours to be realised

Stakeholder	Behaviours	What / Instruments/ When / Where	Capability		Opportunity		Motivation		THEME 1			THEME 2	THEME 3		
			Physical	Psych	Social	Physical	Automatic	Reflective	Subtheme 1.1	Subtheme 1.2	Subtheme 1.3		Subtheme 3.1	Subtheme 3.2	Subtheme 3.3
Leaders	To reinforce to teams the critical importance of safety and its priority in relation to production	Face to face briefings, blogs, videos, communications	NA	Must understand the importance of safety voice & how to report issues. Must recognise the leader influence in role modelling behaviour and remember to use it.	Must be willing to influence teams to raise issues. Must be acceptable for individuals to be recognised for safety.	Leaders need physical opportunities to visibly support the safety voice programme. Must have reward schemes to use	Need to resist other priorities and lend support to the safety voice intervention	More issues, problems and challenges must be viewed positively. Must identify opportunities to recognise good practice from team members & praise.						X	
Leaders	To provide sufficient resources for addressing safety issues raised by the team	Escalation mechanisms, SHE reviews, Ops meetings	NA	Must appreciate the importance of addressing safety concerns of employees in a timely fashion	Bad news must be viewed positively as an opportunity to improve safety.	Must have sufficient resources available and escalation mechanisms for teams to raise issues. Must also have the opportunity to plan with supervisors and others	Need to resist other priorities and lend support to the safety programme	Must be able to prioritise safety and team issues wherever possible.						X	
Leaders	To verify that safety actions have been completed	Operations reviews, supervision and employees; Safety Tours and Process Confirmations	N/A	Must understand the importance of action closure and holding stakeholders to account. Must have access to action logs and progress charts. Must recognise they are accountable for the safety of their teams	Must feel pressure to prioritise safety over other activities and ensure their teams are safe	Must have sufficient time, information and opportunities to review and challenge action closure with stakeholders	Must avoid temptation to assume issues have been resolved.	Must recognise the leader is accountable for ensuring that teams are provided with a safe workplace. Must feel able to challenge whether actions have been completed							X
Supervisors	To communicate clear expectations to their teams about the issues that warrant safety voice	Team meeting; workplace rules & standards and visible reminders	N/A	Must understand the importance of safety voice & psychological safety. Must know how to set ground rules for open & honest discussions & remember to apply them. Must understand the safety reporting mechanisms available &	Supervisors must be open to potentially new ways of conducting meetings and willing to trust others.	Must have physical opportunity to engage team members on the importance of speaking up and clarifying issues.	N/A	Must appreciate the importance of employee safety voice as a means of directing improvements		X					

Stakeholder	Behaviours	What / Instruments/ When / Where	Capability		Opportunity		Motivation		THEME 1			THEME 2	THEME 3		
			Physical	Psych	Social	Physical	Automatic	Reflective	Subtheme 1.1	Subtheme 1.2	Subtheme 1.3		Subtheme 3.1	Subtheme 3.2	Subtheme 3.3
				how/when they should be used											
Supervisors	Proactively consult with teams on safety issues and improvements	In workplace and in all interpersonal interactions with teams	NA	Must know how to engage in effective safety conversations. Must understand benefits of engaging teams. Know how to build rapport; how to tease out safety issues; how to escalate problems to supervisors and the confidence to speak with teams.	Must be socially acceptable to engage team members on a regular basis; adopting a "caring position" Must have trusted relationships with team members	Must have physical opportunities and time to talk with team members about safety. Must have physical, regular contact with team members	Must resist urge to make assumptions about unsafe behaviours and to adopt a curious approach to safety non-compliance. Must resist urge to assume people are ok in their roles and coping.	Must weigh the long terms benefits of gaining trust of teams as opposed to issuing warnings and threats for non-compliance. Must feel motivated to improve the work environment for teams.			X				
Supervisors	To provide employees with a range of formal and informal for teams to express their safety voice	In workplace, team meetings, via supervisors, online systems, colleagues	N/A	Must create, harness and utilise daily interactions with teams to explore their safety experiences. Must understand and mitigate the barriers which prevent employees from speaking up. Must be able to remind employees to speak up	Must feel comfortable engaging teams and individuals on safety in the workplace. Must feel it is acceptable to take time to gauge employees views on safety	Must be able to create time, and opportunities to discuss safety with individuals and teams. Must have the time and ability to act if issues arise	N/A	Must understand the safety & business benefits of effective employee engagement			X		X		
Supervisors	To visibly capture track and provide timely feedback to their teams on safety issues	In workplace using visual display boards		Must remember to capture issues raised by team. Must understand the importance of providing feedback to teams and must be aware of action progress	Must be socially acceptable to visibly capture a range of issues & ideas. Must feel social pressure from above and below to provide feedback.	Must have physical opportunity & resources to visibly capture issues and ideas raised by team. Must have physical opportunities (time / opportunity) to feed back safety issues to teams.	Must resist temptation to downplay problems raised by the team.	Must recognise the importance of treating team inputs fairly. Must feel the importance of providing feedback to the team, Must be driven by actions process							X

Stakeholder	Behaviours	What / Instruments/ When / Where	Capability		Opportunity		Motivation		THEME 1			THEME 2	THEME 3		
			Physical	Psych	Social	Physical	Automatic	Reflective	Subtheme 1.1	Subtheme 1.2	Subtheme 1.3		Subtheme 3.1	Subtheme 3.2	Subtheme 3.3
Supervisors	To proactively address safety issues raised by employees	In workplace; in SHE & business reviews		To be able to prioritise issues appropriately based on resources, risk and business environment. Must understand risk assessment process. Must know when and how to escalate issues to senior management	Must be an expectation that employee issues are addressed promptly. Must feel supported by senior managers to prioritise safety. Must be acceptable for supervisors to request additional support. Must feel senior managers welcome bad news	Must have physical resources and funds to be able to address employee issues. Must have physical escalation mechanisms to highlight key issues	Must resist fear of escalating issues that require senior management input	Must recognise the value of installing improvements on the safety culture. Must feel that senior management want to hear bad news and that escalation is worthwhile							X
Employees	Identify, appraise and speak up about hazards or issues	In workplace		Knowledge of hazards in the facility. Must remember to look for uncontrolled hazards or issues in the workplace. Must recognise the importance of speaking up, when safety voice is appropriate and how to express safety voice effectively.	Must be acceptable to broach unsafe conditions / behaviours with colleagues. Must be a common understanding that challenge is constructive and not designed to create conflict. Challenge must be done in a way that does not embarrass / humiliate the individual	Need physical hazard identification opportunities designed to uncover safety problems & issues. Must have sufficient time to perform safety checks and a platform to raise issues. Must be opportunities to view colleagues working in the workplace and to speak to them.	Must avoid urge to walk past. Need to resist the urge to stay silent on safety	Need to reflect on the nature of the hazards & whether action can be taken to mitigate or escalate it.		X					
Employees	To accept safety challenge from their peers	In workplace and in one to one situations		Must appreciate that safety voice is associated with caring for others. Must know how to receive challenge tactfully.	Must have common understanding that challenge is coming from a place of care. Must have faith that challenge won't lead to conflict	Must have time to consider & reflect on experience of being challenged	Must be prevented from feeling threatened by the challenge	Need to feel that challenging colleagues is an expression of their caring and not a direct criticism of working practices.	X						
SHE	To investigate emergent safety issues in a manner that is proportional to the severity of the incident	Accident and near miss investigations	N/A	Must understand how to investigate issues with understanding and empathy to get to root causes.	Must feel no pressure to reach quick assumptions or to jump to conclusion about immediate causes. Must feel no pressure to bow to	Must have sufficient time to carry out root cause investigations	Must resist temptation to automatically blame employees for shortcomings	Must have an open mind about the origins of SHE issues.				X			

Stakeholder	Behaviours	What / Instruments / When / Where	Capability		Opportunity		Motivation		THEME 1			THEME 2	THEME 3		
			Physical	Psych	Social	Physical	Automatic	Reflective	Subtheme 1.1	Subtheme 1.2	Subtheme 1.3		Subtheme 3.1	Subtheme 3.2	Subtheme 3.3
					production pressures.										
FM Contractors	To respond in a timely manner by closing down actions and providing feedback on progress at each stage	Response via email or by visibly fixing issues raised	N/A	To be able to prioritise issues appropriately based on resources, risk and business environment.	Must be an expectation that reported issues are addressed in a timely fashion based upon risk and contractual obligations	Must have physical resources and funds to be able to address employee issues	N/A	Must recognise the value of installing improvements on the safety culture.							X

A conceptual system map of the behaviours that were relevant to safety voice was created following the interviews (See Figure 8 below). This map is a simplified diagram to highlight the key stakeholders that have the potential to influence employee safety voice at shop floor level and the twelve behaviours that appeared to be important in increasing the likelihood of an employee to speak up about safety. Defining the problem in behavioural terms is the first step in the Behaviour Change Wheel process and these behaviours formed the basis of the design of the intervention which will be described in Study 3.

Figure 8

Conceptual map of the behaviours deemed important to safety voice



4.10. Limitations

There were several limitations associated with this study. Only nineteen individuals from three separate areas took part in the interviews which represents a very small proportion of the workforce as a whole, although this sample size is appropriate for thematic analysis (Braun & Clarke, 2021). In addition, half of the participants were older workers; often with many years of experience of working in the company. Consequently, they have been able to develop and learn voice strategies over time in contrast to their younger counterparts. It would be interesting to compare younger and older workers to understand if their voice strategies differ.

In addition, senior management also appeared to play an influential role in creating the organisational environment in which safety voice occurs but did not participate, despite being invited. Similarly, office-based employees and FM contractors were also not included in the safety voice interviews. Many office workers are engaged in planning, supply and logistical tasks which have a bearing on the work of shop floor teams. Their insights may have provided more of an in-depth understanding regarding the wider contextual factors which shape the experiences of supervisors and employees on the shop floor. Further research is recommended to explore how office workers' experiences and perceptions of safety compare with those of the shop floor.

Likewise, FM contractors play a key role in responding to employee concerns and incident reports regarding facilities maintenance issues and many of these impinge on safety (such as defective lighting or leaking roofs). Understanding their processes and how their response influences the speaking up behaviour of employees may help to place safety voice in an even wider context. It is therefore recommended that further research is carried out to consider how perceptions of safety voice differ amongst different groups of the workforce and to understand the wider contextual boundaries of the system in which safety voice exists.

Conclusion

The factors which underpinned safety voice in aircraft manufacture and how these factors relate were explored. Semi-structured interviews were carried out amongst supervisors and employees representing three shop floor areas in a large aircraft manufacturing facility in the UK. The interviews were subsequently analysed using thematic analysis (Braun & Clarke, 2006; Clarke & Braun, 2017). The findings showed that safety voice is a complex behaviour that is influenced by a wide range of factors associated with the nature of the situation as well as individual, group and organisational factors. In particular, this study revealed that employees often navigate these factors by developing safety voice strategies in order to communicate key safety information. The critical behaviours important to safety voice, were extracted and presented, whilst implications and opportunities for further research were discussed.

Reflection

I felt the interview process was executed successfully and I did not feel that interviewees were concealing information or reluctant to express themselves. However, on reflection, it must be recognised that I was a male employee wearing clothing that was typical of an office worker within the company, in contrast to the shop floor interviewees who wore workwear which formed part of their identity. On the one hand, this could have created the impression that I was independent of the shop floor and therefore in a position of confidence/authority. Some may have recognised me as a longstanding employee and viewed the interview as an opportunity to speak directly with someone who was in a position to improve their working conditions and experiences.

However, it is also plausible that some of the interviewees may have formed a first impression that I was an outsider and lacked the credibility and background to fully understand their challenges, pressures and experiences. At worst, some may have perceived me as a member of the out-group and may have formed a view that I was not to be trusted with the reality of their safety experiences. Others may have viewed

me as a University graduate and therefore less likely to empathise with their work problems. Despite doing my best to allay their fears by trying to develop rapport, clarifying understanding and assuring their confidentiality, this may have been a factor in the responses provided by some of the interviewees.

However, there is no question that, whilst my role as a safety practitioner in the organisation may have influenced the responses by the interviewees, I was able to relate to and interpret their experiences. I was able to understand company terms and the context in which they were working and I could recognise historical issues to which they referred and their views around previous safety interventions.

The thematic analysis also presented new challenges. Initially the interviews were captured on a recording device and Otter.ai was used to support the creation of drafts of the transcripts. However, due to the accents and speed of the dialogue, it took several iterations to ensure that the transcripts matched the audio. Whilst this was frustrating, it did provide an opportunity to become well acquainted with the data.

In terms of conducting the analysis, after attempting to use various software options, such as Nvivo, I selected MS Excel as the means for capturing my analyses which I found simple to use and easy to filter. However, arriving at the right tool and conducting the analysis to the required depth proved to be time-consuming, repetitive and often frustrating. There is no question that the inductive thematic analysis enabled me to capture the participants' rich experiences and the nuances associated with the various antecedents of safety voice behaviours in the manufacturing context. I found this to be extremely worthwhile as well as challenging.

The early steps of the behaviour change wheel are solely associated with extracting the key safety voice behaviours to support the development of an intervention. This deductive approach was far simpler to execute. However, on reflection, the behaviours generated by this approach were generic and applicable across most organisations. One could therefore assume that the interventions created by the process would be generic and applicable to most organisations. Based on this

premise, it should be therefore simple for organisations to develop their safety reporting systems around a common, tested model or framework. Yet, as discussed in the literature review, research across a range of industries repeatedly finds that under-reporting on safety is commonplace. It has led me to conclude that perhaps the inter-play between the situational context, organisational systems and nuanced social factors are extremely important in shaping safety voice.

4.11. Study 2 – Quantitative Measurement of Safety Voice

4.12. Survey Design

The overall aim of study 2 was to develop and implement a “safety voice” questionnaire from existing validated surveys in order to explore perceptions of safety voice amongst a broader cross section of employees engaged in aircraft manufacture. The questionnaire had a number of objectives. It was used as a means of a) triangulating the initial qualitative findings against a quantitative data source b) exploring the factors which underpin employees’ willingness to speak out on safety; c) creating a baseline against which a future intervention could be evaluated, and d) informing the design of an intervention to increase employee’s willingness to express their safety voice.

The reason why a questionnaire was included as part of the methodology is because they have a number of strengths (Marshall, 2005; Sapsford & Jupp, 2006). Firstly, a questionnaire allowed for the efficient and cost-effective capture of data across a large population (Marshall, 2005). Secondly, a questionnaire was deemed to be more time-efficient for participants than other data capture methods and could be administered by the researcher in collaboration with local supervision in a manner that would not impact the study’s validity and reliability. Thirdly, the results of the questionnaires could be analysed using an appropriate software package. Finally, the data could be quantified in order to measure change over time by gathering pre-intervention and post-intervention data (Sapsford & Jupp 2006) and could also be used to contrast the findings against those generated from the qualitative interviews. This process of triangulation using different methods is intended to increase the

validity, strength and reliability of the study whilst reducing researcher bias (Thurmond, 2011). Administering a survey also had the added advantage of mitigating coronavirus risks, as employees could complete the questionnaires whilst maintaining social distancing controls. Questionnaires have been used effectively by researchers exploring safety voice in diverse populations (Turner et al., 2010; Conchie et al., 2012; Tucker et al., 2014; Tucker & Turner, 2015; Manapragada & Bruk-Lee, 2016). Consequently, there were already existing survey items that were available to be selected and, in some cases, adapted for the context of aircraft manufacture.

The questionnaire was designed to be used at two time points. The first time point was at pre-intervention to provide a baseline against which a behaviour change intervention (which aimed to increase the rates of employee safety voice) could be measured. It was envisaged that the baseline survey findings would also inform the design of the intervention by highlighting those antecedents where there were opportunities for improvement. The second time point was originally designed to be at post-intervention to determine the intervention's effectiveness.

The results of the survey were analysed to understand whether there was a correlation between the variables. In addition, a multiple regression was conducted to understand the relationships between the dependent variables, associated with the antecedents of safety voice, and the independent variable which was the expression of both safety voice and safety ideas.

4.13. Measures

The original questionnaire featured 50 survey items that had been previously used and validated by other researchers. These survey items were categorised into fourteen variables for the purpose of the analysis. These variables were demographics, ideas, perceived co-worker support for safety (PCSS), identity, perceived organisational support for safety (POSS), injuries, control variables, supervisor openness, affective commitment and safety silence motives. The survey items, variable category and their origins can be found in Appendix 5.

The questionnaire included all 11 of the survey items used in Tucker et al. 2008's study which explored the extent to which perceived co-worker support for safety (PCSS) and perceived organisational support for safety (POSS) influenced employee safety voice. The items were measured by means of a five-point Likert scale ranging from "Strongly disagree" to "Strongly agree."

The questionnaire also used all 17 of the survey items used by Tucker and Turner (2015) to explore the relationship between having ideas to improve, safety voice and future work-related injuries. As per the original study, unless stated, the items were measured by means of a five-point Likert scale ranging from "Strongly disagree" to "Strongly agree." However, in keeping with the original study, the variable 'work-related injuries,' which asked about their experience of common work-related injuries in the previous month was scored on a 5-point response scale ranging from 'never' to 'more than five times.' Safety voice was measured using three items which were scored on a response scale ranging from 1 (almost never) to 7 (almost always).

The study used 6 items to measure in-group identity which had previously been used by Andersen et al. (2018) to evaluate the relationships between social identity, safety climate and self-reported accidents amongst construction workers in Denmark. These items originated from studies by Cameron (2004) and Edwards and Peccei (2007). The items were measured by means of a five-point Likert scale ranging from "Strongly disagree" to "Strongly agree."

The study used all 17 of the survey items taken from a study on the motives behind safety silence developed by Manapragada and Bruk-Lee (2016). These were subdivided to reflect the different safety silence motivations identified by Manapragada and Bruk-Lee (2016) and included factors associated with the job, the issue faced, the climate of the organisation, relationships, protecting others and protecting the self. These survey items were measured by means of a five-point Likert scale ranging from "Strongly disagree" to "Strongly agree."

The dependent variable was categorised in terms of 8 items associated with the expression of safety voice. The other independent variables were categorised as antecedents of safety voice.

The final survey that was used can be found in Appendix 6.

4.14. Methods

The questionnaire was disseminated via an email link using the Qualtrics software tool to circa 1000 shop floor workers in three facilities at the target organisation's aircraft manufacturing plant to explore their perceptions of and attitudes toward psychological safety, identity and employee safety voice. The same questionnaire was also made available as a paper version, upon request by local supervisors, to aid those shop floor teams who experienced difficulties accessing IT facilities or logging on to the survey (Ranchhod & Zhou, 2001).

4.15. Procedure

The survey was granted ethical approval for use by the University of Derby (ETH1920-1703) and distributed in April 2021. The participants were drawn from the same three shop floor environments in which the Study 1 qualitative interviews had been conducted.

The procedure was as follows:

- 1) The Operational Head of Business was approached and asked to confirm their willingness to support the implementation of a survey amongst their work teams and to provide them with time away from their work to complete it. During this meeting, the Head of Business was presented with the opportunity to review the question set and to discuss proposals for administering the survey in terms of timeframes, stakeholders and logistics.

- 2) The operational supervisory teams and local Safety, Health & Environmental (SHE) practitioners from the target areas were then briefed by the researcher at one of their meetings with details of the proposed questionnaire and asked to support the intervention by providing employees with the time and opportunity to complete the questionnaire, if they so wished. They were provided with an overview of the timeframes agreed with the Operational Head of Business and asked to promote the questionnaire amongst their teams. Flyers were provided to help the promote the survey and supervisors were asked to pin these on the noticeboards in the target areas and to discuss the survey with potential participants in a relevant team meeting (see appendix 7 for the flyer). The researcher offered to be on hand to explain the survey if necessary. The supervisors were explicitly reminded to convey the message to employees that participation in the survey was entirely voluntary and that individuals should not feel compelled to participate if they did not wish to. Supervisors were also reminded to convey the message that there were no means of monitoring or tracking which individuals had or had not completed it.
- 3) The email addresses for the target population were then acquired by the researcher from the local SHE representatives. Emails containing the questionnaire link were disseminated to the target population using the “Bcc function” from the researcher’s University email address. This email briefly explained the purpose of the study, its confidential nature, the time window in which the questionnaire was open, the length of time the survey was expected to take and how the findings would be used. The email also contained the contact details of the researcher to answer any further queries about the survey, as well as contact details of the researcher’s line manager and academic supervisor for any concerns about the wider project. A debrief and instructions on how to withdraw their data was also included in the email. Participants had the opportunity to give informed consent and this was entirely voluntary (see appendix 8).

In addition, identical paper surveys were printed and made available to individual participants or to those supervisors who requested them for their teams. These paper surveys were provided with an easily sealable, opaque envelope already marked with the researchers' internal postal address. Participants were instructed to complete their questionnaires anonymously, seal the completed survey in the envelope provided and send it to the researcher directly through the organisation's secure internal postal system. This was intended to maintain the anonymity and confidentiality of the participants. Again, it was explicit on the paper surveys that participation is entirely voluntary and that employees should not feel compelled to participate if they did not wish to.

- 4) Participants were also reminded in the pre-amble to the questionnaire that the survey was entirely voluntary and that they could withdraw their information at any point up to two weeks after the questionnaire window had closed. This was achieved by creating a unique identifying code for the survey of each participant.
- 5) Informed consent was acquired by providing summary information to the participants at the beginning of the questionnaire. This provided details about the nature and purpose of the questionnaire and it asked participants to tick a mandated checkbox if they agreed that:
 - They had read and understood the purpose of the questionnaire,
 - They understood how the information they had provided would be used.
 - They were taking part in this research study voluntarily (without coercion).
 - Anonymised quotations provided by them in completing the questionnaire may be used in the findings.

If this check box was not completed, the surveys were declared as void.

- 6) At the end of the survey, a written statement was included which thanked employees for their participation. They also received a message to state that

their responses had been captured and would be used to inform a behavioural intervention to increase employee's willingness to express their safety voice. In addition, the researcher's contact details as well as the contact details of the researcher's academic supervisor and line manager were provided should the participants have any further queries or wish to withdraw their data.

- 7) To ensure confidentiality, personal details of the participants were not captured in the questionnaire. Where individuals might have been identifiable (due to a low number of participants representing a team/grade), care was taken to ensure that the findings were aggregated up a level to teams representing more than 6 individuals. In addition, a unique identifying code was generated for each completed questionnaire to allow participants to withdraw their information.
- 8) Weekly email reminders for a period of a month during March 2020 were issued to employees and the supervisors to help promote the completion of the questionnaire.

4.16. Study Sample

Emails were sent to approximately 1000 shop floor workers located in three high hazard areas within the target organisation; each of whom was directly engaged in aircraft manufacture or maintenance activities. The participants were aged over 18 and were directly employed by the target organisation. 46 Shop floor workers responded to the survey via paper forms. Respondents included 20 employees from the modern machine shop, 11 from the traditional machine shop and 13 from the fabrication facility. 3 respondents did not declare their work location. The final sample (N=46) was predominantly male (84%), aged 31 to 50 (62%) and the majority had been employed in the organisation for less than a year (26%) or between 11-20 years (26%).

4.17. The impact of COVID 19

A major limitation of the questionnaire was the very small survey sample (N=46). Given that the three work areas collectively comprised of around 1000 employees, the survey was not deemed to be a representative sample and a decision was made to abandon its use in the context of the wider research project as a way of measuring behavioural change. There were several reasons for the poor response rate. The first relates to the COVID-19 pandemic, which coincided with the implementation of the questionnaire. This caused widespread disruption to manufacturing operations, distracted supervisors and led to significant changes in the organisation's processes. The organisation also conducted a number of questionnaires to gauge employees' willingness to work, understand their concerns and evaluate the effectiveness of their pandemic response arrangements. This may have led to 'survey fatigue' on the part of employees which may have demotivated employees from completing the safety voice questionnaire (De Koning et al., 2021). In this environment, it is highly likely that the safety voice questionnaire was not viewed as a priority by supervisors or employees who were required to maintain production targets in conjunction with installing new ways of working. It is therefore recommended that the questionnaire is repeated in future research in a more conducive environment to understand whether it provides an effective measure of safety voice behaviour and its antecedents.

4.18. Results

The survey results suggested that the majority of respondents expressed their safety voice (see appendix 9 for descriptive statistics). Indeed, the majority 'agreed' or 'strongly agreed' that they told their colleagues to stop if they saw them working unsafely (84%), made suggestions about how safety can be improved (72%), discussed new ways to improve safety with their colleagues or boss (72%) and informed the Trade Union or boss if they noticed a potential hazard (65%). However, when asked to rate how frequently they told their supervisors about the consequences of dangerous working conditions, a third reported 'hardly ever' (33%) or 'sometimes' (23%) as opposed to often (5%), most of the time (21%) or all of the time (19%). Similar findings were also found when the respondents were asked to

'rate how frequently they grouped together with co-workers to raise safety concerns with their supervisors ('hardly ever' 35%; 'sometimes' 30%) and how frequently they told their supervisor about hazardous work ('hardly ever' 28%; 'sometimes' 28%).

The results also showed that the majority of respondents had a perception that their working environment was safe. The majority 'disagreed' or 'strongly disagreed' that they feared that they could have an accident at their job (64%) or could get hurt at their job (59%). In addition, 80% of the respondents reported that they had not experienced any type of workplace injury (including a superficial wound, cut laceration or puncture, work related burn or scald or bruise) in the last month with 11% reporting they had experienced one injury and 9% experienced two or three injuries in the previous month. Of the 20% that had experienced an injury in the last month, two thirds had reported that injury to a supervisor (N=6) whilst a third had not (N=3).

In terms of exploring the antecedents of safety voice, the majority of respondents 'agreed' or 'strongly agreed' that their supervisor would seriously consider good safety ideas (68%), cared about their safety opinions (67%), was interested in their ideas and suggestions regarding safety (66%), and fairly evaluated safety suggestions (59%). Moreover, the majority of respondents had ideas to improve safety at their workplace (59%) and in their job (55%).

The majority of respondents also felt supported to work safely and express their safety voice. Most respondents 'agreed' or 'strongly agreed' that the company takes the safety ideas of employees seriously (77%) and encouraged employees to voice their safety concerns (77%). They also believed their co-workers were prepared to stop others working dangerously (77%), encouraged each other to work safely (75%) and were ready to talk to fellow employees who fail to use safety equipment or procedures (69%).

The respondents also indicated that they felt a shared sense of identity with their co-workers on the shop floor. 70% 'agreed' or 'strongly agreed' that they 'fit in' with other colleagues on the shop floor and the majority believed that they had a lot in

common with other shop floor workers (57%), possessed strong ties (52%) and felt they really belonged (64%). Indeed, 68% 'disagreed' or 'strongly disagreed' that it was difficult to form a bond with other shop floor workers.

The questionnaire findings also revealed that many respondents appeared to have formed an affective commitment towards the organisation. 89% 'agreed' or 'strongly agreed' that they would be happy to spend the rest of their career with the organisation and the majority also responded favourably that the organisation has a great deal of personal meaning to them (55%).

The findings also pointed to some of the barriers that employees face associated with expressing their safety voice. Only 30% of the respondents 'strongly agreed' or 'agreed' that they report to their boss when colleagues break safety rules with the majority answering 'neither agree nor disagree' (51%). A majority of the respondents (52%) also indicated that the organisation was quick to respond to their safety concerns, in comparison to 20% who 'disagreed' or 'strongly disagreed' and 27% who responded neither favourably or unfavourably.

In terms of motives for safety silence, the survey respondents indicated that the biggest reasons for not speaking up was a heavy workload (26%), not wishing to start a dispute between others (26%), time pressures (17%), a perception that speaking up will make it difficult to work with others (17%), losing co-worker respect (17%) and the belief that speaking up can lead to negative perceptions of the voicee (17%).

4.19. Analysis

In order to understand the relationships between the various factors that influence safety voice behaviour, the data was statistically analysed using SPSS. Initially, the individual questionnaire item scores were combined to reflect each of the safety voice variables that had been identified in pre-existing research and a mean average was calculated for that variable. These variables replicated the original studies from which they were taken and were maintained in order to allow for effective

comparison. Two variables of safety voice were analysed to reflect the different survey questions proposed by Tucker and Turner in their separate safety voice studies (Tucker & Turner, 2008; Tucker & Turner, 2015). Parametric assumptions were not satisfied. Consequently, Spearman's tests were carried out to understand the relationship between the two variables of safety voice and the other variables which potentially influenced safety voice. The output of this correlation is in Table 6 below.

The analysis of the Spearman's test revealed that there was a negative correlation between Turner and Tucker's (2015) safety voice variable and the variables perceived co-worker safety support $r(42) = -.383, p = .010$, supervisor openness $r(42) = -.340, p = .024$, a sense of identity $r(42) = .591, p = .001$, and having ideas $r(42) = -.413, p = .005$.

The Spearman's test also revealed there was a positive correlation between Turner and Tucker's (2008) safety voice variable and the variables perceived co-worker safety support $r(43) = .637, p = .001$ and identity $r(43) = .433, p = .003$.

Table 6

Results of a Spearman's test showing the correlations between the Safety Voice variables

Safety Voice Variable		Demographics - Location	Demographics - Age	Demographics Years employed	Demographics - Gender	Work related injuries	Control variables	Safety voice (taken from Turner & Tucker 2015)	Ideas	Supervisor openness	Affective commitment	Safety Voice (taken from Tucker & Turner 2008)	PCSS	POSS	Identity	Silence - self	Silence - other	Silence - relationship	Silence - issue	Silence - job	Silence - climate
Demographics - Location	Correlation Coefficient																				
	Sig. (2-tailed)																				
Demographics - Age	Correlation Coefficient	0.061																			
	Sig. (2-tailed)	0.695																			
Demographics Years employed	Correlation Coefficient	0.097	.403**																		
	Sig. (2-tailed)	0.531	0.007																		
Demographics - Gender	Correlation Coefficient	-0.035	0.063	0.052																	
	Sig. (2-tailed)	0.823	0.684	0.736																	
Work related injuries	Correlation Coefficient	-0.074	0.037	0.039	-0.231																
	Sig. (2-tailed)	0.639	0.814	0.806	0.141																
Control variables	Correlation Coefficient	0.188	0.064	.377*	-0.115	0.186															
	Sig. (2-tailed)	0.223	0.678	0.012	0.458	0.233															
Safety voice (taken from Turner & Tucker 2015)	Correlation Coefficient	-0.032	-0.134	-0.214	-0.149	0.231	-0.094														
	Sig. (2-tailed)	0.836	0.392	0.168	0.341	0.136	0.543														
Ideas	Correlation Coefficient	0.149	0.094	-0.090	-.337*	-0.047	.324*	-.413**													
	Sig. (2-tailed)	0.333	0.545	0.560	0.025	0.764	0.030	0.005													
Supervisor openness	Correlation Coefficient	0.164	-0.216	-0.288	0.149	-.490**	-0.255	-.340*	0.055												
	Sig. (2-tailed)	0.286	0.159	0.058	0.334	0.001	0.091	0.024	0.718												
Affective commitment	Correlation Coefficient	-0.205	0.193	0.036	-0.062	-0.090	-0.042	-0.250	0.035	.433**											
	Sig. (2-tailed)	0.181	0.209	0.817	0.688	0.566	0.782	0.102	0.819	0.003											
Safety Voice (taken from Tucker & Turner 2008)	Correlation Coefficient	-0.034	-0.134	-0.029	-0.165	-0.299	0.126	-.477**	.585**	0.291	0.163										
	Sig. (2-tailed)	0.829	0.387	0.851	0.283	0.051	0.409	0.001	0.000	0.052	0.285										
PCSS	Correlation Coefficient	-0.154	-0.097	-0.080	-0.088	-0.277	-0.223	-.383*	0.226	.433**	.397**	.637**									
	Sig. (2-tailed)	0.320	0.532	0.604	0.568	0.072	0.142	0.010	0.135	0.003	0.007	0.000									
POSS	Correlation Coefficient	-0.099	-0.207	-.425**	0.030	-0.221	-.322*	-0.222	-0.084	.744**	.526**	0.290	.533**								
	Sig. (2-tailed)	0.524	0.178	0.004	0.849	0.155	0.031	0.147	0.584	0.000	0.000	0.053	0.000								
Identity	Correlation Coefficient	-0.122	-0.016	0.213	0.056	-0.116	0.241	-.591**	.304*	0.166	0.254	.433**	.400**	0.101							
	Sig. (2-tailed)	0.431	0.916	0.165	0.717	0.459	0.110	0.000	0.042	0.275	0.093	0.003	0.006	0.510							
Silence - self	Correlation Coefficient	-0.126	-0.015	0.146	-0.134	0.171	.306*	0.111	0.102	-.409**	-0.249	-0.234	-.327*	-.384*	-0.021						
	Sig. (2-tailed)	0.427	0.926	0.355	0.397	0.279	0.046	0.480	0.517	0.006	0.107	0.131	0.032	0.011	0.895						
Silence - other	Correlation Coefficient	-0.039	-0.077	0.034	-0.119	0.138	.350*	0.030	0.168	-0.252	-0.034	-0.194	-.349*	-0.226	0.009	.773**					
	Sig. (2-tailed)	0.806	0.626	0.831	0.453	0.384	0.021	0.849	0.280	0.103	0.829	0.212	0.022	0.146	0.953	0.000					
Silence - relationship	Correlation Coefficient	0.015	0.027	-0.104	-.318*	0.188	0.223	0.269	0.291	-0.265	-0.144	-0.195	-.336*	-.324*	-0.158	.657**	.786**				
	Sig. (2-tailed)	0.923	0.863	0.514	0.040	0.239	0.156	0.085	0.061	0.090	0.363	0.216	0.029	0.036	0.316	0.000	0.000				
Silence - issue	Correlation Coefficient	0.060	0.032	0.280	-0.115	.432**	0.251	0.101	-0.037	-.483**	-.482**	-0.153	-.403**	-.579**	0.010	.340*	0.149	0.186			
	Sig. (2-tailed)	0.705	0.841	0.073	0.467	0.005	0.109	0.523	0.814	0.001	0.001	0.333	0.008	0.000	0.951	0.028	0.345	0.238			
Silence - job	Correlation Coefficient	-0.015	0.130	0.207	-0.205	-0.104	.328*	0.076	0.146	-.416**	-0.249	-0.024	-0.197	-.463**	-0.192	0.276	0.164	.351*	0.265		
	Sig. (2-tailed)	0.927	0.418	0.193	0.198	0.525	0.036	0.635	0.361	0.007	0.117	0.882	0.216	0.002	0.229	0.081	0.306	0.025	0.094		
Silence - climate	Correlation Coefficient	0.039	0.234	.311*	-0.271	0.219	.342*	0.121	0.195	-.671**	-.448**	-0.023	-.328*	-.688**	-0.005	.318*	0.287	.373*	.579**	.509**	
	Sig. (2-tailed)	0.806	0.136	0.045	0.082	0.168	0.026	0.445	0.216	0.000	0.003	0.885	0.034	0.000	0.977	0.040	0.065	0.015	0.000	0.001	

Two separate linear regression analyses were also carried out to evaluate the extent to which the different predictor variables could predict safety voice. The first dependent variable was safety voice as per Tucker and Turner's (2015) study. When the variables were analysed to understand the extent to which they predicted safety voice, a significant regression was found $F(df) (18, 21) = 2.261, p = .038$. The R^2 was 0.66 indicating that the variables explained approximately 66% of the variance in safety voice. The R^2 adjusted was 0.37. The analysis suggested that having ideas ($p = 0.009$) was a significant factor in predicting the expression of safety voice. The output of this regression analysis can be found in Appendix 10.

The second dependent variable was safety voice as taken from Tucker et al. (2008). When the variables were analysed to understand the extent to which they predicted safety voice, a significant regression was found $F(18, 21) = 4.778, p < .001$. The R^2 was 0.80 indicating that the variables explained approximately 80% of the variance in safety voice. The R^2 Adj was 0.64. The analysis suggested that having ideas ($p = 0.001$) was a significant factor in predicting the expression of safety voice. See Appendix 11 for a table showing how each variable influenced safety voice.

4.20. Discussion

The analysis of the pre-intervention questionnaire results indicates that there was a correlation between safety voice and the variables perceived co-worker safety support (PCSS), supervisor openness, a sense of identity and having ideas. However, only having an idea about safety predicted the expression of safety voice.

These findings suggest that shop floor workers' safety voice behaviours in aircraft manufacture are influenced by the social environment in terms of perceptions of how their co-workers might respond to their safety voice, whether speaking up is perceived as part of the identity of shop floor workers and the extent to which supervisors welcomed their safety voice. The analysis also indicated that employees are more likely to speak up if they have improvement ideas to offer.

These findings align with previous research in other industries and contexts which suggest that speaking up behaviours are influenced by the style of their supervisor (Detert & Burris, 2007) and perceptions about the extent to which co-workers will support or disapprove of their safety voice (Miliken & Morrison, 2003; Tucker et al., 2008; Manapragda & Bruk-Lee, 2016). The results add weight to the importance of social factors in creating a psychologically safe environment in which employees feel willing and able to speak up (Detert & Edmondson, 2005; Hirak et al., 2012). The study also found that safety voice is influenced by whether or not people have ideas to improve safety which supports previous research undertaken by Tucker & Turner (2015).

The findings of the survey also align with the findings of the qualitative interviews undertaken as part of Study 1 which highlighted the importance of co-workers in safety voice. The interview participants indicated that maintaining harmonious relations amongst group members was an important factor in inhibiting safety voice behaviours. Some participants feared directly challenging each other or reporting issues that might damage relationships to protect themselves from incurring any negative repercussions, such as being negatively labelled or being ostracised from the group. Many participants also expressed a view that their co-workers were important to them and that they would stop the job or report issues in circumstances where their colleagues were in potential danger.

Similarly, the findings of the questionnaire and the feedback from the interviews both showed there was a relationship between supervisor openness and safety voice. The interview participants revealed that the extent to which supervisors were accessible, willing to listen and act on their concerns was a key consideration in whether they spoke up or withheld their safety voice.

Strengths & Limitations

Triangulating the data from multiple sources such as questionnaires and interviews adds weight to the importance of social factors in shaping safety voice. This underscores the importance of a mixed methods approach in understanding

behaviour and the factors which underpin it (Almalki, 2016). However, the poor return rate of the questionnaire meant that the quantitative findings lacked power and are more likely to be subject to sampling bias which limits the generalisability of the findings to other groups of shop floor workers and negatively impacts its validity. Consequently, the use of quantitative measures to explore safety voice behaviours and the factors which influenced them was abandoned. One of the recommendations from this study is that safety voice measures are used in collaboration with qualitative measures to fully explore the antecedents of safety voice in aircraft manufacture where larger samples are available for survey returns.

Conclusion

A safety voice questionnaire was developed and deployed to measure safety voice behaviour and the factors which influenced it amongst shop floor workers in aircraft manufacture. Whilst the survey indicated that social factors may be important in influencing safety voice, the participation rate of the survey fell far below expectations. Consequently, it was impossible to draw reliable and representative conclusions from the analysis of the results. The survey was therefore abandoned as a means of measuring safety voice in the current project with a recommendation that the questionnaire is repeated in future research post-COVID and in a setting where other questionnaires have not been recently mandated to be completed by the organisation.

Chapter 3 introduced the second phase of the research which was concerned with understanding the factors which influenced employees' willingness to express their safety voice in the context of aircraft manufacture. This phase was associated with gathering data about the specific experiences of shop floor workers associated with safety voice by carrying out a series of pre-intervention interviews as part of Study 1 and a questionnaire as part of Study 2. The findings from the interviews were used to identify three themes and several critical behaviours which appeared to be important for the facilitation of safety voice on the shop floor. However, whilst the questionnaire some level of analysis, it was abandoned as a means of measuring safety voice behaviours and antecedents due to the low completion rate.

Reflection

The survey was originally devised as a means of measuring the effectiveness of the intervention and data points were designed both before the intervention (as a means of capturing a baseline) and post-intervention. However, the completion rates of the survey fell significantly below expectations and was deemed inadequate to effectively measure the drivers of safety voice. It was therefore decided to abandon the quantitative elements of the study in favour of qualitative methods.

There were several reasons which may explain the poor response to the survey. Firstly, the survey was lengthy at 50 questions which may have de-motivated potential participants from completing it. Secondly, the survey was carried out during the early phases of the COVID pandemic. This was a time in which organisations were faced with a great deal of uncertainty regarding the arrangements which should be in place to ensure employee safety in the workplace. During these early stages COVID guidance was being drafted, controls such as PPE were in high demand and organisations were faced with implementing a raft of new measures that included hand hygiene arrangements, social distancing and face masks. New shift arrangements were introduced to limit the number of people in the workplace and one-way systems, briefings and enhanced cleaning arrangements were established. In the organisation, employees in support functions were also asked to work from home and IT support was bolstered to permit access to company systems over the intranet.

These changes transformed the workplace significantly and there was a great deal of concern raised by shop floor workers about the adequacy of the safety arrangements in place, their perceived effectiveness and the impact that contracting COVID could have on their own health as well as those of their families and loved ones. Shop floor workers also complained about the number of employees who were able to work from home and the perceived development of a two-tier system. They considered it unfair, that the home workers were able to continue their tasks in relative isolation and care for their children being schooled from home without requiring the daily commute whilst as shop floor workers, they were still required to attend onsite for work. This created widespread discontent amongst shop floor workers, it heightened

the demands on their own families and increased their potential exposure to the COVID virus.

In the target organisation, management sought to understand employee concerns by regularly capturing feedback from employees via a range of surveys. These included surveys regarding the adequacy of the safety arrangements in place, as well as surveys regarding employee wellbeing and the future of work. These were duplicated by the Trade Unions who were also eager to canvas their members about the workplace changes in order to impress upon the organisation the need to reflect the concerns of shop floor workers.

Consequently, it is highly likely that the climate was not conducive to a further, lengthy survey on safety voice and that employees were unwilling to complete it, given that it took time away from their tasks. It may also have been perceived as another request by management and they may also have had survey fatigue (De Koning, et al., 2021) as this was one of a number of questionnaires they had been asked to complete in a short time frame.

In addition, the completion of the survey was highly dependent upon the supervisors to promote it, given they were in control of their team. However, they were also working to the limits of their capacity a result of the workplace changes brought about by COVID. It is likely that the survey was low on their list of priorities and some may have decided not to promote it as vigorously as I had hoped.

This highlights the importance of understanding the context when selecting measurement methods and their deployment. In hindsight, time would have been better spent engaging in one-to-one interviews with employees in a socially distanced environment rather than providing a survey to complete. It may also have been possible to reframe the questionnaire and possibly even the wider research project to explore safety voice during the COVID-19 pandemic. This approach may have helped to increase the number of questionnaires submitted and gained more interest from both employees and management in the project. However, during the early phases of the COVID-19 pandemic it was very difficult to predict how long the safety measures would be required to stay in place and the impact of the virus.

Initially, I was reluctant to include this study in the final thesis due to the small sample size and my decision to abandon the quantitative methods. However, encouraged by my tutors, I decided to include it because it was an important part of the research process and enabled me to gain new skills and experiences relating to quantitative research methods. I also felt a debt of gratitude to those employees who had taken the time and trouble to complete the survey and therefore wanted to include their opinions and feedback. Despite the small sample size, some of the findings also appeared to align with the findings of the qualitative interviews undertaken in Study 1 which also convinced me to include this as a study in the thesis.

5. Chapter 5: PHASE 3 – Intervention

Chapter 4 is concerned with the design and implementation of a multi-faceted behaviour change intervention using the Behaviour Change Wheel (BCW) framework to increase employees' willingness to express their safety voice. This represented phase 3 of the study, which commenced in September 2021 and is highlighted in the diagram below.

Figure 9

Phase 3 in the context of the wider study



5.1. Study 3 Intervention Design: The Behaviour Change Wheel

This chapter explains the design of a multifaceted intervention to increase employees' willingness to express their safety voice. The behaviours generated from the analysis of Study 1 (i.e. the initial interviews) were considered for their suitability, prioritised and used to inform the design of the behaviour change intervention (see section 4.9 for these behaviours). In order to ensure that intervention was theory based, effective and created in alignment with the resources and expectations of stakeholders within the target organisation, a framework, known as the Behaviour Change Wheel (Michie et al., 2011), was utilised. This chapter explains the Behaviour Change Wheel and the opportunities and challenges its use poses. It also explains how the safety voice behaviours were prioritised, how a number of intervention options were considered and how the intervention design was developed. The chapter then explains the intervention design which included elements of communications, education and training, engagement processes and

the creation of a SHE Enabler Group. It concludes with a personal reflection on the design process and the use of the Behaviour Change Wheel.

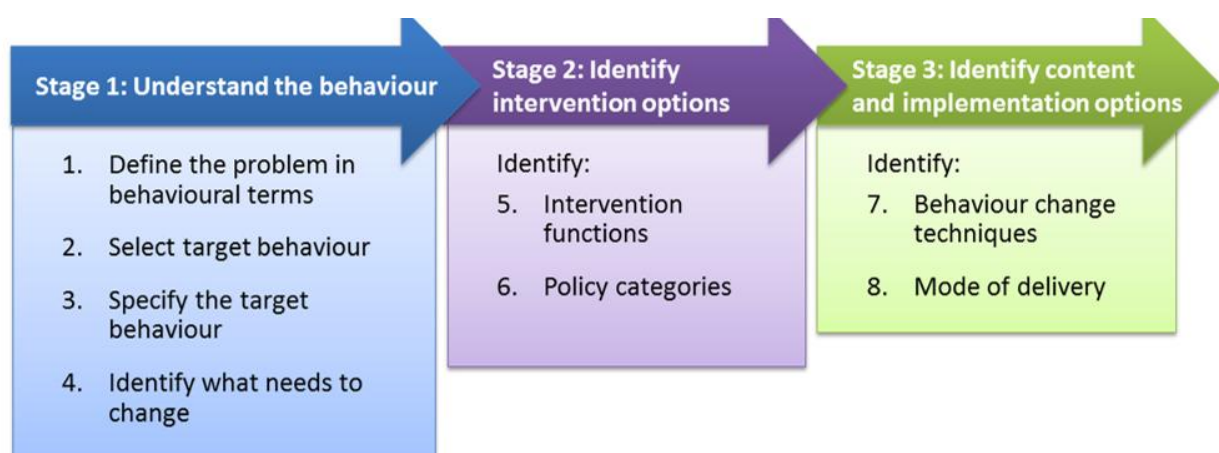
5.2. The COM-B Model & Behaviour Change Wheel

The Behaviour Change Wheel is a behaviour system that has been used to inform the design and implementation of behaviour change interventions (Michie et al., 2011). As discussed in Section 3.3, it follows a systematic approach to intervention design that encompasses three stages. They are understanding the behaviour, identifying intervention options and identifying the content and implementation options.

The present study sought to explore the application of the Behaviour Change Wheel by using the three stages advocated by Michie et al. (2014) to develop a multi-faceted intervention associated with increasing employee's willingness to express safety voice amongst shop floor workers in aircraft manufacture. The process of the intervention design is articulated in Figure 10 below:

Figure 10

Three Stages used in developing the safety voice intervention



5.3. Stage 1: Understanding the problem

Selecting the behaviours to target

In order to complete the first step and understand the behaviours associated with safety voice, interviews were conducted with nineteen employees from the shop floor environment using an interview schedule that was informed by the three conditions of the COM-B model and the findings of the literature review. These semi-structured interviews were described in Study 1 (see chapter 4.1).

From the data generated in the interviews, a complete list of 32 behaviours that were deemed relevant to safety voice was generated. This list included details of the specific behaviour that influenced safety voice and each stakeholder who was required to perform the behaviour. These behaviours and the process that was followed in generating them was described in Section 4.9.

As described in Section 4.9, this list of key behaviours was refined to identify twelve behaviours on the part of leaders, employees, the SHE team, facilities contractors and supervisors that appeared to be critical in terms of facilitating safety voice. They are summarised in table 7 below:

Table 7

Safety voice behaviours relevant to safety voice

	Safety Voice Behaviour	Target Stakeholder
1	To reinforce to teams the critical importance of safety and its priority in relation to production	Leaders
2	Leaders to provide sufficient resources for addressing safety	Leaders
3	To verify that safety actions have been completed	Leaders
4	To proactively consult with employees on safety issues and improvements	Supervisors
5	To communicate clear expectations to their teams about the issues that warrant safety voice	Supervisors

6	To visibly capture, track and provide timely feedback to their teams on safety issues	Supervisors
7	To provide employees with a range of formal and informal opportunities to express their safety issues and access support	Supervisors
8	To proactively address safety issues raised by the team	Supervisors
9	To identify, appraise and speak up about hazards or issues	Employees
10	To accept challenge from their peers	Employees
11	To investigate emergent safety issues in a manner that is proportional to the severity of the incident	SHE
12	To respond in a timely manner to facilities issues raised by the team by closing down actions and providing feedback on progress at each stage	Facilities Management

The safety voice behaviours highlight the diverse range of stakeholders that are involved in shaping safety voice and answers Noort et al.'s (2019a) call "to better conceptualise the ecological nature of safety voice" (p. 377). It demonstrates that even in a relatively small local facility, employee safety voice is shaped by situational factors associated with a specific hazard but also perceptions associated with the extent to which others will respond, how they might respond and how relationships could be impacted. It highlights that safety voice is influenced by a broad system of behaviours that occur across multiple levels of an organisation.

The next step in the Behaviour Change Wheel process is to appraise these behaviours to determine which should be targeted as part of the intervention. In their guide, Michie et al. (2014, pp. 41-45) outlined the following criteria to assist with this, with the interventionist encouraged to consider impact, ease of implementation, spillover and ease of measurement. These are detailed and contextualised below:

- Likely impact: How likely will changing a behaviour increase employees' willingness to express their safety voice?

- Ease of implementation: How easy is it likely to be to change safety voice in view of factors such as financial and human resources, acceptability and preference?
- Likely spill over: How much of a positive or negative impact will changing safety voice behaviour have on other related behaviours?
- Ease of measurement: The extent to which it may be possible to evaluate the effectiveness of changing safety voice by capturing or introducing data capture processes.

These criteria were used against each of the initial twelve behaviours generated from the interviews and a scoring mechanism was applied to prioritise and determine the behaviours that should be addressed as part of the intervention design. This scoring followed the guidance supplied by Michie et al. (2014) and considered the extent to which the behaviour appeared:

- very promising as a target behaviour
- quite promising as a target behaviour
- unpromising but worth considering as a target behaviour
- not acceptable as the target behaviour

This prioritisation exercise was carried out by the researcher who used their knowledge and experience as a SHE professional, Behaviour Change practitioner and employee of the target organisation to determine the behaviours that should be addressed. The output of this prioritisation can be seen in table 8 below.

Table 8*Prioritising which safety voice related behaviours to target*

Who	Behaviour	Impact of behaviour change	Likelihood of changing behaviour	Spillover on other behaviours	Ease of Measurement	Progress in this study?	Comments / Justification
Leaders	To reinforce to teams the critical importance of safety and its priority in relation to production	Quite promising	Quite promising	Quite promising	Very promising	Yes	Harnessing leadership influence when promoting safety voice may be key in establishing the tone for safety. * This behaviour should be considered as part of the intervention
Leaders	Leaders to provide sufficient resources for addressing safety.	Quite promising	Quite promising	Quite promising	Not acceptable	No	This behaviour is unacceptable to measure, given the challenges in gaining access to sensitive departmental budgets. * This behaviour will not be a practical target behaviour for the intervention.
Leaders	To verify that safety actions have been completed	Quite promising	Unpromising but worth considering	Unpromising – could undermine supervisors	Not acceptable	No	Time pressed leaders will not consistently have the time to verify completion of all safety actions. In addition, their involvement may undermine the role of the supervisor. *This behaviour will not be a practical target behaviour for the intervention.
Supervisors	To communicate clear expectations to their teams about the issues that warrant safety voice.	Quite promising	Quite promising	Quite promising	Quite promising	Yes	Communicating clear expectations may not necessarily result in employee behaviour change but would support the establishment of the company position on safety voice. * This behaviour should be considered as part of the intervention
Supervisors	To proactively consult with employees on safety issues and improvements,	Very promising	Very promising	Very promising	Very promising	Yes	Proactively consulting with employees invites safety voice. * This behaviour should be considered as part of the intervention.
Supervisors	To provide employees with a range of formal and informal opportunities to express their safety issues and access support.	Very promising	Very promising	Very promising	Very promising	Yes	Providing different opportunities to express safety voice may overcome individual and other barriers. * This behaviour should be considered as part of the intervention
Supervisors	To visibly capture, track and provide timely feedback to their teams on safety issues.	Very promising	Unpromising but worth considering	Quite promising	Quite promising	Yes	Supervisors may struggle to feedback on issues that are beyond their ability to control but response to employee safety voice is key.

Who	Behaviour	Impact of behaviour change	Likelihood of changing behaviour	Spillover on other behaviours	Ease of Measurement	Progress in this study?	Comments / Justification
							* This behaviour should be considered as part of the intervention
Supervisors	To proactively address safety issues raised by the team.	Very promising	Unpromising but worth considering	Quite promising	Quite promising	Yes	Supervisors may struggle to progress actions that are beyond their ability to control or take large amounts of effort / time / budget but response to employee safety voice is key. * This behaviour should be considered as part of the intervention
Employees	To identify, appraise and speak up about hazards or issues	Very promising	Quite promising	Quite promising	Unpromising but worth considering	Yes	Informal employee safety voice can be difficult to measure but this behaviour is key to the success of the project. * This behaviour should be considered as part of the intervention
Employees	To accept challenge from their peers	Quite promising	Quite promising	Unpromising – can create disharmony	Quite promising	Yes	Accepting challenge may require high levels of interpersonal trust & empathy but is a key behaviour in safety voice. * This behaviour should be considered as part of the intervention
SHE	To investigate emergent safety issues in a manner that is proportional to the severity of the incident.	Unpromising but worth considering	Not acceptable	Quite promising	Unpromising but worth considering	No	SHE have company & other requirements around incident investigation processes that have already been agreed. *This behaviour will not be a practical target behaviour for the intervention.
FM Contractors	Respond in a timely manner to Facilities issues raised by the teams by closing down actions and providing feedback on progress at each stage.	Quite promising	Unpromising – limited influence on 3 rd party	Quite promising	Not acceptable	No	FM contractors have specific contractual arrangements that can't be influenced. *This behaviour will not be a practical target behaviour for the intervention.

When the critical safety voice behaviours were evaluated as to their suitability for the intervention (e.g. Impact of behaviour change, Likelihood of changing behaviour, Spillover on other behaviours, Ease of Measurement), eight behaviours were identified as promising targets. They represented critical antecedents or conditions that need to be in place for facilitating safety voice and were prioritised following a review of the specific behaviours that were deemed “very promising” or “promising” and were articulated in the final column of table 8.

Figure 11

Process of refining the safety voice behaviours



The eight behaviours selected for the intervention are as follows. The key personnel involved are highlighted in brackets:

- Reinforce via direct communication to teams the critical importance of safety and its priority in relation to production (Leaders)
- Communicate clear expectations to their teams about the issues that warrant safety voice (Supervisors)
- Proactively consult via conversations with employees around safety issues and improvements (Supervisors)

- Provide employees with a range of formal and informal opportunities to express their safety issues and access support (Supervisors)
- Visibly capture, track and provide timely feedback to their teams on safety issues. (Supervisors)
- Proactively address safety issues raised by the team (Supervisors)
- Identify, appraise and speak up about hazards or issues (Employees)
- To accept challenge from their peers about unsafe behaviours (Employees)

As part of this prioritisation exercise, a number of safety voice behaviours were removed from consideration for the intervention. Two leadership behaviours: “to provide sufficient resources for addressing safety” and to “verify that that safety actions have been completed,” were removed. The first was removed as gaining access to sensitive financial data on the adequacy of resources was unacceptable to the target organisation. The second was omitted as it would be impractical for leaders with a demanding schedule to verify that all safety actions had been completed. This was a task which would require time and effort and could undermine the role of their supervisory team.

One behaviour, related to members of the SHE team; “To investigate emergent safety issues in a manner that is proportional to the severity of the incident” was removed from consideration as the SHE team had pre-existing, defined accident and incident processes that had been agreed with senior management and Trade Union (TU) representatives. Changing these for the current intervention, would have required a lengthy review and TU consultation that was beyond the scope of this particular project.

The FM contractors were also removed as a potential target audience associated with the behaviour “to respond productively when employees use their safety voice.” This behaviour was removed from consideration because the FM contractor in question was a corporate external contractor over whom the local area could exercise little control. It was therefore deemed “unacceptable” to measure or intervene in their operations, as they were working under pre-agreed separate contractual arrangements.

Table 9 below shows the target safety voice behaviours that were selected for the intervention, with the key actors involved and the intervention specifics.

Table 9

Detailing the target behaviours that will inform the behaviour change intervention

No	Target Behaviour	Who	What	When	Where
1	To reinforce to teams the critical importance of safety and its priority in relation to production	Leaders	Brief teams verbally on the importance of safety voice	Team meeting or event	Shop floor
2	To communicate clear expectations to their teams about the issues that warrant safety voice.	Supervisors	Verbal reminders and visible messages in the workplace to remind teams how, when and whom to express their safety voice	Daily and monthly sessions	Shop floor
3	To proactively consult with employees on safety issues and improvements	Supervisors	Create daily hazard spotting & regular opportunities to express issues. Also provide training on how to conduct safety conversations	Throughout intervention	Shop floor
4	To provide employees with a range of formal and informal opportunities to express their safety issues and access support.	Supervisors	Establishment of employee volunteer safety champions and dedicated events to express safety voice. Maintenance of daily team meetings featuring safety.	Throughout intervention	Shop floor
5	To visibly capture, track and provide timely feedback to their teams on safety issues.	Supervisors	Visible way of capturing safety voice and feeding back progress	Daily	Team boards in DSUM zone
6	To proactively address safety issues raised by the team.	Supervisors	The creation of an expectation that safety voice should be addressed and systems to make employee issues visible.	Individual and team conversations	Shop floor
7	To identify, appraise and speak up about hazards or issues	Employees	Provide opportunities to identify hazards and speak up with issues.	Throughout intervention	Shop floor

8	To accept challenge from their peers	Employees	Information on the reasons why challenge often originates in care.	Throughout intervention	Shop floor

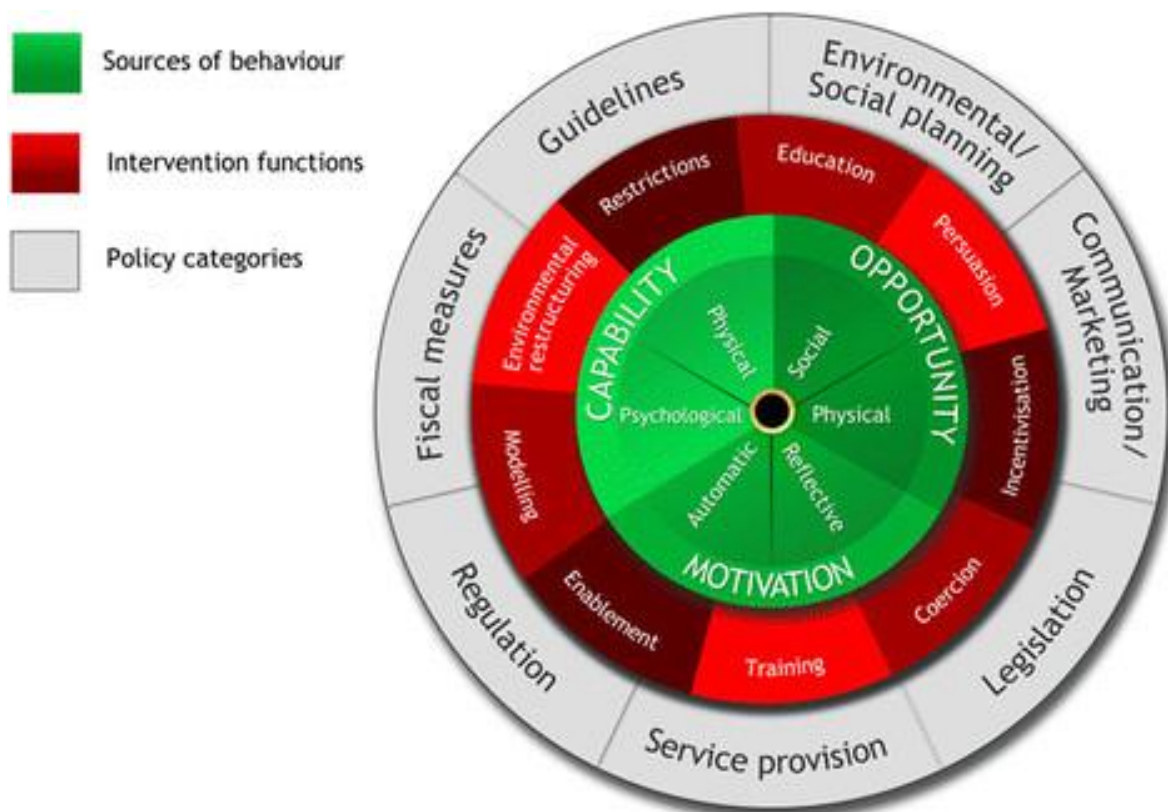
Step 4: What needs to change?

Assessing Capability, Opportunity & Motivation

The next step in the intervention design process was to consider whether the target individuals had the capability, opportunity and motivation to perform the identified target behaviours as per the core elements of the BCW (See Figure 12 below).

Figure 12

The Behaviour Change Wheel displaying the COM-B model at its centre (Michie et al., 2014)



Leadership Behaviours associated with safety voice

One leadership behaviour that was identified as suitable and acceptable for targeting as part of the intervention was to *reinforce to teams the critical importance of safety and its priority in relation to production*. The pre-intervention interviewees suggested that leaders possessed the physical and psychological capability as well as the reflective and automatic motivation to engage their teams on safety. However, regular opportunities for leaders to communicate their commitment to safety were not always created, due to their busy schedule and the fact that local team sessions were delegated to supervisors. The intervention thus focused on providing scheduled opportunities for leaders to convey and role model the importance of safety voice on the shop floor.

Supervisor Behaviour associated with safety voice

Five supervisor behaviours were identified as suitable and acceptable for addressing as part of the intervention. They were:

- To communicate clear expectations to their teams about the issues that warrant safety voice.
- To proactively consult with employees on safety issues and improvements
- To provide employees with a range of formal and informal opportunities to express their safety issues and access support.
- To visibly capture, track and provide timely feedback to their teams on safety issues.
- To proactively address safety issues raised by the team.

The analysis of the pre-intervention interviews highlighted that supervisors possessed the physical and psychological capability, the reflective and automatic motivation and the physical and social opportunity to engage their teams on safety and confirm expectations around safety voice. Each day they were required to communicate information and interact with the team as part of “Daily Start Up” meetings which they facilitated. The only aspect that supervisors lacked was consistent information

(psychological capability) in the form of briefing packs and prompts to deliver specific and clear content to their teams on the topic of safety voice.

The pre-intervention interviews also highlighted that the style of these interactions was important and that not all supervisors possessed the psychological capability to empathise with their employees and tease out safety voice from less confident employees which suggests psychological capability may have been lacking on the part of supervisors in this area.

The interviews also indicated that supervisors created a number of physical opportunities throughout the course of the day to engage their teams on safety, such as in Daily Start Up Meetings (DSUMs) and during inspections. However, some of the interviewees suggested the structure and quality of these interactions varied amongst supervisors (i.e. some supervisors lacked psychological capability), and that they were rarely afforded a great deal of time for in-depth discussion (i.e. physical and social opportunity was curtailed). Participants suggested that some supervisors were busy and preferred not to dwell on safety in any depth, preferring to swiftly move on to other priorities (i.e. reflective motivation) in order to fulfil the planned agenda of the meeting and to limit their heavy workload. This suggests that the intervention should target the psychological capability of supervisors as well as provide alternative, physical opportunities that allow supervisors the time to focus on safety voice.

Employees involved in the interviews also complained that actions were not consistently captured, tracked or addressed by supervisors which highlights a lack of consistency over how supervisors recorded and progressed actions (psychological capability). The interviewees also noted that, despite having physical opportunities afforded by daily team meetings, feedback by supervisors to the teams regarding progress on their safety issues was frequently inadequate and safety actions were not always carried out. This highlighted a shortfall in reflective motivation on the part of supervisors, as they prioritised other activities. The supervisors that participated in the interviews highlighted competing production pressures (reflective motivation), time constraints (physical opportunity) and the challenges of obtaining updates from facilities management contractors (psychological capability) as the main barriers to

providing effective feedback. In light of this, finding ways to educate and empower supervisors to provide feedback on safety concerns and ideas formed part of the intervention.

Employee behaviours associated with safety voice

Two employee behaviours were identified as suitable and acceptable for addressing as part of the intervention. They were to:

- Identify, appraise and speak up about hazards or issues
- Accept challenge from their peers

The analysis from the pre-intervention interviewees highlighted that employees possessed the physical opportunity to identify hazards throughout the day and could express their safety voice daily through DSUMS and via liaising directly with supervisors. However, some employees felt inhibited to express themselves fully (reflective motivation) on account of low confidence (psychological capability), time pressures associated with production (physical opportunity), feeling that it was often futile to speak up (reflective motivation) and social factors, such as the proximity of other group members (social opportunity) and the perceived fear of negative consequences (reflective motivation). In addition, the pre-intervention interview analysis suggested there was an inconsistent understanding (psychological capability) on the part of some employees over the safety situations that should be escalated, with some suggesting that some hazards were too inconsequential or would result in an unproductive response from the organisation (reflective motivation) or the breakdown of harmonious relations if they challenged their colleagues (social opportunity). This suggests that the intervention needed to remove personal and social barriers to speaking up, clarify what constituted safety voice and support employees to express their safety voice.

The interview analysis also revealed that most employees possessed the physical and psychological capability to welcome challenge from their peers. However, there were limited occasions where challenge was forthcoming (physical opportunity) and many employees preferred to avoid these awkward interactions which risked damaging

harmonious relations (reflective motivation and social opportunity). This highlights that the intervention needed to target the removal of these social barriers and provide a psychologically safe space for employees to challenge unsafe behaviours.

5.4. Intervention Development

In order to develop a proposal for an intervention designed to increase employees' willingness to express their safety voice, Michie et al. (2014) also advocated the use of the Theoretical Domains Framework (TDF). The TDF is a synthesis of key theoretical constructs used in behaviour change that can be used in the planning or evaluation of an intervention both at the individual and organisational level. The framework comprises of 14 domains which were derived following a comprehensive review of the cognitive, affective, social and environmental influences on behaviour (Michie et al., 2005). It has been used in healthcare interventions (Mosavianpour et al., 2016), validation of occupational health and safety questionnaires (Morgan et al., 2021) and to support local patient safety interventions (Taylor et al., 2013).

However, the TDF is not without its critics. For instance, Phillips and colleagues interviewed health professionals in Australia about their perceptions of using the TDF (Phillips et al., 2015). Although the participants suggested it provided confidence in the intervention design and gave a broader perspective on behavioural influences that was underpinned by theory, they also pointed out that it was difficult to operationalise and time consuming to use. Francis et al. (2012) echoed the challenges associated with operationalising the TDF and highlighted the unclear relationships and boundaries between the theoretical domains. These issues were explored in the current research project.

The TDF intervention domains were considered for applicability in the planning of the safety voice intervention. Table 10 below highlights what needed to change to influence employee's willingness to express safety voice using the Theoretical Domains Framework:

Table 10*The TDF interpreted for safety voice*

COM-B	TDF	Relevance of Domain to Safety Voice
Physical capability	Physical Skills	N/A
Psychological capability	Knowledge	Educate or remind employees on the importance of safety voice and how / when to express it
	Cognitive and interpersonal skills	Equip supervisors and others with interpersonal skills to facilitate employee safety voice
	Memory, attention and decision processes	Remind employees to express safety voice when they encounter safety issues Remind supervisors to engage their teams on safety issues at key points in their work schedule.
	Behavioural regulation	Provide supervisors & teams with processes to support the identification, communication and discussion of safety issues
Physical opportunity	Environmental context and resources	Provide dedicated time and opportunities to enable employees to identify hazards, raise issues and discuss solutions. Provide physical opportunities for supervisors to feedback to teams on their safety voice.
Social opportunity	Social influences	Create opportunities for employees to express safety voice in a psychologically safe space. Use influential stakeholders as role models of safety voice behaviours
Reflective motivation	Professional / social role and identity	Encourage peer discussion and peer ownership of safety issues within their workplace
	Beliefs about capabilities	Equip supervisors and others with interpersonal skills to help them facilitate safety voice effectively from employees
	Optimism	Create an expectation that speaking up will lead to safety improvements
	Beliefs about consequences	Develop feedback processes that highlight how the expression of safety

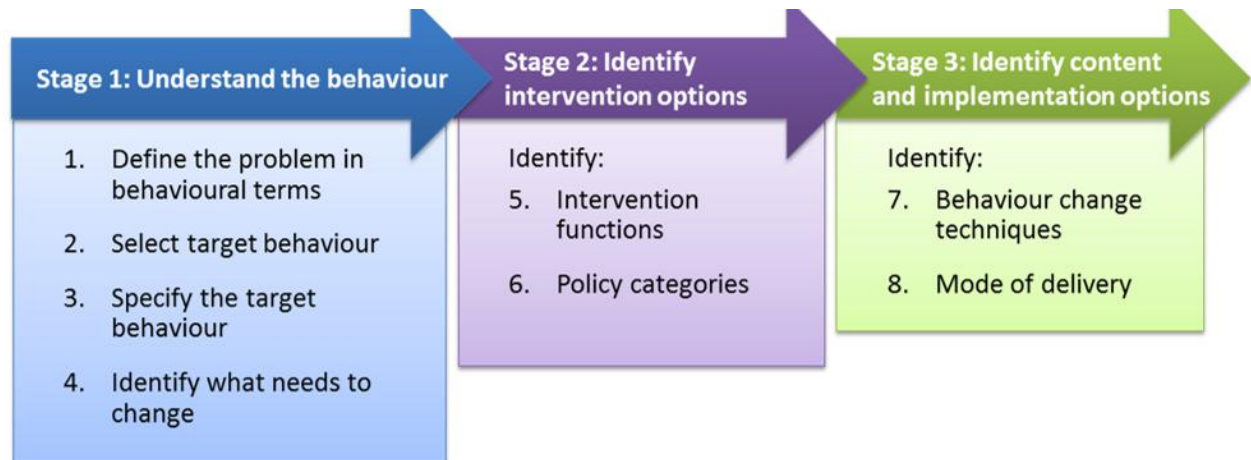
		voice leads to positive action & outcomes
	Intentions	N/A
Automatic motivation	Reinforcement	Develop feedback processes that highlight how the expression of safety voice leads to positive action & outcomes
	Emotion	N/A

5.5. Stage 2: Identify Intervention Options

Stage 2 of the BCW is associated with identifying and evaluating the options associated with the development of the safety voice intervention. This in figure 13 below:

Figure 13

The process stages of designing an intervention advocated in the BCW

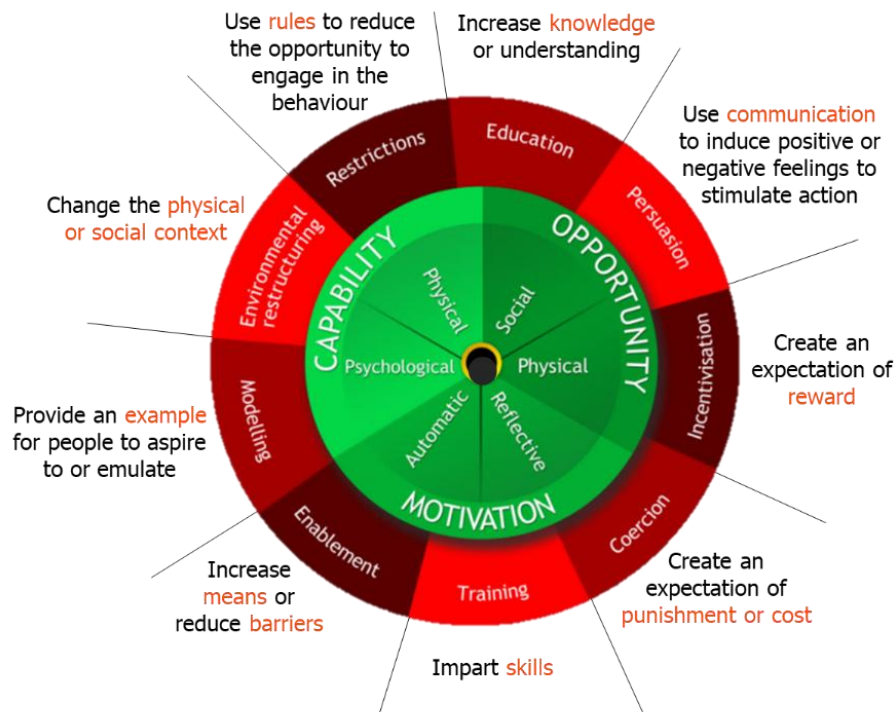


Intervention Functions

As well as incorporating the 14 elements of the TDF, the Behaviour Change Wheel also introduces nine intervention functions which are broad categories by which an intervention can change behaviour. They comprise of Education, Persuasion, Incentivisation, Coercion, Training, Restriction, Environmental restructuring, Modelling and Enablement. They are termed functions rather than interventions because each function can serve a number of purposes. For instance, providing information can improve knowledge (education) but can also serve to persuade people to enact a particular behaviour. Figure 14 below shows the Intervention functions in the context of the BCW.

Figure 14

The Behaviour Change Wheel showing the intervention functions and COM-B model



The COM-B components were mapped to the nine intervention functions identified within the behaviour change wheel to evaluate the extent to which they would meet the Affordability, Practicality, Effectiveness and cost effectiveness, Acceptability, Side effects / safety and Equity (APEASE) criteria (Michie et al., 2014) which helps to determine the acceptability and practicality of the intervention function. The APEASE criteria can be used during the design phases of behaviour change projects to select the most appropriate intervention and has been used in a number of contexts (Robinson et al., 2019; Steinmo, 2015). In particular, the following was considered in relation to the safety voice project.

- Acceptability: How likely will the leader, supervisor and shop floor workers engage with the activities and are these intervention techniques familiar?
- Practicability: How likely is it to be completed in the allocated time? How much time, trouble and effort will be required to deploy these elements of the

intervention? How many facilitators will be required? Can this be transitioned to other areas?

- **Affordability:** How likely can the interventions be implemented within the allocated budget?
- **Effectiveness:** Will the intervention improve employees' willingness to express safety voice and influence safety voice behaviours?
- **Side effects / Safety:** What are the other likely to be influenced by these interventions? Are there any negative (or positive) side effects expected to arise from the intervention?
- **Equity:** How far the intervention or part of the intervention is likely to affect equity of access?

Table 11

The extent to which each intervention function for the proposed safety voice intervention achieved the APEASE Criteria

Intervention function	Does the intervention function meet the APEASE criteria?
Education	Yes
Persuasion	Yes
Incentivisation	Yes
Coercion	Not practicable or acceptable
Training	Yes
Restriction	Not practicable or acceptable
Environmental restructuring	Yes
Modelling	Yes
Enablement	Yes

The intervention functions that were immediately excluded from the present study were coercion and restriction as these measures could potentially create discord amongst the workforce and lead to negative perceptions of the intervention and a subsequent increase in safety silence rather than safety voice. In addition, it is highly

likely that the organisation's Trade Union would object to the use of coercion and restriction to change the behaviours of its members.

Developing the intervention

Having identified what needed to change in order to increase employee's willingness to express their safety voice and the intervention functions which may be effective in influencing change, the next step was to identify the specific Behaviour Change Techniques (BCTs) which form the outline of an intervention strategy. A BCT is a strategy that helps an individual to change their behaviour. These can include providing information, setting goals, action planning, providing rewards or providing feedback (Michie et al., 2014). Table 12 highlights the BCTs which were applicable to safety voice and met the APEASE criteria.

Table 12

The Behaviour Change Techniques associated with safety voice and their applicability to the APEASE Criteria

Intervention Function	Individual Behaviour Change Techniques (BCTs)	Does BCT meet the APEASE criteria?
Education	• Information about safety voice processes & their importance • Information about consequences of safety voice & safety silence • Prompts and cues on safety voice processes • Feedback on safety voice behaviours • Feedback on output of safety voice actions	Yes
Persuasion	• Credible sources approve of safety voice • Identification of employees to act as a role model for safety voice • Information about safety voice processes & their importance • Information about consequences of safety voice & safety silence • Feedback on safety voice behaviours	Yes

	• Feedback on output of safety voice actions	
Incentivisation	• Reward employees for supporting safety voice activities • Feedback on safety voice behaviours • Feedback on output of safety voice actions	Yes
Training	• Demonstration & rehearsal of how to facilitate effective safety voice discussions • Instruction on how to utilise safety voice processes • Instruction on how to capture, track and feedback safety voice issues to teams	Yes
Environmental restructuring	• Installing cues and prompts in the workplace to remind teams to express their safety voice • Restructure the environment to ensure safety voice actions and tracking has a dedicated focus	Yes
Modelling	• Demonstration of safety voice behaviours by influential individuals	Yes
Enablement	• Hazard spotting & other safety voice activities to encourage the expression of safety voice (e.g. action planning and problem solving) • Social support to help employees express safety voice • Restructuring the physical environment to ensure safety voice actions and tracking has a dedicated focus • Provide leadership commitment on safety voice	Yes

The exercise above highlighted the range of BCTs that had the potential to influence employee's willingness to express their safety voice and points to the importance of creating a multi-faceted intervention. It also suggests that the numerous interventions would meet the APEASE criteria and could therefore be developed into an intervention strategy.

Intervention strategy

In order to devise an intervention strategy using the behaviour change wheel, Michie et al. (2014) proposed that a series of policy categories should be used which help in determining the nature of the intervention and serves to support the creation of an intervention strategy. This forms part of Stage 2 in the BCW and is associated with identifying intervention options. Table 13 below highlights how the intervention strategy was derived.

Table 13*Developing the intervention strategy*

Intervention Functions	COM-B components served by intervention functions	BCTs used to deliver intervention functions	Policy categories through which BCTs can be delivered	Intervention strategy
Education	Psychological Capability	• Information about safety voice processes & their importance	Communication / marketing / Guidelines	Clarify, improve, communicate and reinforce safety voice processes
		• Information about consequences of safety voice & safety silence	Communication / marketing	Promote the reasons why safety voice is so important
		• Prompts and cues on safety voice processes		Create workplace cues to remind employees to express safety voice
	Psychological Capability / Reflective motivation	• Feedback on safety voice behaviours		Provide mechanisms for capturing and feeding back safety voice behaviours & actions
		• Feedback on output of safety voice actions		
Persuasion	Reflective motivation	• Credible sources approve of safety voice	Service Provision / Communication / marketing	Recruit leaders and influential shop floor workers to champion safety voice
	Social opportunity	• Identification of employees to act as a role model for safety voice		
	Psychological capability	• Information about safety voice processes & their importance	Communication / marketing	Clarify, improve, communicate and reinforce safety voice processes
		• Information about consequences of safety voice & safety silence		Promote the reasons why safety voice is so important
		• Feedback on safety voice behaviours		

	Psychological Capability / Reflective motivation	• Feedback on output of safety voice actions		Provide mechanisms for capturing and feeding back safety voice behaviours & actions
Incentivisation	Reflective motivation	• Reward employees for supporting safety voice activities	Fiscal measures / Communication / marketing	Provide a reward for those who engage in safety voice activities
	Psychological Capability / Reflective motivation	• Feedback on safety voice behaviours • Feedback on output of safety voice actions	Communication / marketing	Provide mechanisms for capturing and feeding back safety voice behaviours & actions
Training	Psychological Capability	• Demonstration & rehearsal of how to facilitate effective safety voice discussions	Communication / marketing	Provide practical training to safety voice targets to effectively facilitate employee insights
		• Instruction on how to utilise safety voice processes		Provide instruction to clarify safety voice processes available
		• Instruction on how to capture, track and feedback safety voice issues to teams		Provide instruction to supervisors on mechanisms for responding to safety voice
Environmental restructuring	Psychological capability	• Install cues and prompts in the workplace to remind teams to express their safety voice	Communication / marketing	Install reminders in key places to encourage employees to speak up when they encounter safety issues.
	Physical opportunity	• Restructure the environment to ensure safety voice actions and tracking has a dedicated focus	Environmental / social planning	Ensure teams have a dedicated visual way of capturing, monitoring and managing safety issues.
Modelling	Social opportunity	• Demonstration of safety voice behaviours by influential individuals	Service provision	Establish a group of advocates who will champion safety voice at shop floor level

Enablement	Physical opportunity	• Hazard spotting & other safety voice activities to encourage the expression of safety voice (e.g. action planning and problem solving)	Guidelines / Communications / marketing	Provide opportunities for employees to identify and raise their safety observations, concerns & ideas
	Social opportunity	• Social support to help employees express safety voice	Service provision	Establish a group of advocates who will champion safety voice at shop floor level
	Physical opportunity	• Restructuring the physical environment to ensure safety voice actions and tracking has a dedicated focus	Environmental / social planning	Ensure teams have a dedicated visual way of capturing, monitoring and managing safety issues.
	Social opportunity / Reflective motivation	• Provide leadership commitment on safety voice	Service provision	Acquire visible leadership support for safety voice interventions.

In order to assess each aspect of the proposed intervention to determine whether it should be included in the final delivered intervention, the APEASE criteria was used (Michie et al., 2014). To date, there is very little guidance on how to use or evaluate the extent to which an intervention achieves the APEASE criteria with studies employing the use of both qualitative measures (Brierley et al., 2022) and quantitative measures (Gallant et al., 2024). In Public Health England's (2019) guide to behaviour change for local government, the authors acknowledged that applying the APEASE criteria requires a degree of practitioner judgement. They therefore proposed ways to strengthen the decision-making process. This included reviewing the scientific literature, establishing working groups to review the evidence, consulting with stakeholders and commissioning the collection of additional data.

In alignment with this guidance, as part of this safety voice research, a group of stakeholders including employees, supervisors and leaders from the target area, as well as safety managers from within the company's Safety Health & Environment (SHE) function, were engaged on the proposed intervention strategy. The purpose of this was to understand their perceptions associated with the proposed intervention and to form a judgement as to whether it would satisfy the APEASE criteria. This was carried out during the planning phase of the project and in initial SHE Enabler Group meetings, a SHE Manager's meeting and in leadership / supervisor engagement sessions.

To judge whether the APEASE criteria was satisfied, a rating of high, medium, low or uncertain was awarded to each proposed element of the intervention in terms of whether it was acceptable, practical, effective and affordable (i.e. high acceptability indicates a judgement that the intervention would have been acceptable to stakeholders). Meanwhile, spill-over effects and equity were evaluated as to whether they were predicted to be positive, uncertain or negative. The output of this evaluation can be found in Table 14.

Table 14. APEASE grid of evaluation criteria for options to increase safety voice

Intervention Function	Intervention strategy	Evaluation (APEASE Criteria)					
		Acceptability	Practicality	Effectiveness	Affordability	Spill-over effects	Equity
Education / Persuasion	Clarify, improve, communicate and reinforce safety voice processes	High	High	High if accompanied by other options	High	Positive	Positive
Education / Persuasion	Promote the reasons why safety voice is so important	High	High	High if accompanied by other options	High	Positive	Positive
Education	Create workplace cues to remind employees to express safety voice	High	High	High if accompanied by other options	High	Positive	Uncertain
Education / Persuasion / Incentivisation	Provide mechanisms for capturing and feeding back safety voice behaviours & actions	High	High	High if accompanied by other options	High	Positive	Positive
Persuasion	Recruit leaders and influential shop floor workers to champion safety voice	Medium	High	Uncertain	High	Uncertain	Positive
Incentivisation	Provide a reward for those who engage in safety voice activities	High	High	Uncertain	High	Uncertain	Uncertain
Training	Provide practical training to safety voice targets to effectively facilitate employee insights	High	High	High if accompanied by other options	High	Positive	Positive
Training	Provide instruction to clarify safety voice processes available	High	High	High if accompanied by other options	High	Positive	Positive
Training	Provide instruction to supervisors on mechanisms for responding to safety voice	High	High	High if accompanied by other options	High	Positive	Positive
Environmental restructuring	Install reminders in key places to encourage employees to speak up when they encounter safety issues.	High	High	High if accompanied by other options	High	Positive	Uncertain
Environmental restructuring / Enablement	Ensure teams have a dedicated visual way of capturing, monitoring and managing safety issues.	High	High	High if accompanied by other options	High	Positive	Positive
Modelling / Enablement	Establish a group of advocates who will champion safety voice at shop floor level	Medium	High	Uncertain	High	Uncertain	Uncertain
Enablement	Provide opportunities for employees to identify and raise their safety observations, concerns & ideas	High	High	High if accompanied by other options	High	Positive	Positive
Enablement	Acquire visible leadership support for safety voice interventions.	High	High	High if accompanied by other options	High	Positive	Positive

Following the evaluation, it was determined that all aspects of the proposed intervention would be advanced to the design stage. However, several uncertainties were identified associated with aspects of the intervention which may have a positive, negative or unforeseeable outcome. These uncertainties were identified as risks and actions were developed to mitigate these risks. They are elucidated below:

Education - Providing cues to remind employees to express their safety voice may not be equitable as differing locations would not always allow for visible cues and prompts to be easily visible to all employees (e.g. if it is not permissible to place cues on machinery and there are no other opportunities, such as walls or pillars in the vicinity). To mitigate this risk, cues were to be installed in high footfall or circulation areas to ensure they were accessible.

Persuasion – There was a risk that recruiting leaders and influential shop floor workers to champion safety voice may not be acceptable to the wider group. This could increase or decrease the likelihood of employees expressing their safety voice as this element of the intervention may lead to positive or unintended side effects relating to group cohesion. To mitigate this risk all employees in the target area were given the opportunity to volunteer as a safety voice champion.

Incentivisation – There was a risk that rewarding those employees who engage in safety voice activities may not be equitably distributed if some employees work in areas that have fewer hazards or opportunities to improve safety than other areas. This could lead to negative spill-over effects in terms of division between employee groups if employees feel they are unable to participate. This could hamper the effectiveness of the intervention. To mitigate this risk, incentives were targeted at the entire group rather than certain individuals.

Environmental restructuring - Installing reminders in key places to remind employees to express their safety voice may not be equitable depending on the location as they may not be visible to all employees. To mitigate this risk, reminders were installed in high footfall or circulation areas to ensure they are accessible.

Modelling / enablement - It was unclear as to whether recruiting leaders and influential shop floor workers to champion safety voice would increase or decrease the likelihood of employees expressing their safety voice as this element of the intervention may lead to positive or unintended side effects relating to group cohesion. To mitigate this risk all employees in the target area were given the opportunity to volunteer as a safety voice champion.

The location for the intervention

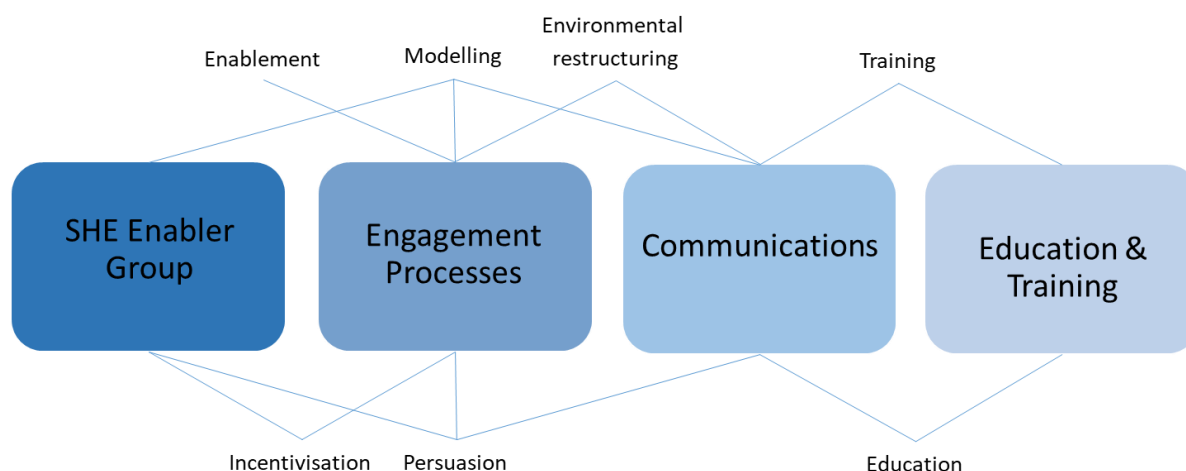
The intervention was designed and deployed in a large machine shop at the organisation's main manufacturing site in northern England. This area was a high hazard facility in which steel and titanium parts were cut and fabricated into structural aircraft components for assembly using a range of modern and traditional machinery. Around 70 highly skilled shop floor workers worked in this facility and were overseen by one Head of Business who was in overall charge and a team of seven supervisors who were employed across two daily shift patterns. They were supported by one full time, local SHE representative who provided advice and guidance about managing risk and legislative compliance. Seven supervisors and shop floor workers from this facility took part in the pre-intervention interviews described in Study 1.

5.6. Stage 3: Intervention Design

Based on the requirements of the intervention strategy, a multi-faceted intervention was designed in collaboration with operational stakeholders from the target organisation which featured four broad elements that incorporated the intervention functions; each of which are articulated below in figure 15 – see the blue boxes:

Figure 15

Safety Voice strategy with showing the intervention functions mapped.



The outline strategy was initially developed by the researcher and reviewed by the Operations Manager, Trade Union members and influential supervisors. However, the detailed intervention including ideas for the communications and engagement processes was developed by the SHE Enabler Group in a series of planning meetings (see next section). The Operations Manager and Trade Union members approved the final concept and proposed timeline for the intervention in a meeting prior to the intervention's launch. The strategy is articulated below. The deployment of the intervention is covered in the Section 5.7 of the thesis.

5.6.1. The SHE Enabler Group

To support the planning, deployment and maintenance of the safety voice interventions, a SHE Enabler Group was established. The SHE Enabler Group comprised around a dozen shop floor workers and supervisors, covering the day and night shifts who were invited to volunteer to improve elements of safety in the target facility.

The principal aims of the SHE Enabler Group was to act as the decision-making body for the design of the interventions and to give shop floor workers the opportunity of taking a leading role in its deployment. Their role was associated with actively increasing employee participation, empowering teams to shape the safety of

their working environment and to build trust, fostering positive relationships with team members. The SHE Enabler Group was designed as a means harnessing social influence and to create a local sense of shop floor ownership and commitment regarding the safety voice interventions. The members of the SHE Enabler Group were also invited and trained to be a recipient of safety voice in order to support those individuals who lacked the confidence to speak out at the DSUMS or to their supervisors when faced with emergent issues.

The SHE Enabler Group members were each provided with a welcome pack as recognition for volunteering their time. This included company merchandise, a water bottle, aircraft pin badges and a new notebook. This was intended to exploit the principle of reciprocity which assumes that individuals are more likely to contribute when they have been recipients of a kind gesture (Cialdini, 2017). Meetings were held every two weeks to discuss the interventions and their deployment. These sessions were facilitated by the researcher in collaboration with the local SHE Representative. The SHE Enabler Group agreed the overall plan and were consulted in the design of the specific interventions (outlined below). As will be discussed below, they also played a leading role in facilitating the deployment of some elements of the intervention monitoring/evaluating it.

5.6.2. Safety Communication campaign

A second element of the safety voice intervention was associated with communication and the promotion of safety voice behaviours. A suite of posters were developed to act as a workplace reminder to encourage employees to express their safety voice. These were developed with the intention of educating and persuading employees to express safety issues as and when they encountered them. The posters were created with the headlines “See Something; Say Something” and “Let’s talk safety... your input is priceless.” These headings were used to reinforce the notion of speaking up about safety issues and to convey the dual message in the workplace that the company wanted to hear employees’ views and that their input was valued. The imagery used in the posters contained an eye-catching photograph of one of the SHE Enabler Group who was a well-known figure

on the shop floor and who had volunteered to act as a potential outlet for safety voice. Using this imagery was intended to promote the individual as a potential avenue for safety voice but also sought to reinforce and role model that speaking up on safety was important to shop floor workers generally. The imagery portrayed the SHE Enabler Group member in a friendly, smiling pose to in order to reduce interpersonal fear and to highlight that the individual was approachable and welcoming. The posters also included a quotation from the featured SHE Enabler Group member about their positive views on safety voice. This was designed to create social pressure amongst employees that speaking on safety voice was acceptable and valued by members of their ingroup. For instance, one poster featured the quote,

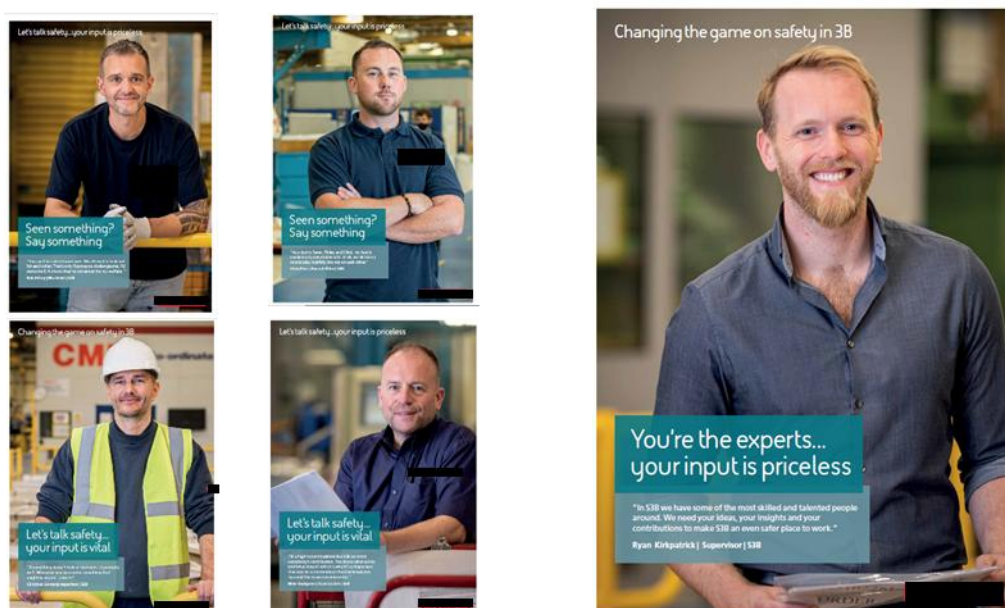
“In a high hazard business like [name of facility] we need everybody’s contribution. You know what works and what doesn’t which is why it’s so important that you let us know about the challenges you face and the issues you encounter.”

This element, which utilised the influence of social pressure has also been used effectively to nudge hotel guests into reusing towels (Cialdini, 2017). It was also designed to create an association between shop floor values, speaking up and the shop floor identity which was linked to problem solving and competence.

Five posters were created (See illustration 1 below). They were displayed in poster frames and noticeboards throughout the target workplace in areas that were highly prominent, such as near entrances, adjacent to team boards and near to the break rooms and welfare facilities. These posters were also installed at the same time as large vinyl banners displaying the strapline “See Something: Say Something” which were intended to highlight a change in safety emphasis within the facility. They were also designed in accordance with the organisation’s branding requirements to ensure they were palatable to the organisation and reflected the fact that this intervention was important to the company.

Illustration 1:

Posters used showing imagery of the SHE Enabler Group



5.6.3. SHE Engagement Processes - SHE & Biscuits Events

The SHE & Biscuits events were another initiative which formed part of the wider safety voice intervention. These were designed to be a dedicated market stall event, carried out on the shop floor itself at which employees could freely express their safety voice. They were intended to be informal, relaxed sessions; hence the SHE & Biscuits title which was a play on words associated with Tea & Biscuits which characterises breaks and informality.

The format of the events was as follows. Supervisors invited employees to attend the SHE & Biscuits event at the morning DSUM and urged them to bring any safety issues, ideas or concerns to the scheduled event. Before the 30-minute event started, SHE & Biscuits branded banners containing the strapline "let's talk safety" were installed by the SHE Enabler Group in the communications area of the target facility together with teas, coffees and biscuits to act as a focal point around which teams could gather. To launch the SHE & Biscuits session, the Operations Manager within the facility gathered employees together to reiterate his personal commitment

to safety and to ask employees to come forward with issues or ideas they may have encountered which had the potential to impact safety. This was intended to harness the importance of leadership and to demonstrate to employees that the company valued their safety voice and wanted to hear their views. Teas, coffees, biscuits and mugs printed with the strapline “Take time to talk safety” (see illustration 2)



Illustration 2

A mug provided during the SHE & Biscuits events.

were provided by the business to incentivise employees to attend and employees were urged to help themselves to refreshments. This was deemed an important step in creating an environment that was informal, different from their everyday experience and which would break down any potential barriers to help facilitate discussion. It was also intended to demonstrate the importance placed on safety learning by the business.

The sessions were facilitated by the local supervisors & members of the SHE Enabler Group who were each instructed to engage small groups of employees informally regarding their safety issues and ideas. This approach was intended to minimise interpersonal fear by using peers with whom the employees were familiar and in a manner in which issues could be expressed without being overheard by too many other stakeholders. This also meant employees could gravitate to those facilitators with whom they had already developed rapport and trust. It enabled those employees engaged in the discussion to bounce ideas off each other and discuss their concerns as a collective. The issues were captured on clip boards by each of the facilitators for review, consideration and prioritisation by the SHE Enabler Group and management. These issues were subsequently captured and placed on the visual “action boards” that are used by the teams to discuss and feedback action progress. Each shift was given access to at least one SHE & Biscuit event during the course of the 6-week intervention and each session lasted between 20-30 minutes.

Illustration 3:

Imagery of the SHE & Biscuits events taking place with the promotional banners in the background



5.6.4. Stop, Look, Assess & Manage (SLAM) process

In order to develop consistency regarding the way in which safety voice was captured, prioritised and addressed in the target area on a daily basis, a new process called SLAM was deployed. The SLAM approach was initially developed by the UK Health & Safety Executive as a means of promoting situational awareness when carrying out an initial appraisal of a task (HSE, 2020). The simple SLAM mnemonic encouraged teams to stop, look, assess and manage safety issues. In the target facility, this approach was adapted and incorporated as part of the team's regime of daily checks at the start or end of a shift or the commencement of a safety-related task. The process was as follows:

Supervisors were asked to give their teams a few minutes at the start of each day during their DSUM to visit and evaluate their working areas in order to identify any hazards or reflect on any activities that might pose a significant risk. During this time, the teams were encouraged to look at their workplace critically to identify any problems or emergent issues. This might include poor housekeeping, leaking machinery or

Leaflet provided to employees to highlight how to use the SLAM process.



If any issues were identified, individuals were encouraged to assess them to understand who could be harmed and how and whether the issue could be addressed there and then. If the issue could be managed immediately, individuals were encouraged to manage the situation and make it safe. Otherwise, individuals were asked to return to their team boards and inform their supervisor of the hazard or problem. These issues were then captured on a visual A3 sheet that was included on the team's visual management boards for the team to discuss and suggest ideas for its resolution.

The visible capture of these issues was incorporated for a number of reasons.

Firstly, it was easy for the supervisors to consistently capture hazards raised by the team using a simple marker pen and the visible nature of the safety concern provided them with safety materials to have regular, authentic engagement discussions. Secondly, it provided teams with visibility of the issues that had been raised which provided them with a sense of assurance that their safety voice was being taken seriously. Thirdly, this visible approach meant that supervisors could be held to account by both the teams and their leaders if they failed to address issues in

a timely manner. And finally, leaders could see the output of the SLAM activities and use it to direct their safety engagement activities and role model safety leadership behaviours. Once captured, these issues were held on the boards for a period of a week for local resolution; after this they were logged on an electronic business action tracking module which again was overseen by senior management.

5.6.5. Education & Training

The education and training intervention covered two aspects; the first of which was associated with training SHE Enabler Group to become effective receivers of safety voice. Members of the SHE Enabler Group and local supervisors were provided with the opportunity to access the two-day Institute of Occupational Safety & Health (IOSH) accredited Coaching for Safety course which was developed and delivered by Securus Health & Safety, an external agency (Securus, 2024). The course educated delegates on the use of coaching techniques in a safety setting by applying the Goal, Reality, Opportunity, Wrap Up (GROW) coaching model to safety discussions. This practical classroom-based course provided information on when, where and how to use coaching conversations to engage on safety as well as the opportunity to practice them in realistic scenarios. There was also a test of competency which all participants passed.

The purpose of making this course available to the SHE Enabler Group was to equip them with the skills to be able to engage their colleagues by creating a psychologically safe space for employees to open up with their issues and support the effective capture of rich safety information that could be harnessed by the organisation. Six members of the SHE Enabler Group voluntarily attended the course.

The second element of the education and training intervention was associated with providing briefings and education to the management and supervisory team on the notion of the SHE Enabler Group, as well as the mechanisms and rationale behind the SLAM process and the SHE & Biscuits events. Briefing packs, infographics and

tool box talks were developed by the researcher who took the supervisors through the various elements of the intervention during a dedicated Skype call and was on hand to ensure any questions or queries were answered. It was important to make sure that the supervisors interpreted the processes correctly and were able to tailor them to suit their own shift requirements. The specific intervention deployment and engagement materials are described in Section 5.7.

Reflection

The Behaviour Change Wheel offers a structured approach to designing behaviour change interventions. The COM-B model, in particular, is a useful tool for understanding the factors which shape behaviour and identifying where antecedents may be required. Its simplicity is such that non-academic operational stakeholders can be engaged on its constructs. Likewise, the Theoretical Domains Framework is a useful tool that provides ideas for interventions and helps the practitioner to identify the range of options available for interventions.

Nevertheless, the terminology, such as the Theoretical Domains Framework is not suitable for all audiences, especially those from a non-academic background. There are potentially too many tools which can be confusing, such as the nine intervention functions and the fourteen elements of the TDF. The guidance is not straightforward or logical. In addition, the tables that can be used to refine intervention design can be excessive and time consuming to complete, if followed prescriptively. The tables also assume that the researcher has no level of creativity, experience or intuition about what would work best and requires one to go through rudimentary stages which can be frustrating. As a practitioner, one has experience and intuition about the interventions which may work and this tacit knowledge can be discussed and shaped through conversations with the teams.

However, the Behaviour Change Wheel, if followed correctly, can feel like a solution is being engineered by the tools. Indeed, it is tempting to make the tools fit a pre-existing intervention idea rather than the other way round. The BCTs are a list from which the intervention designer can select the most appropriate. This will inevitably

be guided by the subjective judgement of the designer/practitioner who may likely be influenced by experiences regarding what has or has not worked previously.

The Behaviour Change Wheel also is not clear on how best to deploy an intervention. It does not clarify the order in which interventions are delivered, offer proposed timescales or give recommendations on how best to secure the commitment of organisations to implement a behaviour change intervention. Indeed, it was not explicitly clear which element of the TDF would have identified the potential for a SHE Enabler Group to act as the coordinating and decision-making body for the interventions. This idea had been successfully used elsewhere by the researcher and drew upon research around empowerment (Mathisen et al., (2022)). In addition, whilst the APEASE model is a really useful way of evaluating the effectiveness and stakeholder acceptability of intervention elements, it infers that the aim of an intervention is to change behaviour. In some circumstances, the aim of an intervention may be more associated with creating an attitudinal shift e.g. changing the perception that a manager takes safety seriously, rather than actually effecting behaviour change improvements.

5.7. Intervention Deployment

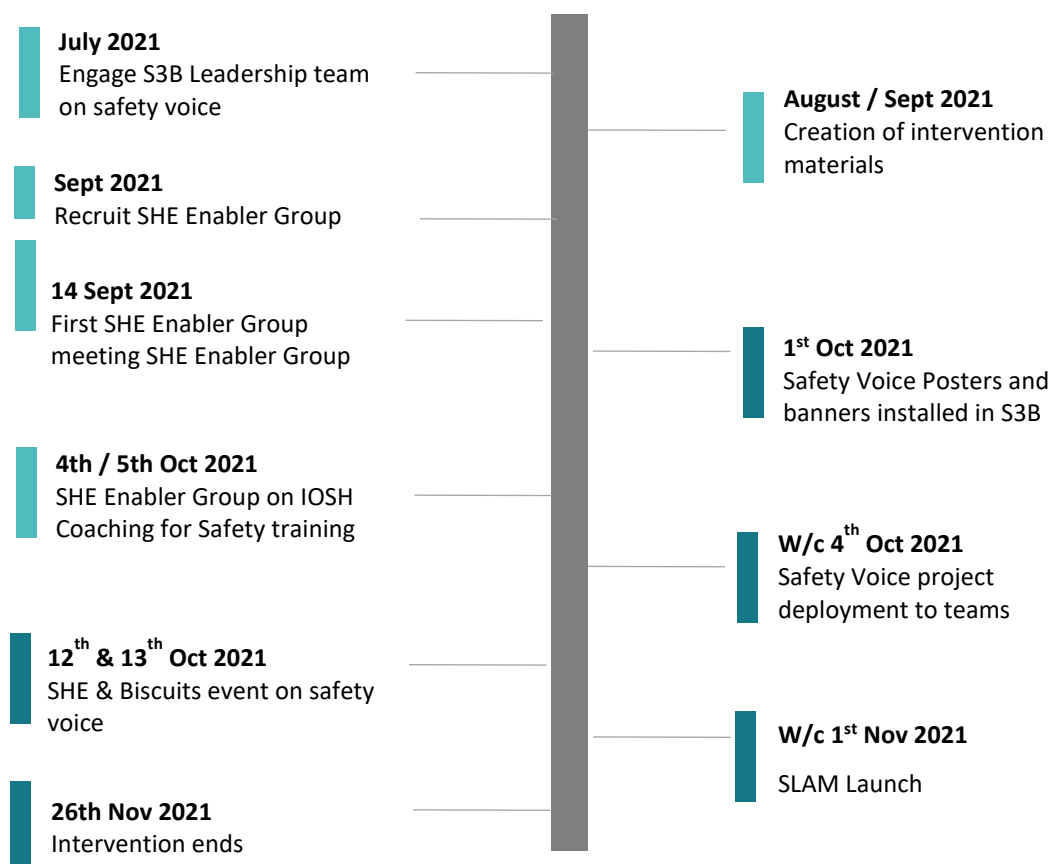
The multi-faceted intervention, comprising the formation of a SHE Enabler Group, dedicated SHE & Biscuits events, communications and the deployment of the SLAM process was deployed in a single machine shop at the organisation's aircraft manufacturing facility. It was facilitated by the researcher in collaboration with the operational head of business, supervisors and the SHE Enabler Group and deployed to shop floor teams over a period of two months between October - November 2021. Figure 16 below describes the timeline of activities.

Intervention Timeline

The deployment plan was delivered in two phases; a preparatory phase indicated in figure 15 in light green and an implementation phase indicated in dark green.

Figure 16

The preparation and implementation phases of the intervention



Phase 1 - Preparation comprised:

- Stakeholder engagement & organisational arrangements
- Creation of deployment materials
- Establishment & training of the SHE Enabler Group

Phase 2 – Implementation comprised the deployment of:

- Posters & banner deployment
- SLAM Launch
- SHE & Biscuits events

5.7.1. Phase 1 - Preparation

Stakeholder engagement and organisational arrangements

In order to be in a position to launch the intervention, the Operations Manager in the target area and their leadership team of managers and supervisors were taken through the intervention ideas in July 2021 by the researcher using a safety voice presentation pack (see Appendix 12). This was to ensure their ongoing commitment to the project, to secure necessary resources and to refine the approach in line with their schedule of events so that it was acceptable to key stakeholders (i.e. the shop floor workers in their teams) and practicable to deliver. These stakeholders were also involved in subsequent reviews of the project and were provided with progress updates.

The responsibility for cascading the intervention tools and processes was given to the local supervisors but they were to be supported by the volunteer SHE Enabler Group who were recruited through the supervisor population. There were good reasons for using the supervisors as the conduit for deploying the safety voice intervention. The supervisory team were used to engaging their teams, were adept at briefing out company messages and had daily sessions already established that regularly featured safety. Utilising these sessions, not only minimised any disruption to production, but also helped to give supervisors a sense of ownership regarding the project and it conveyed to employees their commitment to the intervention.

Supervisors were also able to personalise the communication and add their own personal stories to help individuals understand when to express themselves and why safety voice was so important. In addition, it was envisaged that supervisors could use their local knowledge and experience to quickly adapt processes such as SLAM to suit the working patterns and arrangements of their teams.

The leadership team also decided that the SHE Enabler Group would be given the responsibility for planning the SHE & Biscuits events, determining the locations of the posters / banners and developing further ideas for improving participation on safety within the facility. This was designed to empower employees to increasingly contribute to safety and to instil shop floor workers with a sense of autonomy over the project. From a theoretical point of view, this aligned with self-determination theory (Deci & Ryan, 2012) and was intended to increase intrinsic motivation for recruiting volunteers to participate in the SHE Enabler Group.

Establishment of the SHE Enabler Group

In September 2021, supervisors were issued with a flyer (see appendix 13) and information on the roles and responsibilities of a SHE Enabler Group member (see appendix 14) to help recruit employee volunteers to support the safety voice project. This flyer included information about the notion of a SHE Enabler Group and an open invitation to recruit shop floor volunteers to become part of the Group. The volunteers were recruited through the supervisors and local SHE Representative who attended local DSUMs to provide further clarity relating to information on the concept of the group.

Around a dozen employees came forward and offered to be part of the group. The researcher launched the first session on the 14th September 2021 by issuing each of the individuals with a welcome pack of company merchandise for expressing interest, and delivered a presentation on safety voice to communicate and discuss the aims, agenda and terms of reference for the group (see appendix 15). The group decided to meet twice weekly during the intervention to plan, implement and evaluate the interventions. The researcher, along with the local SHE representative helped to facilitate these bi-weekly sessions.

To help equip the SHE Enabler Group with the knowledge and skills to be able to engage their peers on safety, the SHE Enabler Group were invited to attend the IOSH “Coaching for Safety” training. The course, which was delivered by Securus Health & Safety (an external training company) on 4th and 5th October 2021, had been delivered previously to SHE professionals and received positive delegate feedback. The course was delivered in the meeting room, adjacent to the target facility and lasted two days. Nine individuals attended which included five employees and four supervisors.

Creation of deployment materials

During the preparation phase, a budget was agreed by the SHE and leadership team from the target area for the design and printing of bespoke safety voice posters and banners as well as SHE & Biscuits promotional merchandise. The safety voice posters and banners, as well as the SHE & Biscuits mugs and banners were designed and manufactured in August and September 2021 through a local graphic design agency which was a partner of the target organisation. The design agency was issued with a brief by the researcher. Meanwhile the photography for the posters was carried out by the company photographer. Photographic approval forms, already provided by the company, were used to ensure that those involved in the photography consented to being involved. All of the communications materials were agreed with the supervisors, the individuals who were featured in the posters, the SHE Enabler Group and the Head of Business before being printed.

At the same time, materials were being prepared for the deployment of the other elements of the intervention. This included a SLAM briefing pack for supervisors and managers (see appendix 16), a SLAM infographic (see appendix 17) and SLAM toolbox talk (see appendix 18) to help supervisors explain the process around SLAM. Meanwhile, SLAM feedback sheets (see appendix 19) were developed to help supervisors capture and provide feedback to employees on safety voice issues. SLAM promotional banners were also designed and acquired to help remind employees of the existence of the SLAM process, the meaning behind the acronym

and the fact that they could identify hazards using the SLAM process throughout their working day.

The same presentation pack provided to operational leaders (see appendix 12) was also issued to supervisors via a Skype call to help them communicate the rationale behind the whole safety voice project to support its launch, as well as specific materials to help supervisors communicate the importance of SHE & Biscuits events and to recruit employees for the SHE Enabler Group. In addition, teas, coffees and mugs were ordered for the SHE & Biscuits intervention.

5.7.2. Phase 2: Implementation

The intervention was originally planned to place over a six-week period during October - November 2021. However, that time frame was extended to a period of two months in total to allow employees to experience all aspects of the intervention. One of the challenges associated with the deployment of the intervention during this time period was associated with the COVID pandemic, which coincided with the deployment of the intervention. COVID placed requirements on the operational teams associated with social distancing, face coverings and additional hygiene measures which limited the number of people that could meet in groups. This impacted upon the effectiveness of interpersonal communications generally throughout the facility and reduced the number of people on shift at any one time. These arrangements placed a great deal of strain on supervisors, leaders and their teams. Team meetings, such as DSUMS had to be duplicated in several small groups which took additional time for the supervisors to deliver. They were also required to enforce cleaning, social distancing and the wearing of face masks. Meanwhile, employees were required to work in unconventional (and often unpopular) ways to avoid breaking COVID protocols. For instance, in order to carry out a “two-man” manual handling lift in which employees were required to work closely together, significant amounts of PPE were required which caused frustration amongst some of the shop floor workers and slowed the completion of their tasks. Attitudes towards COVID also varied amongst employees. Some were extremely

concerned about contracting the virus whilst others believed they were not at particular risk, which created tensions between the teams.

It also hampered the smooth running of the SHE Enabler Group, given there were restrictions on the number of people who were able to enter the facility's meeting room and there was significant disruption to the shift patterns which meant not all of the volunteers were available to meet at the same time. Consequently, the attendees at the group varied and often their attendance was sporadic.

Poster & Banner Deployment

The first element of the intervention aimed at all employees in the target facility comprised the installation of the generic A1 sized posters which were installed on Friday 1st October by the local SHE representative. The banners were installed over the weekend by the local Facilities Management contractor. Shortly after these were installed, during the week commencing the 4th October, supervisors were asked to communicate to their teams the importance of safety voice, to identify and explain the role of the SHE Enabler Group and to highlight that, over the coming weeks, a number of interventions would be trialled to encourage speaking up behaviours. A tool box talk was provided to support the launch and the researcher held a 30-minute Skype meeting to explain the content of the tool box talk.

SHE & Biscuits Event

The third element was the roll out of SHE & Biscuit events. Two rounds of SHE & Biscuits events were held in the target facility on the 12th and 13th October to capture the safety concerns and ideas from employees on different shifts. A further SHE & Biscuits session was used to explain the launch of SLAM on the 1st November. To support the deployment of the SHE & Biscuits events, the researcher hosted another 30-minute Skype session prior to the events involving the supervisors and SHE Enabler Group to explain the concept behind the SHE & Biscuits sessions and to answer any questions.

SLAM Launch

The final element comprised of the launch of SLAM as a means of encouraging employees to identify hazards and to help supervisors visibly capture and feedback regarding employee issues. SLAM was deployed to employees during the week commencing 1st November as part of their Daily Start Up Meetings and continued to be used daily throughout the research project and beyond.

Chapter 4 has described how the critical safety voice behaviours identified in the pre-intervention interviews (Study 1) and survey (Study 2) were used to design and implement a multi-faceted behaviour change intervention to increase the willingness of shop floor employees to express their safety voice. Chapter 5 subsequently describes how the intervention was measured and evaluated.

6. Chapter 6: PHASE 4 – Review

Chapter 5 is concerned with reviewing the adequacy and effectiveness of the multi-faceted behaviour change intervention by conducting a number of interviews with shop floor workers to understand perceptions of the intervention and the extent to which perceptions of safety voice had changed following its deployment. This represents phase 4 in the broader research project and is highlighted in the diagram below.

Figure 17

Phase 4 in the context of the wider study



6.1. Study 4: Evaluating the efficacy of the intervention

In order to evaluate the effectiveness of the intervention, a series of individual, semi-structured interviews were conducted over a period of six weeks with four supervisors and seven employees who had been exposed to the intervention.

Before commencing the interviews, ethical approval was obtained from the University of Derby (ETH2021-4281) and the study was conducted in strict alignment with British Psychological Society requirements (BPS, 2021). The interviews were conducted using the same methodology as described in Study 1. The only difference was the use of an amended interview schedule (see appendix 20) which placed more focus on exploring perceptions of the intervention and its outcomes, in addition to exploring whether / the extent to which safety voice-related behaviours had changed.

All of the interviewees willingly volunteered to participate, had worked on the shop floor in the target facility during the deployment phase of the intervention and were either involved in its deployment or were exposed to it as an employee.

The interviewees were all male and had worked in the organisation for an average of 19.6 years.

Table 15

Demographics of the post-intervention interview participants

Name (Pseudonym)	Role	Age	Length of Time in organisation (years)	Length of interview
Roger	Supervisor	30-45	0-5	34 mins
Lawrence	Supervisor	46-55	25+	52 mins
Mark	Supervisor	46-55	0-5	44 mins
Alistair **	Supervisor	55-67	25+	55 mins
Ron	Shop floor worker	46-55	0-5	32 mins
Alan **	Shop floor worker	30-45	5-10	34 mins
Gareth	Shop floor worker	55-67	10-25	27 mins
Chris **	Shop floor worker	55-67	25+	29 mins
Matt	Shop floor worker	46-55	10-25	57 mins
James	Shop floor worker	55-67	25+	42 mins
Pete	Shop floor worker	46-55	25+	47 mins

Key: ** Also participated in the Study 1 pre-intervention interviews under the same pseudonym.

The interviews were conducted in a private meeting room adjacent to the working facility and were conducted in accordance with an interview schedule (see appendix 20). Initially, the interviewees were reminded of the nature of the study, their rights as a participant and the fact that they could withdraw from the interview at any point. They were then asked a series of open questions; the aim of which was to explore their perceptions of the intervention and its effectiveness, understand the factors which may have impacted the intervention and to identify the extent to which attitudes and behaviours may have changed towards the expression of safety voice. The interviews lasted on average 41 minutes ($M = 41$; $SD = 10.17$).

Each of the interviews were recorded using a secure audio device and were subsequently transcribed verbatim by the researcher.

Thematic Analysis

The interview transcripts were analysed by the researcher using inductive thematic analysis (Braun & Clarke, 2006). Initially the interviews were coded for meaning, before being developed into initial and broader themes. (Please see study 1 in Chapter 4 for more detail on the methods used to generate interview data and analytic procedure). In carrying out the analysis, the researcher sought to capture employee perceptions associated with the intervention. The analysis was inductive and aimed to explore safety voice enablers and barriers in light of the intervention employees had been exposed to. The analysis was also carried out to understand a) the extent to which the themes identified in the pre and post intervention interviews remained consistent, b) understand whether the interventions identified using the Behaviour Change Wheel were perceived to be effective and c) explore the extent to which other factors previously identified, or those that were generated in these post-intervention interviews, appeared to influence employee safety voice behaviours.

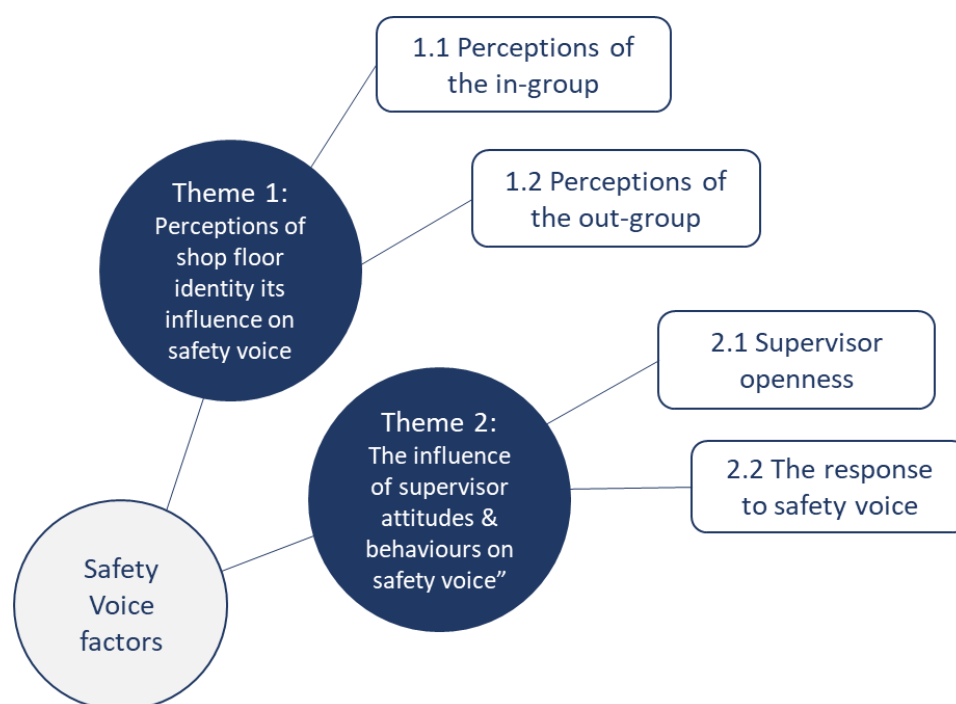
Initially, the data was collated into 34 codes of meaning which were analysed and refined over time. After several iterations of exploring the data, two themes were generated that are elucidated below. The first explores how the culture of the shop floor and how shop floor workers' sense of identity influenced speaking up behaviours. This is divided into two subthemes; the first relates to perceptions of the shop floor in-group and how these shaped the content and manner in which safety voice is expressed, whilst the second subtheme focuses on the perception of an outgroup comprising the wider SHE team and leadership.

The second theme considers the extent to which perceptions about supervisor attitudes and behaviours influenced safety voice. Again, this is divided into two subthemes; the first explores supervisor openness and how their style of leadership supported safety voice. The second sub theme is associated with how supervisors

responded to employees' safety observations, concerns and ideas and their influence on the future expression of safety issues by employees.

Figure 18

Themes generated in the analysis of the post-intervention interviews



6.2. Findings

The principle aim of the intervention was to increase employees' willingness to express safety voice by facilitating aspects of capability, opportunity and motivation. The post-intervention findings revealed that improving the physical and social opportunities had the biggest impact on safety voice behaviours. Indeed, it is likely that increasing opportunity to express safety voice also influenced employees' motivation to speak up with their issues.

However, whilst some elements of the intervention appeared to be effective in shaping safety voice; other aspects had less of an impact. The following sections

explore the findings of the interviews and employee perceptions of the multi-faceted intervention.

6.3. Theme 1: Perceptions of Shop floor identity and its influence on safety voice

“We sort it ourselves and move on with the job!”

6.3.1. Subtheme 1.1: Perceptions of the in-group

Despite the focus placed upon safety voice over the timeframe of the intervention, it was evident that some deep-rooted cultural issues remained difficult to influence which appeared to have a significant bearing on safety voice behaviour. The first of these was associated with the culture on the shop floor and employees' sense of a shop floor identity. The post-intervention interviewees echoed the sentiments of those involved in the pre-intervention interviews when describing shop floor workers in positive terms.

As a collective, shop floor workers were viewed by the interviewees as a group who “all get on pretty well” (Roger - S) and cared about the safety of their colleagues. This commitment to safety was revealed consistently in most of the interviews, as the examples below show:

We want a happy workforce and we want the business to thrive and we want to be safe, don't we? (Matt - E)

Safety is always there in the back of my mind and what have you all the time.
(Pete - E)

We are serious. You know, it would be abhorrent if, if anybody got injured in here. (Mark - S)

These comments suggest that employees believed the machine shop was a hazardous environment in which they could be seriously injured if their risk control measures were not effectively applied and if safety was not a constant consideration. A number of employees described specific risks associated with working in the facility; for example Gareth explained that:

Those blue walkways are obviously supposed to be safe but go anywhere off there on some of the areas without guarding is really dangerous isn't it? If a cutter breaks or something comes flying off - it's like a bullet isn't it? Yes, people who are working here are obviously aware. I think outsiders possibly not. You used to see a lot of strangers that I have confronted, not confronted, but actually, yeah, just just approached, 'Who are you? What are you doing? Why are you here? Have you been inducted?' and all that type of stuff. (Gareth - E)

Gareth's comment shows that shop floor workers were not only acutely aware of the risks in the facility but also that strangers were unfamiliar with the working environment and potentially vulnerable as a result of being exposed to hazards. His reported challenge to these individuals is an example of safety voice but also reflects a sense of caring to protect the safety of others.

As well as being perceived as safety conscious, the majority of the interview participants also viewed shop floor workers as highly skilled, competent people who could be relied upon to find practical solutions to overcome work challenges:

If we do come across an issue on a job, we'll sort it out ourselves. (Roger - S)

We have a couple of guys who've been on for years - they know the easiest and quickest ways of how to do things. (Chris - E)

If we're not already doing it, we've probably thought about it and dismissed it.
(Alistair - S)

These comments suggest that shop floor workers saw themselves as experienced experts at performing their tasks who took pride in their ability to identify and resolve problems independently without requiring the input of other stakeholders. Several of the interview participants suggested that, following many years of safety improvements, the safety arrangements in their facility were extremely mature and that there were few opportunities to improve.

For me, everything seems really well sort of thought out and organised. (Ron - E)

Because we've been here a long time. There's not really a lot to change. (Pete E)

These comments highlight that interviewees had a perception that the facility was inherently safe as a result of the contribution of the shop floor workers stretching back over many years. They also indicate that some workers believed there were few safety issues to uncover, given the maturity of their safety arrangements. This may have led some to accept their existing systems of work rather than to proactively seek out opportunities to improve their safety processes. Shop floor workers were also characterised by the interview participants as individuals who would confidently express their views.

They've always been a vocal bunch. (Lawrence - S)

I think if there's any safety concerns, people will highlight them based on what they see. (Gareth - E)

You know, most of the people on our section will speak up, whether it's just to our immediate supervisor, or basically through [name of Head of Business].

There's one lad who, if you come in tomorrow - He doesn't care who he speaks to. (Chris - E)

These comments indicate that some shop floor workers were very assertive and the final comment "he doesn't care who he speaks to" suggests that there were

employees who paid little regard to how their message might be received by the other party and were unwilling to amend their style depending upon who the receiver might be. The interviews also revealed that shop floor assertive expression could stray into confrontation. This was revealed by several participants who described recent, angry exchanges between shop floor workers and their supervisors:

I've just done it today; collared a manager - high up. I collared her yesterday; chewed her head off. (James - E)

The reason I wasn't in here on time; at the DSUM, there was a fairly heated exchange and I've just had that conversation with the two irate guys and the ops manager here. (Mark - S)

I've had a few ding dongs with managers and sometimes it's beyond a joke how they talk to you, do you know what I mean? (Matt - E)

The language used in these quotes indicates that conflict was a feature of life amongst some on the shop floor, particularly between employees and their supervisors. This may have served to influence employee safety voice and, in particular, the manner in which it was expressed. For instance, those exhibiting this aggressive behaviour may have served to role-model to others that this was acceptable behaviour and the way employees should interact with their supervisors. For those with less confidence, witnessing these disagreements could have the opposite effect and cause them to withdraw their safety voice or suppress it. Indeed, interview participants described how some less confident or new shop floor workers preferred to stay silent or spoke to their supervisors privately away from the public judgement of their peers. This was revealed by Ron and Pete who pointed out that:

Some people don't want to say anything. And I guess it depends on the person as well, doesn't it? I mean, I don't really have any problems going - if there's an issue, I'll bring it up but I know other people probably wouldn't do it. (Ron - E)

The guys in here - they're not backwards about coming forwards. No not here; especially the ones that have been here a long time because there's quite a few new starters now so they're obviously, they're finding their feet a little bit. They don't necessarily want to upset the applecart and what have you. (Pete - E)

This latter comment, describing how shop floor workers were “not backwards about coming forwards,” reinforces the notion that some employees had strong views and were not afraid to speak their mind. Moreover, these quotes highlight that some shop floor workers, such as those lacking in confidence or those who were just beginning to embed themselves with the group, were cautious about speaking publicly in front of their peers about safety issues. This fear appeared to stem from their desire to maintain harmonious relations amongst the group and to avoid being embroiled in a conflict situation with potentially more dominant, experienced and assertive team members or supervisors. For instance, when discussing the extent to which employees challenged one another's' unsafe behaviour, several employees suggested that, whilst employees occasionally challenged one another, these situations had to be approached carefully. When asked how employees receive challenge, two employees commented:

I suppose it depends on who it is, I suppose but generally speaking, I think most people would be "Oh, yeah. Sorry. I forgot." I suppose it depends what the issue is you'd call em up for as well. It's quite broad isn't it? I suppose it depends on the issue and also on the individual as well as to whether you get any grief back. (Alan - E)

So if we see something, we should report it, you know what I mean? And that should be encouraged but you don't want to grass someone up. And some people are, you know, if someone saw me doing something wrong, or something dangerous, and someone said it to me, I'll take it on the chin you know, I'll be going "right, or fine brilliant." But other people would be more aggressive. And you'd have issues, you know, what I mean? (Matt - E)

Employees appeared to carefully evaluate the potential social consequences when deciding whether or not to speak up about safety. Alan's comment, in particular, highlighted that speaking up "depends on the issue and the individual" as to whether the conversation could lead to conflict. Meanwhile, Matt's statement "you'd have issues" not only demonstrated how challenging a colleague could lead to unpleasant social consequences but his assertion "you don't want to grass someone up" reveals a group social norm of the shop floor. Clearly, challenging peers directly or reporting their unsafe behaviour to a supervisor was socially unacceptable to some shop floor workers and could lead to the potential for conflict with members of the group and even being ostracised. This was made explicit by James who suggested that some employees were afraid to speak up about safety as they didn't want to be labelled negatively by the group: "you could get labelled oh he's a troublemaker." (James - E)

Moreover, as discussed previously, as safety arrangements had been developed over many years with input from shop floor workers, it could be argued that expressing any element safety voice could be viewed, by some, as calling into question the adequacy of risk controls that had been developed and installed by members of the team. This could be perceived as risky for shop floor workers to publicly express or criticise.

To mitigate these risks, several participants described safety voice strategies which included sending an email or speaking to the supervisor on a one-to-one basis away from the scrutiny of the group:

I think you probably get a lot of people if they are going to say things prefer to, to go and see the manager to talk away from anybody else. (Ron - E)

If they don't want to do it in an open DSUM environment, then they can go to their supervisors in the area and bring it up that way. (Gareth - E)

These strategies appeared to be one way that shop floor workers could raise safety issues in confidence without incurring negative repercussions from the rest of the group. When interviewees were asked about the types of issues that are raised by

employees, they were typically mundane matters associated with the facility rather than the unsafe acts of their colleagues:

It tends to be a lot of the typical shop issues like walkways and lighting and general stuff. (Chris - E)

It's fluids on the floor. It's bits missing out of the walkways because the concrete breaks up every now and again, and what have you. (Pete - E)

Slip hazards - issues with things that shouldn't be where they should be. Yeah, just usual bits and bobs really - nothing sort of beyond that really. (Ron - E)

This suggests that, as far as the shop floor workers were concerned, on a day-to-day basis their facility was sufficiently safe for them to work in and that the majority were satisfied with the status quo. The issues raised above appear to be dynamic issues associated with wear and tear on the infrastructure of the building as opposed to fundamental issues with working arrangements or the unsafe behaviour of their colleagues.

To create another avenue for safety voice on the shop floor and to harness the independent, problem-solving nature of the shop floor identity, the multi-faceted intervention incorporated the creation of a SHE Enabler Group supported with a promotional campaign. The SHE Enabler Group comprised around a dozen shop floor workers (both supervisors and employees) who volunteered to become involved in the planning and, to some extent, the deployment of the interventions. They were also explicitly asked to be advocates for safety voice by acting as a potential target for emergent employee concerns and ideas. This was designed to increase opportunities for impromptu safety voice on the shop floor and to try and overcome any social barriers that individuals may have about reporting issues to their supervisors. The group met on four occasions during the intervention and continued to meet after the intervention had ended.

The members of the SHE Enabler Group who were interviewed expressed positive feelings about being involved in the intervention. Lawrence described the group as:

“a certain handful of individuals who’ve actually stood up and been counted.”
(Lawrence - S).

His comments indicate that many employees in the facility preferred not to volunteer for improvement groups and his reference to these individuals’ ‘actual willingness to stand up and be counted’ suggests their support was unusual. He described how the SHE Enabler Group provided an opportunity for team members to take on board new responsibilities and to raise their profile within the facility. He recalled how he had reminded two of the volunteers that:

You guys are going to be leading this. I want you to talk to your teammates in the canteen, you know, and I do think enable is the right word, because it's enabling the guys to have the competence and the knowledge to share it isn't it? (Lawrence - S)

This quote reveals Lawrence had high aspirations for the SHE Enabler Group and wanted group members to engage their co-workers on safety and develop new skills in the process. His use of language also suggests Lawrence’s style is directive as well as supporting their agency.

To support the introduction of the SHE Enabler Group as a potential vehicle for employee safety voice, a communications campaign was launched at the start of the intervention. It comprised of banners containing the strapline “Seen something? Say Something!” and posters bearing the same strapline but featuring imagery of the SHE Enabler Group to indicate potential avenues for employees to contact. The campaign was designed as a visible cue in the workplace to highlight the importance of safety voice and to remind employees of the importance of reporting issues they may encounter during the working day. Most of the interviewees had noticed these promotions. For instance, Matt commented:

There's posters everywhere. You know what I mean, which is a reminder for everyone that, you know, like I just said to you, you know, we all need to be as

safe as we can be doing our tasks that we've got to perform during the day.

(Matt - E)

However, the impact of these posters appeared to be limited in terms of promoting the SHE Enabler Group as avenues for impromptu safety voice. Ron, who was a member of the SHE Enabler Group noted that, aside from the SHE & Biscuits events, he hadn't been approached by another employee about a safety concern or idea. Meanwhile, Pete had noticed the posters but wasn't aware of any other changes:

Being a representative, I've not had anybody come to me with any, any specific SHE issues. (Ron - E)

There's, obviously there's been the posters up and what have you. But the actual health and safety side of it. I don't think it's really changed that much apart from just different pictures. (Pete - E)

One reason for the perceived limited impact of the promotions may have been because posters are regularly used for SHE campaigns and employees had either become used to messages on the wall or had failed to notice new posters amongst the "noise" of other employee-focused communications which adorn the walls and noticeboards. For instance, Matt and James reported:

There was a poster I saw yesterday though I can't remember what it was. There is that many isn't there. (Matt - E)

I can't picture them. But the thing is with certain posters, right. You see them! You don't see them! Yeah, they blend in. The more posters you have up, you turn off. They get like wallpaper. (James - E)

This comment suggests that, whilst Matt and James had recognised that the posters changed, neither had absorbed any of the information or their meaning as if it was just decorative 'like wallpaper.' It should also be noted that the interviews took place

a few weeks after the intervention; by which time the novelty of the posters may have worn off.

Another reason as to why employees may not have approached the SHE Enabler Group with their safety voice was that the existing methods of raising safety voice were well understood and accepted by shop floor workers. As noted earlier, the interview participants consistently described the DSUM and their supervisor as the principal means of raising issues. At no point did any of the interview participants describe the SHE Enabler Group as an outlet for safety voice:

You can raise things usually through the supervisors or team leaders, normally at the daily DSUMS or what have you as part of the daily meeting. Yes all the areas have the local DSUMS that go through the usual stuff: safety, quality cost, delivery, people. So if there's any issues they should come through that.

(Gareth - E)

This suggests that, despite the intervention, shop floor workers did not view the SHE Enabler Group members as a credible outlet for their safety voice or were not aware of how the SHE Enabler Group could be used to express safety issues. It may have also been the SHE Enabler Group were perceived to lack the ability or influence to progress their issues or that employees simply preferred the normal avenues to raise safety issues.

However, it may also have been the case that volunteering to be part of the SHE Enabler Group placed individuals at the edges of acceptable in-group conduct. This was indicated by another shop floor supervisor, Alistair, who talked disparagingly about the SHE Enabler Group:

I don't want to appear as negative but we've got this group – the “lightbulb team” or whatever. Perhaps it's my culture but if someone asked me to walk around in high viz with a light bulb on the back of it – I'd hate it. So what on

earth have you given me that to walk round in? Do you want me to feel like a complete idiot? (Alistair - S)

Alistair indicates an upcoming negative statement by starting with a disclaimer, '*I don't want to appear as negative but...*' and then continuing to air their frustration with SHE Enabler Group by labelling them as '*the lightbulb team or whatever.*' This derogatory term suggests that he feels that volunteering to be part of an improvement group can potentially isolate that individual from the rest of the group and he would not want to do that. This is the antithesis of psychological safety and was an unintended consequence of introduction of the SHE Enabler Group that was not foreseen.

6.3.2. Subtheme 1.2: Perceptions of the out-group

Whilst the interviewees expressed perceptions about the shop floor in-group, they also highlighted the existence of an out-group which helped to define the boundary between the in-group and out-group. This was a familiar theme that was identified during the analysis of the pre-intervention interviews. The out-group comprised of the wider site SHE department or members of the leadership team who were viewed, by the participants, as an unseen "out-group" who were perceived to possess the power and influence to change aspects of their work without their consent. In describing the out-group, interview participants often used the terms "them" or "they" in contrast to the "us" or "we" that were used when describing members of the shop floor. According to many of the interviewees, this outgroup did not necessarily have the understanding or context to inform effective decision making which was a constant frustration amongst the shop floor teams.

There's that much differential between your SHE team who's not from the production environment and they're blinkered - compared to what's actually going on. (Lawrence - S)

You've got people who don't know what to do, telling you how to do it and you go "What?" (James - E)

Because we're on the shopfloor it's like, 'Oh, don't worry about them. They'll do it; they'll get on with it, we'll tell them what to do.' And whatever they say - it just gets ignored. And that is a true opinion of what happens on the shop floor.

Everyone makes decisions off the shop floor for people on the shop floor. (Matt - E)

These comments reveal that in contrast to the shop floor, members of the out-group were seen by the interview participants as possessing a level of authority over the work of shop floor workers which they did not like, did not accept but felt unable to challenge directly. This was revealed by James' account of how the outgroup appeared to insist on "telling you how to do it" or Matt's comment that the out-group will "tell them what to do." The members of the out-group were also viewed by employees on the shop floor as lacking the competence or credibility to make these decisions. This was evident in the description of the out-group as people who were "not from the shop floor environment," "blinkerred" and "people who don't know what to do." Moreover, as revealed by Matt's comment, this out-group appeared to care little about the perceptions of shop floor workers - 'Oh don't worry about them. They'll do it; they'll get on with it, we'll tell them what to do.' The shop floor workers appeared to resist passively either by questioning these seemingly arbitrary decisions "What?" or by simply ignoring their instructions.

One specific example associated with the reported imposition of safety controls by the outgroup was related to the introduction of a new requirement for employees to wear hard hats and high visibility clothing when operating cranes and other lifting equipment. Matt and Alistair, felt aggrieved that the shop floor workers had not been consulted about the imposition of these safety measures which they believed were disproportionate, ill thought through and unnecessary:

I'm stood here with [co-worker name] and 25 foot away is the crane which is quite common. Or they're lifting off a machine, and they're nowhere near it, and they've got a hard hat on that is described by the shop, as totally and utterly pointless. What is the point of having it on? So if that hits me on the head -

forget that! The people around me need their hats on more than me. (Alistair - S)

So they brought a rule in a couple of years ago, where you have to use a high vis jacket and a hard hat. But if you've got a billet that weighs a tonne, and it lands on your head, right a hard hat is not gonna stop you. The problem is the hats have got peaks on. So basically, when you look, all you can see is your peak - right? So you're restricting your visibility, and when you put your head back the hard hat that comes off. So you've got this -it's not fit for purpose. (Matt - E)

The frustration revealed by the interview participants and contempt for the outgroup at imposing these changes upon the shop floor workers is clearly evident through their use of the terms “totally and utterly pointless” and “it’s not fit for purpose.” The outgroup were perceived as possessing the power and influence to initiate unpopular and impractical safety interventions regardless of whether they were acceptable to the shop floor teams or not. Even when employees challenged these interventions, it would appear that the out-group often refused to hear their concerns. James, for instance, described how he had acquired a dustpan and brush with long handles to limit the need for him to bend down when carrying out his housekeeping duties. However, this equipment did not correspond with the standard equipment provided on a shadow board which had been issued throughout the facility. He described how he had challenged this decision but his protestations had been ignored:

I said ‘Why are you gonna get me a shovel and a brush?’ ‘Well for your sweepin up.’ ‘I’ve got one of the old pans like that with a handle on. And I don’t have to bend down. “So why do I have to bend down?” “Well, everybody’s got one. It’s the same board.” I said “but you should be catering for the area, not just filling the board with everything. (James - E)

This sentiment was supported by other interviewees who cited historical examples of outgroup interventions which did not yield any tangible safety benefits. For instance, Gareth described a target driven hazard spotting process known as “good spot” which became widely known for motivating people to report a wide range of issues; the majority of which were trivial and did not lead to safety improvements.

So that's a long while ago but yeah, but what they did. - Oh, you just got millions of em, bloody millions of good spots that were never ever an accident. Just that was literally a ticking box exercise wasn't it? (Gareth - E)

Gareth's example highlights that perceptions of the out-group had been developed over a period of time and influenced attitudes amongst employees on the shop floor who had grown to expect new interventions from the wider SHE team and supervision which yielded few safety benefits for them. A number of employees expressed the belief that highlighting accidents or safety challenges could attract the attention of leaders and the wider SHE team who had the potential to instigate safety investigations or install new “improvements” which had the potential to take up time, create effort for the teams or hinder their work.

According to interviewees, the out-group appeared to be motivated by the need to impress senior management and create the impression that safety was being managed effectively. This was elaborated upon by Matt who was also a first aider in the target facility who described his reaction when he had witnessed a powerpoint presentation, delivered by management on their positive accident performance:

I've had a word in here when people have put slides up and said, "Oh, we've had no accidents, for the last three months." Really? If they want to fabricate things. (Matt - E)

Matt's comment reveals his lack of trust in management which seemed to stem from their willingness to report and promote positive (low) accident figures when he believed it was widely known that accidents had occurred in the facility. Roger, Mark, Matt and Alistair described how it was commonplace for plasters to disappear from first aid boxes and for employees to continue to work with visible injuries on their

upper limbs. However, this did not correspond with a rise in the reporting of accidents. This suggests that employees were still not willing to report minor accidents and supervisors were reluctant to investigate these minor injuries.

We have had an issue over the past sort of six months with plasters going missing and it begs the question in my mind - if plasters are going missing. And then what are they using them for? (Roger - S)

Several employees in the post-intervention interviews highlighted that this outgroup often reacted in a disproportionate and excessive manner when accidents or incidents occurred which may explain why employees preferred to remain silent about minor accidents or bouts of ill health that they could conceal. This was a finding that was consistent with the pre-intervention interviews. For example, as a first aider, Matt described how the accident investigation process was lengthy and involved lots of people whilst Alistair, an experienced supervisor, reflected on how a member of his team felt after reporting an injury:

Because when you have a cut, and it goes into a book, you get this mass of people that, that, that come around and sort of interrogate you, and you make you feel like you know. But you're trying to do your day job. (Matt - E)

It makes them feel like a criminal is what I got back. [Employee name] - to give you a name. If you brought him in here and asked him, he would, without a shadow of a doubt. He basically felt that he was some form of leper, and we make a drama out of it. Yeah. Maybe it's serious, maybe it's not but they will hide it to an extent. (Alistair - E)

The language used by Matt and Alistair when describing how injured employees were “interrogated” and left to “feel like a criminal” by the wider SHE team reveals how reporting injuries could leave shop floor workers feeling exposed and potentially blamed for being involved in an accident. Alistair’s use of the term ‘feeling like a leper’ indicates that the injured employee felt that, during the investigation process, he was being singled out as different from his peers and left to defend himself

without receiving any support from his co-workers. This sense of the outgroup investigating and possessing the potential to impose unpopular, arbitrary and excessive safety solutions on the team was prevalent amongst shop floor workers in both the pre and post intervention interviews and may have caused employees to avoid expressing their safety voice if they could.

One aspect of the intervention which sought to circumnavigate the involvement of the outgroup was the creation of the SHE Enabler Group. As described earlier, this was a group of shop floor volunteers who were encouraged to be an outlet for safety voice. The group was promoted by way of a communications campaign which featured supervisor briefings as well as posters and banners featuring imagery of the group members. Posters and banners were selected as the vehicle for promoting safety voice messages (and the SHE Enabler Group as voice targets) because there were a number of poster frames and noticeboards available within the target facility that could be utilised at a fairly low cost in alignment with the APEASE criteria.

Posters and banners were also employed because, despite having access to the intranet and email, not all shop floor workers accessed electronic company systems on a regular basis which was highlighted in the pre-intervention interviews. However, using posters and banners may have created an association, amongst the workforce, between the current safety voice intervention and campaigns of the past. The company had a history of using posters and banners for safety campaigns; many of which were developed by the SHE department and imposed upon the teams by management - the very same outgroup which were identified in the pre-intervention interviews as the natural 'opponents' (the 'them' v 'us') of the shop floor. Pete described how, "When they first got put up, they got defaced within a couple of days with sunglasses being put on and what have you." (Pete - E) This adaptive response could be viewed as opportunistic; employees poking fun at their colleagues, possibly for offering to volunteer to support the project. Or it may have been motivated by a general opposition to the intervention that may have been perceived as being yet another intervention imposed upon the teams by the outgroup. This ingroup v outgroup dynamic forms part of the cultural backdrop against which the whole intervention must be understood. It highlights the importance of understanding historical and subtle cultural factors and the workplace

as a system with nuanced and embedded social norms; something which the process-driven behaviour change wheel does not explicitly address.

In summary, the interviews indicated that shop floor workers used reflective motivation to weigh up the consequences of expressing their safety voice before deciding whether to speak up or remain silent, particularly on minor safety issues. If the consequences had the potential to involve the out-group, employees often preferred silence to speaking up. The manner in which the out-group reportedly responded to employee safety voice remained beyond the scope of the current project and may comprise a potential topic for further safety voice research in the future. This indicates that whilst the shop floor workers were willing to engage in conflictual exchanges with those in supervisory or management roles, they rarely sought out disagreements with one another and appeared to prefer to withhold their safety voice rather than challenge their colleagues. This again highlights some of the unwritten social protocols regarding what is and is not acceptable on the shop floor and may even explain the limited influence of the SHE Enabler Group in facilitating safety voice. As members of the ingroup, it could be argued that they may have been motivated to overlook the unsafe behaviour of their colleagues rather than challenging them; a situation which could potentially lead to their expulsion from the ingroup. This again underscores the influence of cultural factors which were not fully understood when the intervention was designed and which the behaviour change wheel failed to tease out.

6.4. Theme 2: The influence of supervisor attitudes and behaviours on safety voice

“You’ve got to break down the barriers”

The second theme relates to the importance of supervisor attitudes and behaviours to safety voice and has been divided into two subthemes: a) Supervisor openness and b) the response to safety voice.

6.4.1. Subtheme 2.1: Supervisor Openness

The first subtheme associated with Theme 2 relates to supervisor openness which explores the extent to which supervisors encouraged safety voice, made themselves available to be a target for employee concerns and possessed the capability and skills to engage, listen and capture employee issues.

The majority of the post-intervention interviewees highlighted that their supervisors consistently encouraged and welcomed safety voice on the shop floor. For instance, employees commented:

We're always told, and I've been in here probably seven, six or seven years, and different areas I've worked it's always been a case of the supervisor saying "if there's anything you are not comfortable with you stop. Let's get it sorted first, it could be something and nothing and not be an issue but even if you think it is - raise it. If you're not comfortable, don't do it!" (Alan - E)

Even if, even if you're not doing a task, and you see someone doing something wrong, you know, they're encouraging people to report them which is right.
(Matt - E)

They're always asking for input on some of these key issues and safety issues.
So yeah, they're really quite approachable. (Ron - E)

Ron and Alan, in particular, reflected that supervisors "always" asked for employees to speak up and collectively. These three examples indicate that supervisors encouraged employees to raise a variety of issues about their work, employee behaviours but also any situation that made them feel uneasy. Likewise, the supervisors who were interviewed also confirmed that they consciously made a proactive effort to regularly encourage safety voice on the shop floor. For instance, two supervisors, Mark and Lawrence urged their teams:

If something's not safe tell us raise it; raise it to your SHE reps or whoever it is.

(Lawrence - S)

If you do see something and you can't sort it, pass it to the relevant authorities and we'll sort it. (Mark - S)

Most of the participants interviewed continued to point out that either raising issues at the DSUM's or speaking to the supervisor or the Facilities Management team when emergent issues arose provided the best opportunities to raise safety concerns:

Usually through the supervisors or team leaders, normally at the daily DSUMS or what have you. (Gareth - E)

So things do get raised at DSUMS but it's not just the DSUMs that is the place to raise the problems. You can raise them or you should be raising them whenever and whenever it occurs. If you can't sort that problem out yourself, then you raise it with the relevant people. Do I need my manager, maintenance and that sort of thing? (Pete - E)

These comments indicate there was an expectation amongst shop floor workers that safety problems should be shared with the supervisors in a timely manner if the employee was unable to resolve the issue themselves.

The post-intervention interviewees also highlighted that, in recent months, supervisors had moved from the office to the shop floor itself in order to provide more effective opportunities for employees to seek help, if they needed it. This was described by Lawrence who played a key role in instigating the changes:

If you're noticed - they're located on the shop floor now, not hiding and sitting down in their offices. Yeah, you're more visible. You're more approachable. The

open door policy? There is no door there now so. So the operators can see if they're visible 'any issues?' They know exactly where they are. (Lawrence - S)

Some of the supervisors also appeared to be very conscious that they were the principal outlet for shop floor concerns and they recognised that their leadership style and the relationships they engendered with their team could either promote or hinder the expression of safety voice. Roger commented about the importance of listening rather than blaming or judging individuals when safety issues arose:

It's you don't want to be driving things underground. You don't want to be saying, if you've cut your finger, what you know, 'what you playing at?' and that sort of thing. (Roger - S)

In this respect, Roger recognised that blaming individuals for safety issues or overtly judging their behaviour without justification can lead to situations where safety voice is driven "underground" i.e. where employees withhold their voice to minimise the risk of incurring negative consequences or being negatively labelled. This was a real concern for shop floor workers which was discussed previously in Subtheme 1.1. Meanwhile, other supervisors talked about the importance of adapting their style to suit the situation in order to maintain harmonious relations. For instance, Mark described how he had sought to reduce tensions earlier in the day with members of his team to reduce any barriers to communication:

At the DSUM, there was a fairly heated exchange not from me, because I know when to just, you know, stand there and say, "Yep I'll take that on board." And obviously, I've escalated that and then I've taken the individual in a room and had to coach him to get the constructive passion out of him. (Mark - S)

These examples indicate that some of the supervisors had developed an awareness about creating a psychologically safe environment in which employees could express themselves without feeling humiliated, ignored, ridiculed or blamed. That Mark took the individual to a room highlights that he did not want the conversation to be overheard by others which could have adversely impacted how other shop floor workers may have perceived both parties. Mark's use of language also suggests that

by 'coaching the constructive passion out of him' he was trying to calm down the individual and reduce the levels of emotion and tension in order to be in a position to hear his concerns.

In order to ensure that all supervisors and members of the SHE Enabler Group possessed these valuable, interpersonal skills to engage and tease out safety insights from their colleagues, one element of the multi-faceted intervention was associated with providing specific safety-related coaching training which was delivered by a recognised external supplier. This involved learning about the essence of coaching, how to apply coaching models, such as GROW and role-playing safety conversations.

However, despite being described as "entertaining" by Lawrence, the coaching training appeared to have been poorly received by some members of the SHE Enabler Group and Supervisors who attended. One criticism was that the scenarios they explored in the training did not reflect the real challenges, personalities and friction that characterises shop floor relations. Several commented that the training was aimed at health and safety practitioners when investigating accidents or incidents, rather than shop floor workers:

I think it's more focused on the SHE Team. Not, not really a production SHE environment the guy was briefing to - if you get my gist? It was more like office based. They don't come up with the scenarios that you get; the challenge you get on a daily basis. (Lawrence - S)

So really for us - the shop floor lads that went - It was just over their head, yeah. And they felt very uncomfortable for the days that they were there if they're honest - which they are with me. And for us, it was like, "What are we doing here? (Alistair - S)

Lawrence's comments suggest that he saw the shop floor as a unique environment that few outsiders, such as the course tutor, could understand as no examples were provided that related to this context. Similarly, Alistair's comments indicate that some

of the shop floor workers were uncomfortable attending the course and the information was poorly designed for their needs. His comments suggest that he believed their time was being wasted by attending the training. In stating that his team are 'honest with me,' this suggests that he believed some of the course delegates may not have been honest when describing their experience during the research interviews which he knew were being conducted. One could also perceive both Alistair and Lawrence' comments as a veiled criticism of yet another intervention organised and delivered by outsiders that failed to reflect the needs and expectations of shop floor personnel which aligns with the ingroup / outgroup tension previously described.

Other interviewees who attended the course felt that the coaching training was unnecessary and even patronising, in view of their considerable experience on the shop floor and their daily interactions with their teams.

I think experience brings you to a point where you think, "I do know how to deal with certain people and talk to certain people. Yeah, you know, and cope with certain people. (Mark - S)

I'm probably too old to change the approach. But no, it was, for me, it's just very much what you do as the day job. I suppose the older you get, the more you see this stuff. It's the wheel has been reinvented. (Alistair - S)

This poor training experience may have negatively impacted upon perceptions of being involved in the SHE Enabler Group and potentially demotivated employees from proactively engaging their colleagues on safety voice or maintaining their interest in the group. Pete expressed this sentiment when he described how the momentum of the meetings had declined over time. He went on to describe how:

We probably needed a lot more time on it. But to keep doing that, you only have to look and see there's not so many people coming as often now because they're not really getting anything else out of it. (Pete - E)

This demonstrates the importance of understanding employee motivations for volunteering as well as their expectations regarding their involvement. It also highlights the importance of ensuring that training should be tailored to reflect the needs and context of the audience. In hindsight, the fact that the coaching training was classroom based and required participants to engage in potentially awkward social interactions with their peer group may have placed them in an uncomfortable situation and reduced their confidence to facilitate safety voice. This, in turn, may have caused individuals to shy away from impromptu interactions with their peers on safety. Indeed, the influence of the group appeared to be lost on some employees within the facility – as revealed by a comment from Alan:

I mean, if they've come up with any new ideas or anything around safety culture that they've changed - If they have - I haven't been told or I'm not aware what it is. (Alan - E)

The creation, training and introduction of the SHE Enabler Group exemplifies the nuanced challenges associated with using the behaviour change wheel to design and implement complex and culturally sensitive behaviour change interventions. Far from simply enhancing “physical and social opportunity,” to support supervisor openness, the SHE Enabler Group helped to magnify a plethora of cultural issues that had not been foreseen at the outset of the project.

One element of the intervention which appeared to be effective in facilitating safety voice behaviour and creating open safety discussions was the SHE & Biscuits events. These were dedicated, no-agenda safety sessions that were focussed on increasing the physical and social opportunity for employees to express their issues and were facilitated by supervisors and members of the SHE Enabler Group. Many of the interviewees described them as the most popular and memorable elements of the intervention that were effective at bringing people together:

I think that the SHE & Biscuits events, obviously, that's the main focus anyway, but I think they seem to get people involved and a lot of people seem to enjoy them as well; seemed interested in it. (Ron - E)

As you can see with the interaction we get every time we do an event. Yeah, I think it's pretty good, man. Yeah. Since as it's new, I think it's gone pretty good. Everybody's involved! (Lawrence - S)

These comments reveal that the SHE & Biscuits events had been delivered effectively and were well received by shop floor workers. Furthermore, they suggest the novel events had been successful at creating interaction and engagement around safety issues. They also helped to convey the message that the supervisory team wanted to hear employee issues. The events helped to yield a long list of potential safety issues and improvements that were highlighted by the workforce which supports the evidence of the SHE and Biscuits events as being a highly successful strategy for eliciting employee safety voice. These were revealed by Mark and Roger who commented:

I've got a full A3 sheet [of issues], you know, from the first few. (Mark – S)

People do bring up a lot of a lot of good points at those meetings that we've taken away and some really good points from that. So I think that is definitely something worth carrying on. (Roger - S)

The interviewees suggested several reasons as to why the SHE & Biscuits events were effective in engaging employees. They were novel, dedicated safety events and were conducted in small groups, which served to break down the barriers of hierarchy which may have developed between employees and line managers. They were supported by multiple members of the SHE Enabler Group which may also have helped to overcome issues associated with possessing the confidence to speak up in large, formal groups led by supervision. This was highlighted by Mark who commented:

At first, I was a little apprehensive about how many would turn up but everybody turns up. And I think part of it is – it's a good excuse to have a, you know, an informal chat and it is all about safety. (Mark - S)

The informal, small group aspect of the sessions also appeared to provide the opportunity for individuals to bounce ideas off each other. It could be argued that when one or two individuals began to express themselves, they were acting as role models for safety voice which showed others that it was psychologically safe and socially acceptable to contribute.

Everybody stands around and just gets talking about things. I found that I was stood in a small group. And I found once one person start saying stuff, other people get a bit of an input, and it does get a bit of a decent conversation going. It also triggers other people to start thinking about what they can contribute to that issue, if you will. (Alan - E)

These comments suggest that the SHE and Biscuits events were successful at creating a psychologically safe environment in which employees felt able to express themselves. This may have been because individuals could gravitate to whichever facilitator or group they felt comfortable with which helped to create open, honest discussions.

The events also created a sense amongst employees that the organisation was committed to improving safety and wanted to hear their views; not least because leaders also were in attendance to support the launch of the sessions. The fact that the business had afforded employees “time off the job” and spent money on refreshments and promotional banners may have motivated or incentivised to employees to reciprocate by embracing the events wholeheartedly and voicing their concerns.

It's the way it was organised was - you almost looked at it as well, and think they wouldn't put all this on if just for the fun of it. Yes. They want to hear what you think. (Alan - E)

This active encouragement of safety voice by supervisors gave interviewees a sense that the organisation was committed to safety and wanted to hear employees' views. Two examples of this were highlighted by Gareth and Alan who commented:

Here I feel it's definitely a priority over delivery. Like they're willing to stop parts moving if it's a safety issue. Whereas I've worked in places that the parts move first, then we'll address the problem. (Alan -E)

They do collaboratively take note of it [employee safety voice]. They want you to be safe don't they at the end of the day within this business, shall we say? And others - anywhere within [name of the company]. (Gareth - E)

These quotes provide evidence that the interview participants perceived that the supervisors genuinely cared for their teams, did not want anybody to be injured and prioritised safety. Moreover, they suggest the interviewees had a perception that the supervisors welcomed the communication of hazards that could put their teams at risk so they could prioritise and resolve them. Moreover, Gareth's comment that this sentiment related to 'anywhere within [the company]' suggests that commitment to safety was a cultural norm amongst the supervisor population throughout the company.

6.4.2. Subtheme 2.2: The response to employee safety voice

"Would you keep flogging a dead horse?"

The second subtheme associated with supervisor attitudes and behaviours relates to how supervisors responded when employees had expressed their safety voice. This subtheme was concerned with the extent to which supervisors facilitated the capture, planning and implementation of actions to improve safety and how these improvements were fed back to the employees who raised them. This was deemed an important element associated with safety voice, as the manner in which supervisors addressed safety concerns could influence speaking up behaviours in the future.

The interview participants revealed that many safety issues raised by employees were not captured in a way that was formal and visible to other workers. This appeared to stem from an inconsistent understanding from both employees and

supervisors about the issues that were considered worthy of capturing. For instance, Lawrence commented:

He mentions it at the DSUM. 'Bloody hell - an airline left out blahdy blahdy blah'
 It's a simple answer. You don't need to write it down. Certain issues - you do write down. If you've got a stanchion dropping off the wall? "Get it on the board!"
 That's a major issue that. Yeah but little issues like that. I'm against, putting every little thing on the board, otherwise you're creating a monster. (Lawrence - S)

Lawrence saw himself as being able to differentiate between those issues which were high risk and of imminent threat to those in the vicinity and therefore needed recording and other seemingly minor issues which could be addressed without the need for recording them. Paramount in his thinking was the need to avoid the administrative burden of capturing minor safety issues; all of which would need to be tracked and closed, which could take considerable time and effort for supervisors like himself. This was the "monster" to which he was referring.

However, this inconsistency about what should and should not be captured appeared to create some confusion about the systems in place for recording and resolving safety voice issues. For instance, some interviewees expressed uncertainty about the local systems in place for capturing and tracking issues:

Yeah we have trackers. But not everything necessarily gets put on the tracker. It is supposed to be put on the tracker and what have you. (Pete - E)

There are boards up at the top but I'm not sure how well they're used. (James - E)

I think the guys on the shop seem to think that some of the issues that they deal with on a day-to-day basis are too small to put on the SLAM sheets. So its stuff that we may not record very well. (Roger - S)

Roger's comment revealed that this perceived lack of clarity over the issues that are captured and progressed influenced safety voice, given that some issues were perceived as 'too small' to put on the SLAM sheets. This indicates that employees were left to determine for themselves whether or not it was worth reporting minor issues.

The interview participants also suggested that supervisors and leaders in the area did not consistently prioritise and address safety actions in a timely or satisfactory manner. Several highlighted that safety actions took a long time to resolve, which was also a finding identified in the pre-intervention interviews. Indeed, almost every interview participant could describe examples of actions which had fallen by the wayside:

Things do seem to take a long time to get done in here - you know, issues. Like if we know we have, we've had oil spills in the background. Sometimes it can take a couple of attempts to get it to get it dealt with. But yeah, I mean, yeah, it does always get dealt with eventually. (Ron - E)

I'll sort and then nothing - no. It's selective. (James - E)

Having a tracker doesn't necessarily get the job done. Certain jobs will get to a certain point. And they're just not finished. (Pete - E)

I guarantee that all the things he has raised will still be exactly the same.
(Alistair - S)

These comments suggest that there was significant variability regarding the actions that are successfully addressed and others that require reminders and additional effort. Alistair's comment even suggests that many issues would not be addressed at all.

The response to voice was a key principal of the Stop, Look, Assess & Manage (SLAM) process which was deployed as part of the multi-faceted intervention. The

SLAM process introduced physical opportunities at key times of the day for teams to inspect their work areas. It incorporated A3 sheets (see appendix 19) on which the supervisors could visibly capture hazards and actions that the team had identified. These sheets were permanently displayed on the team DSUM boards and were intended to motivate employees to engage teams with SLAM at the start of the shift and to provide information about the progress of their issues. These same sheets were also used to capture employee issues raised during the SHE & Biscuits events. Generally, the introduction of the SLAM intervention was perceived by shop floor workers in a positive light and provided a daily focus for identifying hazards and raising issues which, in itself, supports the expression of safety voice:

Yeah, we have introduced SLAM. So you know anything - at the morning meetings, anything that we're unhappy about, we bring it up. (Chris - E)

It works it works. Now everybody says it works. It makes everybody aware; the questions I ask every morning, every DSUM that supervisors take, "have you got any SLAM issues? (Lawrence - S)

However, despite the launch of SLAM and the visible focus on safety voice, several of the interviewees complained that the supervisors had either not progressed the issues that had been raised during the course of the intervention or had not kept them informed about the progress of actions. This sentiment was captured by Alan and Ron who pointed out that the organisation had been largely silent following the big push to capture employee issues through SLAM and the SHE & Biscuits events:

I haven't heard anything and if they have - I haven't seen them promoted or "this is what we've done" or anything. Have they done anything? (Alan - E)

It's been more talking about it in here and discussing what we're gonna do about it. And I don't think there's been a lot of other activity. Not that I've noticed anyway. (Ron - E)

This lack of any follow up action or feedback to the teams may well have served to reduce employee's willingness to express their safety issues as the intervention

progressed over time and may have reinforced the notion that speaking up on safety was futile. This issue was recognised by Mark, a supervisor, who reaffirmed his commitment to safety but acknowledged that, as a supervisory team:

We're at risk of doing the same thing with issues that come up with the SHE & biscuits event. And that's probably because the lack of feedback to the guys in the shop. It's probably it's probably turning them off a little bit. (Mark - S)

Several reasons were suggested by the supervisors who were interviewed as to why so many of the issues identified by the workforce had not been progressed. The first was associated with the cost and complexity of some the issues raised by employees that required significant investment which had not been hitherto planned. For instance, Roger and Mark commented:

some things that were brought up were very big, big issues - things like staging being too high on some of the machines and things that are going to cost hundreds of thousands of pounds to fix. (Roger - S)

I don't think there's resources there to do what we want to do. (Mark - S)

These comments suggest that employees had used the SHE and Biscuits and SLAM opportunities to highlight a range of shortfalls to improve safety and not solely just the day-to-day operational issues that were raised in the DSUM. This indicates that the dedicated safety voice events enabled employees to view their workplace with a different perspective that encompassed aspirational improvements as well as daily challenges.

Others pointed to the challenges of the COVID pandemic, which coincided with the deployment of the intervention, as one of the key barriers to the completion of actions. The organisation's COVID controls limited the number of people who could gather for team meetings which interrupted the usual drumbeat of weekly and daily team meetings where feedback would normally be provided. In addition, COVID also had a dramatic impact on the supply chain which hindered the organisation's ability to act on employee safety voice by hampering the acquisition of new or alternative

goods and services. Chris acknowledged that in the wake of COVID, “we're having difficulty getting stuff.” (Chris - E)

Yet these challenges don't wholly account for the inconsistent manner in which safety issues were recorded, tracked and fed back to employees. Several of the supervisors admitted that safety actions had not been progressed and alluded to confusion associated with the allocation of actions and clarity over who should take responsibility for implementing the safety improvements identified by employees. Lawrence appeared to blame the local SHE representative for not taking responsibility for addressing the issues:

There were a lot of sheets compiled of issues that the guys in the shop had.

And they were fed back to, [the SHE rep]. And I'm not sure what he's done with them. I've not had any feedback on any improvements that have been made.

(Lawrence - S)

Another supervisor appeared to resist accepting any actions in the wake of the SHE & Biscuits events claiming that employees should have taken the lead on safety improvements:

We pulled together a list of actions; some of which had my name on, I think.

And it was like “whoa hold on a minute. That's not what this is about!” This is totally about the people sorting out their own issues and getting involved!

(Alistair - S)

This lack of clarity over who should be leading on the coordination and management of safety actions seemed to lead to a situation in which neither the shop floor supervisors or employees believed they were accountable for progressing them. Others blamed the organisation's facilities management contractor for failing to prioritise and act on issues raised by the shop floor teams. Despite having mechanisms for raising and tracking the completion of infrastructure concerns, these processes were not well understood by the shop floor teams. Consequently, this led to frustration when the FM contractor's response fell below their expectations.

I think that's where it falls down a little bit, sometimes as well, because it then it's out of my supervisor's hands and they've passed it onto somebody else. Yeah, a different department or what have you. And then it can get held up there. So just say that it's [name of the FM Contractor] that are going to come in and sort something out. It'll only get sorted out when they actually come and do it. Whether they've got the time, whether they forget about it. (Pete - E)

It may well have been the case that the FM contractor had its own resource issues, challenges and priorities, which were beyond the scope of this intervention. However, it highlights the multiple agencies and actors that can be involved in influencing safety voice at the working level. Nobody appeared to be held accountable for addressing the safety issues raised by the team and it was perceived to be acceptable for actions to be overlooked. This could also be seen as the existence of a culture in which safety was not prioritised.

Several of the themes associated with the organisation's poor response to safety voice were identified during the pre-intervention interviews which suggests that the intervention had failed to influence the manner in which the organisation responded to safety voice and points to an embedded culture in which other issues are prioritised over safety. Furthermore, it could be argued that, whilst SLAM provided a mechanism for recording and tracking safety issues, it did not include sufficient means of motivating supervisors, facilities contractors or employees to complete their actions. Over time, this lack of action and feedback to employees may have caused some of the workforce to lose faith in reporting safety issues which, in hindsight, may have served to reinforce the notion that safety voice is futile.

6.5. Discussion

This study involved interviewing shop floor workers and supervisors who had been exposed to the intervention to understand the extent to which perceptions of safety voice and safety voice behaviours had changed following its deployment. Two themes were generated from the interview findings; the first of which was associated

with perceptions of shop floor identity and its influence on safety voice whilst the second theme explored the influence of supervisor attitudes and behaviours on safety voice. This section summarises the findings of the post intervention interviews and explores the differences between these and the pre-intervention findings. The wider implications from the study as a whole will be discussed in Chapter 6.

The study reinforced that safety voice is a complex behaviour that is shaped by a wide range of factors which, in some circumstances, served to support safety voice and, in others, served to hinder its expression. Theme 1 Subtheme 1 explored how shop floor workers viewed their own sense of collective identity. Shop floor workers were viewed as a competent, close-knit group who 'got on with the job' and valued safety. They frequently raised safety issues associated with their work and their working environment with their supervisors. However, they were reluctant to challenge their co-worker's unsafe behaviours or to raise issues that might result in the imposition of safety measures which could hamper their working practices. A paramount consideration was the need to maintain harmonious relationships with the group and avoid negative consequences. This was particularly important for younger or less experienced employees who were less established members of the group. Employees adopted particular safety voice strategies to mitigate the risk of incurring negative consequences from members of the in-group.

Theme1 subtheme 2 was associated with shop floor perceptions of an out-group who were viewed as an unseen entity comprising leadership and the site SHE teams. The interviewees described this out-group as being committed to preventing accidents and they were perceived to possess the power and authority to investigate incidents and impose solutions on the shop floor teams that were often unpopular and impractical. This group was perceived to lack the credibility and understanding of what it was like to work on the shop floor. Consequently, shop floor workers concealed minor injuries and used silence to avoid attracting the unwanted attention of this out-group. However, when the opportunity arose, they also employed safety voice to reinforce the difference between the in-group and out-group when leaders' safety behaviours were found to be lacking. This cultural and nuanced interplay between the in-group and out-group appeared to be pivotal in determining the safety

issues that employees raised, how they raised them and the circumstances when they preferred to remain silent.

The second theme generated through the interview findings was associated with supervisor attitudes and behaviours towards safety voice. This was also divided into two subthemes. Theme 2 sub-theme 1 explored supervisor openness, which was related to the extent to which supervisors were perceived to be accessible, promoted safety voice and were willing to listen to their employees. As the principal target for safety voice, supervisors played a key role in facilitating a psychologically safe environment and interviewees suggested that supervisors consistently promoted safety voice, provided regular opportunities for its expression and welcomed employee views. However, supervisor behaviours did not always enable safety voice.

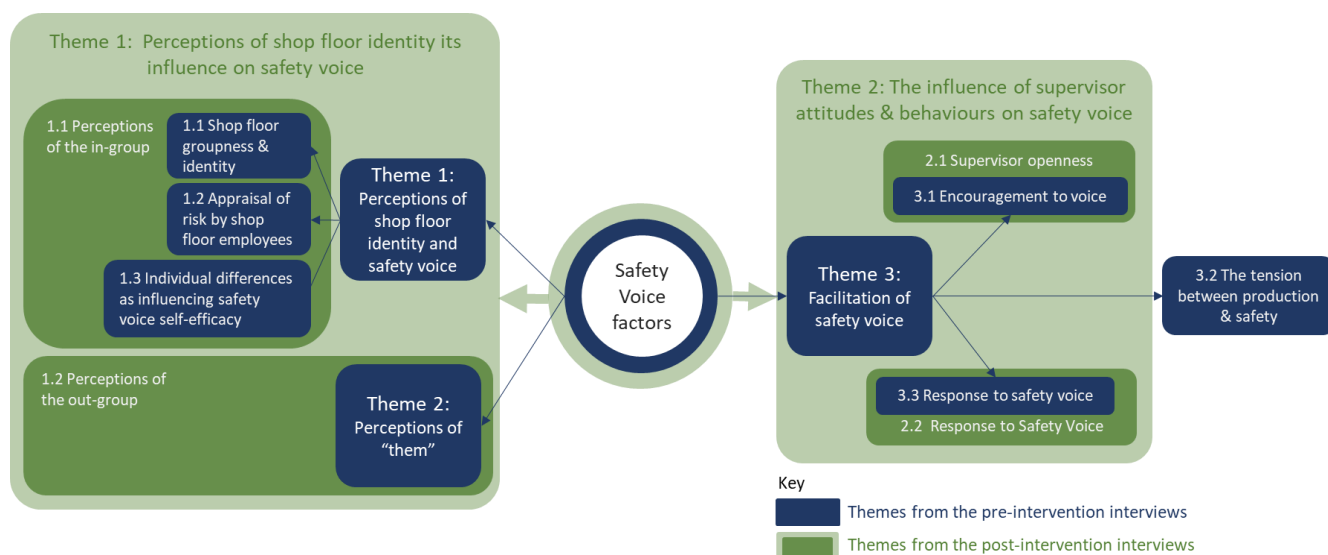
Theme 2 Subtheme 2 considered the response to employee safety voice. The study found that where issues were considered minor and within the supervisors' power to resolve, they were rectified quickly. However, more complex issues that required escalation or input from other stakeholders took time, were more difficult to track or feedback to those who raised them and were perceived to be not completed. This led some employees to believe that it was futile to speak up with their safety issues. The reasons cited for this poor response to safety voice included confusion over what was appropriate to capture, poor action management as well as the cost of initiating change. In addition, the complexity and size of the organisation, the poor allocation of responsibility, poor feedback processes on the part of FM contractors and supplier challenges brought about by the COVID pandemic were also described as reasons for this collective poor response to safety voice.

Comparison of the pre and post intervention findings

This next section reflects upon the pre and post-intervention interviews to explore the extent to which findings differed and how the intervention shaped perceptions about safety voice. The findings are summarised in Figure 19 below:

Figure 19

Comparison between the themes generated in the pre and post intervention interviews



When the findings of the pre-intervention and post-intervention interview analyses were compared, it was evident that both data sets shared similarities. Firstly, consistent themes of shop floor identity were evident both before and after the intervention which shaped safety voice behaviour. Secondly, at both time points, shop floor workers described perceptions of an out-group whose involvement they sought to avoid by concealing minor accidents and withholding their safety voice. In the post-intervention analysis, this was included as a component of the shop floor identity which distinguished the in-group from the out-group. A third similarity was the perceived poor response to safety voice which was prevalent at both time points and was associated with a range of complex issues; many of which were beyond the scope of local supervisors to address. These three consistent themes appeared to reflect long-standing, ingrained cultural and organisational issues which the multi-faceted intervention was unable to influence. In some ways, this was expected, as addressing the behaviours of leaders, the wider SHE team and contractors were not specifically targeted by the safety voice intervention as this would have required a significant transformation in the way the wider organisation was managed. However, the influence of these organisational and cultural issues highlights how safety voice must be understood in the context of a wider organisational system. It also points to the limits of using a toolset like the Behaviour Change Wheel which focuses the

practitioner on addressing a series of targeted local behaviours which can be overpowered by wider organisational, cultural or contextual factors.

One significant difference between the pre and post intervention interviews was that the tension between safety and production was not identified as a clear theme in the analysis of the post-intervention interviews. One reason may have been associated with the timing of the intervention which was deployed during the early phases of the COVID pandemic. The COVID pandemic created widespread disruption to business operations and hampered delivery schedules beyond the control of local management. This period of confusion and shifting priorities may have reduced the emphasis on achieving production targets in the post-intervention interviews.

Another reason may have been associated with the introduction of the SHE & Biscuits events which provided a dedicated time slot, supported by leadership, for a team safety discussion in which operations stopped and supervisors were afforded time to engage their teams. The SHE & Biscuits events were widely regarded by shop floor employees as the most popular intervention and helped to them express a wide range of safety issues. It could be argued that this physical and social opportunity provided a psychological window of space in which supervisors and employees could focus solely on safety without the immediate pressure of other priorities. Similarly, the SLAM intervention also introduced a daily, physical opportunity during the DSUM for teams to identify hazards and raise them with their supervisors. These interventions may have helped supervisors to prioritise safety which created a sense that they were increasingly open to employee's safety issues and less likely to be distracted by other tasks.

Another consistent theme identified in the analysis of the pre-intervention and post-intervention interviews was the importance of supervisors as a key target for safety voice. Shop floor workers consistently described their supervisor as the principal means for raising issues at both time points, despite the introduction of the SHE Enabler Group as one element of the multi-faceted intervention. The introduction of a SHE Enabler Group of "in-group" volunteers was designed to help promote the safety voice interventions and provide an outlet for safety voice if shop floor workers encountered an emergent unsafe condition or situation, without feeling the need to wait for a DSUM or approach a supervisor, given some employees lacked the

confidence to raise safety issues. Their introduction was promoted via a communications campaign featuring posters and banners and group members were provided with specific coaching training to support safety conversations. However, members of the SHE Enabler group were not used by employees for impromptu safety voice. One reason may have been that employees preferred their traditional route of speaking to supervisors or were unaware of the SHE Enabler Group as potential safety voice targets. It is also plausible that employees believed the SHE Enabler Group lacked the influence and resources to progress their issues and that, with the introduction of SLAM and SHE & Biscuits events, teams had even more opportunities to express their safety voice through their supervisors. However, a third reason may have been associated with their perceptions of why the SHE Enabler Group had been introduced and who had instigated it.

One interviewee described how some of the posters featuring the SHE Enabler Group had been defaced whilst another talked in derogatory terms about the purpose of the group. Whilst the number of respondents expressing this view was small, it suggests that some shop floor workers had a negative perception of the group. When viewed against the backdrop of the in-group / out-group tension which permeated the shop floor environment, this negative view of the SHE Enabler Group may have originated from the belief that this improvement group was instigated by members of the out-group. As a member of the SHE team and therefore a member of the out-group, the researcher's presence in leading the intervention may have reinforced this view which may explain why employees did not use the SHE Enabler Group as an outlet for their voice. It highlights that when interventions are designed, it isn't solely *the content* of the intervention that is important but *who* is perceived to be initiating it. This was not fully appreciated at the intervention design stage and was not a consideration identified through the use of the Behaviour Change Wheel.

Chapter 5 was concerned with reviewing the adequacy and effectiveness of the multi-faceted behaviour change intervention by conducting a number of interviews with shop floor workers to understand perceptions of the intervention and the extent to which perceptions of safety voice had changed following its deployment. The next chapter draws together the findings from the broader research project in terms of

psychological and behaviour change theory, safety voice research and how industry can apply the lessons learned.

Reflection

There are several learning points that were gleaned from the design and deployment of the multi-faceted intervention. Firstly, the intervention required supervisor support, given supervisors are the conduit to the shop floor workers. A great deal was done to gain the trust and approval of senior leadership to the project, it could be argued that more could have been done to explain the rationale, approach and interventions to the supervisor population to secure their commitment. The supervisors had very specific motivations and daily challenges which were borne out of production pressures and the rapidly changing COVID environment which placed a great deal of strain upon them. Against this backdrop of change, it could be argued that launching a new safety voice intervention may have been met by active or passive resistance from the supervisor population.

The skills and rituals of the supervisor population also appeared to be deeply ingrained. Some of these rituals were co-opted to support the intervention, such as using Daily Start Up Meetings to launch SLAM, harnessing their extensive knowledge of safety and their recognition of the importance of leadership. This understanding had been gleaned from many years of working with the supervisor population. However, some supervisors were unwilling to embrace the interventions in a positive spirit of change. They resisted the interventions and approached them with a fixed mindset; which was exemplified in their attitude towards the coaching training and derogatory comments around the notion of the SHE Enabler Group. The coaching training involved the introduction of an external trainer who was not present to hear their negative feedback about the course. It could be argued that these supervisors may also have resisted other elements but preferred not to criticise these explicitly to the researcher, given these were explicitly introduced and led by the researcher. Although some supervisors were involved in the SHE Enabler Group and were party to the interventions that were being proposed, this did not include all of the supervisors. It may have been beneficial to clarify the needs and motivations of the supervisor population as well as their attitudes towards change more generally

at the outset of the project. It could be argued that they were in the pre-contemplation stage (Prochaska & Diclemente, 1983) and did not accept the need for the intervention. Exploring their perceptions beyond solely safety voice may have helped to influence the nature of the intervention and the extent to which it was supported and deployed by the supervisors. It could be argued that the BCW does not account for these contextual issues and that having a stakeholder map and analysis tool as part of the BCW may be a useful addition.

The introduction of the SHE Enabler Group also posed challenges. This group was a new innovation within the organisation and yet defining its purpose and setting the boundaries proved to be difficult. Some members of the group were very motivated and had wider aspirations beyond influencing safety voice whereas the interest of other group members waned over time. Aside from vague references to social influences, modelling and enablement, there was no guidance in the BCW for how stakeholder groups should be involved in the design and deployment of interventions. Indeed, in many ways, the BCW could be interpreted as imposing interventions “onto people” rather than harnessing their unique knowledge, experiences and motivation by co-designing behaviour change strategies. Guidance for how and when to involve and empower local teams would have been beneficial. One of the positive aspects of the intervention was that the SHE Enabler Group carried on after the intervention had finished. The group continued to meet on a regular basis after the intervention had finished and continued to expand SHE & Biscuits events by featuring a range of topics that included prostate cancer awareness and ideas for how to save energy. Moreover, the SHE Enabler Group continued to generate and implement ideas for how to positively influence their culture. After the safety voice intervention concluded, they deployed a poster campaign which was designed by the children of employees in the target facility to promote workplace safety. This simple initiative sparked several employee engagement activities that involved the local leadership inviting the children in for a tour of the facility, disseminating rewards and gift packs and the planting of a tree. The original children’s poster campaign took pride of place in their reception and has been replicated by other teams across the target organisation.

The concept of the SHE & Biscuits events was also adopted by other teams across the organisation. Given the simplicity and informality of the approach, they were frequently used by both supervisors and leaders to create a conducive environment to capture perceptions from the shop floor about the barriers and challenges to safe working. They have since become part of the engagement toolkit for teams the organisation. Indeed, colleagues from the target facility were regularly consulted for guidance on how they should be run.

However, the reach of the intervention was limited. The Night Shift was not included, which was an oversight that only emerged during the post-intervention interviews. This meant a number of employees were not able to access the SHE & Biscuits events, given they were run during the day and may have been prevented from speaking up in the same way as co-workers on the day shift. However, they would have been able to utilise the SLAM process and access the communications materials.

On reflection, the SHE Coaching training was also too theoretical and, although it may have provided techniques to engage team members, it may not have fully equipped members of the SHE Enabler Group with the capability, opportunity or motivation to address employee safety issues. Indeed, the SHE Enabler group were in a difficult position when it came to engaging their peers on safety issues. Challenging their colleagues had the potential to damage harmonious relations. They may not have been viewed as credible safety voice targets amongst employees. In addition, group members may have also lacked the confidence, resources or the authority to address the issues raised by the teams. This may have caused SHE Enabler Group members to feel more inclined to avoid rather than engage their colleagues on safety issues; an issue which had not been fully appreciated when the intervention was designed.

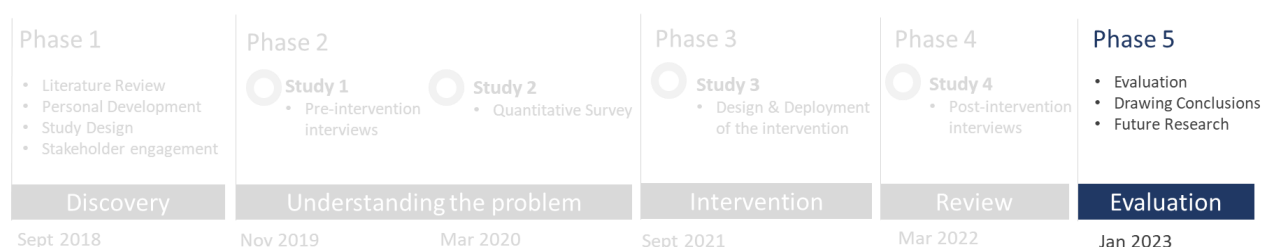
In addition, the intervention failed to explicitly address poor action management which was evident both before and during the intervention. In hindsight, more could have been done to motivate those in leadership and supervisory roles to capture and address actions through objectives, targets, incentives or even coercion.

7. Chapter 6: PHASE 5 – Evaluation

Chapter 6 is concerned with evaluating the project as a whole and drawing conclusions about implications of the study from an academic and wider industry perspective. This fifth and final phase, which is highlighted in the diagram below, also highlights the wider impact of the study and how the learning will be disseminated.

Figure 20

Phase 5 in the context of the wider study



7.1. Overall discussion

The overall objectives of this research were to a) identify the factors which influence employees' safety voice behaviours in manufacturing, b) develop measurements for safety voice behaviour, c) determine the extent to which the behaviour change wheel (BCW) is useful in developing a behaviour change intervention to increase employees' willingness to express their safety voice, and d) to identify the behaviour change interventions that are effective in shaping safety voice behaviour.

The research found that safety voice is a complex behaviour that is shaped, in the context of manufacturing, by a wide range of factors. Indeed, the research supports Noort et al.'s (2019a) assertion that safety voice is best understood from a systems perspective, given the wide range of variables and actors which can influence speaking up behaviours. These included the nature of the hazard, individual factors associated with confidence and self-efficacy, the perceived consequences and outcomes of speaking up, supervisor openness as well as the extent to which safety

voice is encouraged. The research also found that safety voice in aircraft manufacturing is influenced by perceptions of identity and maintaining harmonious in-group relations amongst shop floor workers, whilst protecting against the involvement of an outgroup comprising SHE and the senior leadership team.

Conchie et al. (2012) defined safety voice as behaviours that seek to improve safety by identifying current limitations and possibilities for positive change” (p.105). This research found evidence that the construct of safety voice serves wider purposes than simply to highlight safety shortfalls known as preventative voice and improvements, known as promotive voice (Liang et al., 2012). In aircraft manufacture, safety voice was used to differentiate in-group attitudes, values and behaviours from those of the out-group which suggests the need to expand the safety voice construct to reflect these wider dimensions. In a study on generic employee voice, Morrison (2014) differentiated ‘prosocial voice,’ which was associated with improving workplace conditions, from ‘defensive voice’ which was driven by self-protection and was associated with re-directing blame and attention to others. This research indicates that, when considering safety voice, this ‘defensive’ component may not just apply to individuals but also to the protection of group norms, values and behaviours. However, further research is needed to define this dimension of safety voice. Considering safety silence, this research supports the findings of Manapragda and Bruk-Lee (2016) who identified that employees are motivated to remain silent based on perceptions of harming relationships, perceptions of the organisational climate, an evaluation of the hazard or associated with characteristics of the job.

In adopting a critical realist standpoint, several mechanisms were identified which underpinned safety voice behaviours. These important mechanisms can be viewed as the underlying processes and structures which were undeniably present within the workplace, which served to facilitate or constrain the expression of safety voice by shop floor employees. They included communication channels, training and information on when, how and what to report and the support provided by critical such as supervisors, safety representatives, leadership and contractors. Moreover, these mechanisms also included procedures relating to feedback, safety investigations, supervision and hazard identification, as well as the existence of

mechanisms relating to the infrastructure of the workplace. These included items such as alarms and early warning signals, the workplace layout and the nature of equipment and infrastructure. In addition, social factors such as cultural norms and co-worker support can also be viewed as mechanisms.

These mechanisms can be viewed as antecedents to safety voice, although the complex interaction between these causal mechanisms varied according to situational and other factors. Explaining why some mechanisms triggered safety voice whilst others did not, helps in understanding the factors which shaped safety voice behaviours and explains why some safety voice outcomes appeared to be unpredictable. For safety voice to be triggered, several of these mechanisms were required to be enacted. For instance, one of the consistent findings from the research interviews was that shop floor employees frequently reported issues impacting the safety of the aircraft. This suggests that several mechanisms had been triggered. Firstly, information and training about what, when and how to report had been understood. Secondly, work instructions that clearly explained the quality of the work required were available. Thirdly, communications channels were in place for individuals to report issues. Fourthly cultural norms existed that prioritised and supported the reporting of aircraft-related issues. Fifthly, systems were in place to receive and address these reports. Finally, feedback mechanisms were in place to respond to the issue and demonstrate that employees' safety voice had been welcomed.

The fact that outcomes differed depending on the context and nature of the hazard or issue, highlights that these mechanisms were sensitive to a wide range of additional factors. These include self-efficacy, the interpretation of the hazard and beliefs about the consequences of speaking up. This underscores the relevance of adopting a holistic approach to this research which is at the cornerstone of critical realism. The outcome of the interplay between these mechanisms was either the expression of safety voice or safety silence.

This chapter is divided into six sections to consider the learning and implications from this overall research project. It will discuss a) the factors which influence safety voice in aircraft manufacture, b) an evaluation of the use of the Behaviour Change

Wheel, c) an evaluation of the adequacy and effectiveness of the intervention on increasing employees' willingness to express their safety voice, d) study strengths, limitations and future research, e) the impact of this research; and f) how the lessons learned from this research have been disseminated.

7.2. Factors which influence safety voice in aircraft manufacture

The shop floor workers that were interviewed described being provided with numerous physical opportunities to raise safety issues throughout their working day either to their supervisor, the local SHE representative or via company reporting mechanisms. They also described being routinely asked for their safety input by supervisors as part of their daily start up meetings. Hence, the barriers to speaking up were associated with aspects of psychological capability and motivational factors.

The findings from the interviews indicated that employees' risk perception of the hazard was an important element in the decision to express or withhold safety voice which aligns with other research on the motives relating to safety silence (Managragda & Bruk-Lee, 2006). If employees perceived that a hazard was unlikely to result in injury or if they perceived the potential injury or outcome to be inconsequential, they were not motivated to report it. This suggests that adding a construct of "hazard factors" to the model of employee silence proposed by Miliken et al, (2003) would make it applicable to safety voice as opposed to generic employee voice. The findings also revealed that the anticipated outcome of safety voice shaped whether employees would speak up. If shop floor workers perceived that their safety voice would be ignored or if they perceived the organisation lacked the resources or motivation to investigate and rectify the issue, they were less likely to speak up. Consequently, minor injuries and hazards, which were not prioritised by supervisors, were inconsistently reported whereas raising product safety related issues were perceived to be a priority to both shop floor workers and management. The organisation appeared to welcome the escalation of product safety issues by the way in which they were thoroughly investigated and problems rectified. Clearly, the potential outcome of a product safety failure in aviation could be catastrophic which appeared to motivate employees to speak up about these issues because they

understood that management would act. This lends weight to evidence found in other industries that, before speaking up, employees perform an evaluation about the likelihood and severity of the hazard as well as the outcome of whether their safety voice will lead to action (Burris et al., 2017).

The existence of a shop floor identity was also identified as an important factor which influenced not only whether employees spoke up but also what was voiced and the safety voice strategies they used. The pre and post intervention interviews revealed that shop floor workers often remained silent about perceived minor issues and instances where their colleagues had breached safety rules to avoid conflict and maintain harmonious relations with the group. This finding supports previous research regarding the powerful influence of co-workers on safety silence (Manapragda & Bruk-Lee, 2016; Aktas & Kagnicioglu, 2023).

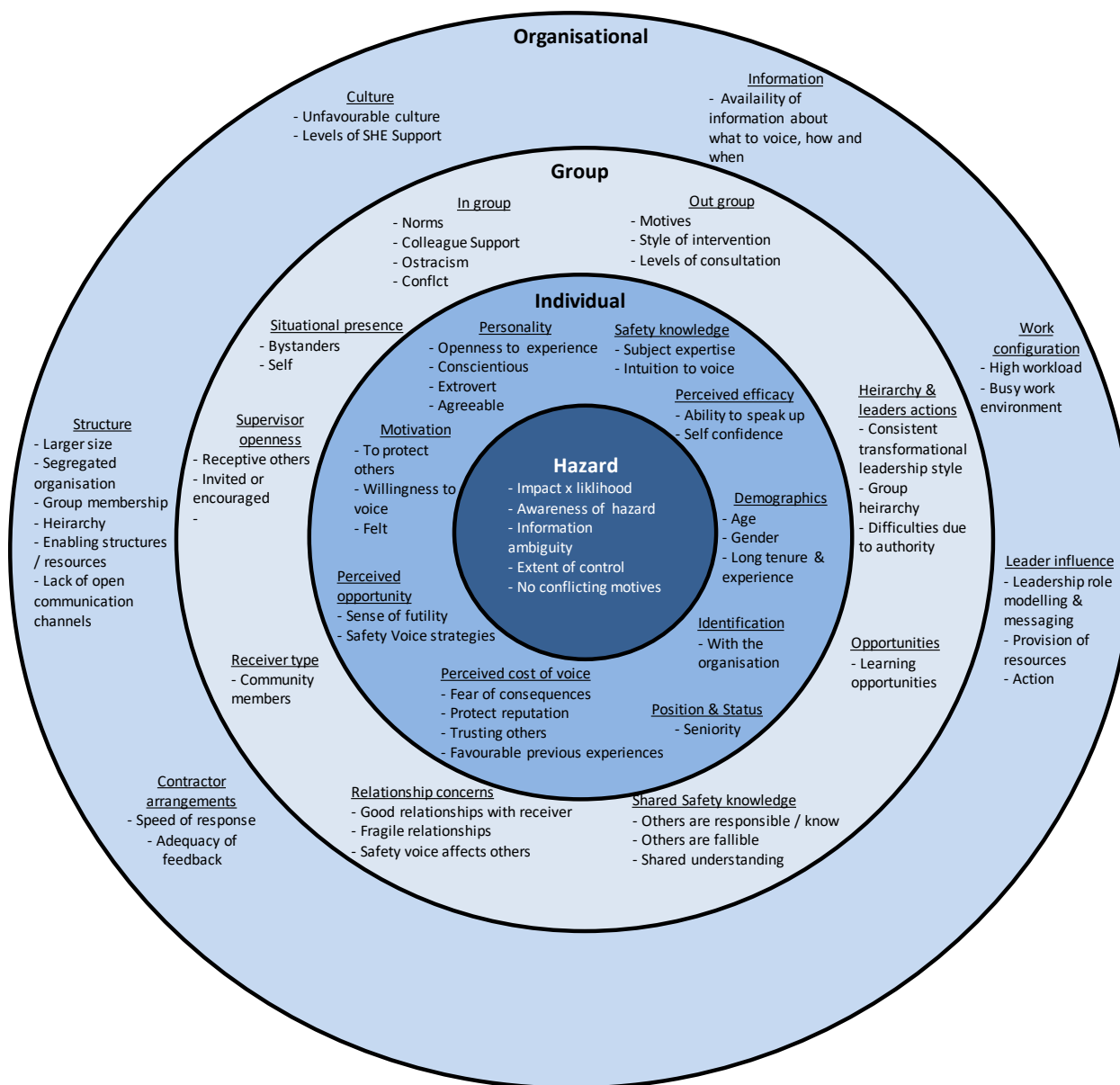
To avoid becoming embroiled in conflict with their co-workers, which might damage relationships, some interview participants described employing clandestine strategies to flag up unsafe behaviours to their supervisors without disclosing their identity to their colleagues. These strategies enabled employees to protect their co-workers whilst, at the same time, relieving themselves of any guilt for failing to speak up about an observed transgression. The interviewees described proactively looking for a supervisor and speaking to them face-to-face in a meeting room in which they could not be overheard, speaking to supervisors in hushed tones as they conducted their inspections and raising issues anonymously using a shared email address on the company safety reporting system. They were designed to minimise in-group conflict amongst shop floor workers, mitigate the risk of individuals from being ostracised by the group and prevent the involvement of a perceived out-group which comprised of leadership and the wider SHE team who were viewed as imposing excessive and unpopular safety initiatives on the teams. This notion of safety voice strategies is a novel finding and goes some way to answering Violato's (2022) recommendation for further research about how speaking up behaviour occurs, its outcomes and how safety voice is received.

From a theoretical standpoint, this concept of a perceived in-group and out-group points to the importance of Social Identity Theory (Tajfel, 1979) in safety voice. Shop

floor workers appeared to unify behind shared attitudes, values, beliefs and behaviours which were learned through experience and reinforced through name calling, conflict and interactions with the perceived out-group. This aligns with the social categorisation, social identification and social comparison processes of Social Identity Theory (Tajfel, 1979). Moreover, shop floor workers appeared to use safety voice as a means of reinforcing the boundary between the in-group and out-group, which sheds light on how safety voice is used in complex, culturally diverse workplaces (Jones et al., 2021). For instance, whereas shop floor workers preferred silence to challenging their colleagues, several interview participants described how it was acceptable (and even enjoyable) to report or directly challenge members of the out-group, such as leadership, unfamiliar workers or new employees, when they breached safety rules. Again, using safety voice to define social boundaries is a novel finding and is worthy of further investigation. This goes some way to answering Aktas and Kagnicioglu's (2023) call to undertake further studies regarding group norms the formation of group norms and safety voice behaviour in aviation. The diagram below (See Figure 21) shows the wide range of factors drawn from this research project that appeared to influence employee safety voice. It reveals the importance of hazard, individual, group and organisational factors in shaping whether employees speak up.

Figure 21

An ecological diagram of the factors which influence safety voice



7.3. Evaluation of using the Behaviour Change Wheel

This research employed the use of the behaviour change wheel (Michie et al., 2014) to design and implement a multi-faceted intervention to increase employee safety voice. Understanding and evaluating the effectiveness of the BCW was one of the objectives of the research project. From a practical perspective, the COM-B element helped to engage members of the senior leadership team from the target organisation on the behaviour change approach to be taken and helped inform the

question set developed for the interviews. The methodology was logical, systematic and helped to identify shortfalls where change was required. Meanwhile the Theoretical Domains Framework (TDF) was particularly helpful providing numerous ideas for behaviour change strategies that could be selected. These experiences align with others who have effectively used the BCW to design interventions (Murtagh et al., 2018; Saarikko et al., 2021; Asimakopoulou & Newton, 2015).

However, using the BCW and developing analysis tables in support of the intervention was time-consuming and repetitive which reflect the findings of other practitioners who have used the BCW in real world situations (Surendran et al., 2023; Mitchell, 2011; Beyene et al., 2019). Some of the terminology used was difficult to communicate and had to be modified to be understood by some of the business stakeholders. More importantly, the process did not aid in identifying some of the nuanced factors that proved critical to the outcomes of the intervention, such as tailoring the training to suit the audience and perceptions of identity in terms of who was perceived as instigating the intervention. Whilst effective at identifying “what” components should be included in a behaviour change intervention, the BCW failed to include important elements about “who” is best placed to deliver an intervention, “how” it is best delivered and in which order elements should be implemented. It could be argued that that these critical elements need to be informed by those who know the target audience intimately. This research project on safety voice has revealed just how important these nuanced factors can be. Indeed, it supports Ogden’s (2016) claim that the behaviour change wheel fails to reflect the variability in behaviour.

Another criticism of the BCW was the extent to which the descriptions in the guide were sufficient in order to prioritise and select the target behaviours and intervention functions. Following the pre-intervention interviews, a long list of behaviours that were deemed important to safety voice was generated which were subsequently streamlined into a manageable list of 12 behaviours and subsequently refined into eight target behaviours. During this process of refinement, the BCW guide recommended reflecting on questions about the extent to which changing behaviour will lead to the desired outcome, ease of measurement, the potential impact on other related behaviours and the likelihood of change. However, there was no scoring

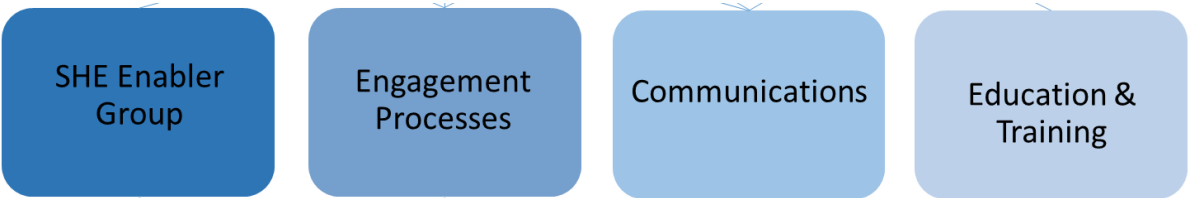
mechanism about how to apply these. Similarly, when making judgements as to which intervention function to select using the APEASE criteria, the guide offered little for how to make anything other than a subjective judgement. Consequently, when Brierley and colleagues (2022) applied the same criteria, they did so qualitatively. Meanwhile others have used quantitative scoring mechanisms (Gallant et al., 2024) to determine whether the APEASE criteria was satisfied. These examples demonstrate the variability in how practitioners are required to make subjective and pragmatic decisions in a scientific study (Whittal et al., 2021).

7.4. Evaluation of the intervention

The intervention, which was developed using the BCW, involved the establishment SHE Enabler Group, the creation of engagement processes (such as SHE & Biscuits events and SLAM process), communications and aspects of education and training (see fig 22. below).

Figure 22

The components of the intervention



It could be argued that aspects of the intervention were successful at increasing employees' willingness to speak up. The SHE & Biscuits intervention, which focussed on increasing physical and social opportunities to speak up, was an engagement process that was popular with shop floor teams and helped employees escalate safety concerns with their supervisors and SHE Enabler Group facilitators. Its success lay in the fact it was novel; it was perceived as the business investing in the safety insights of the team which helped to reinforce that the leaders were committed to hearing the views of shop floor workers. Indeed, the presence of leaders to launch the SHE & Biscuits events helped to set the tone for the successful

events. This underlines the importance of leadership commitment in shaping voice behaviour (Detert & Burris, 2007; Conchie et al., 2012; Tucker & Turner, 2015). This collective investment in time and money relating to safety voice encouraged employees to reciprocate by expressing their safety concerns which points to the importance of Social Exchange Theory (Blau 1964) in improving the frequency of safety voice behaviours. Providing incentives (in the form of free mugs and refreshments), allowing employees time off the job and acquiring leadership support, appeared to create the antecedent conditions in which employees felt willing to share their safety experiences and insights. This aligns with the principle of reciprocity which has been shown to motivate responsible behaviours (Cialdini, 2017). The manner in which the events were facilitated also appeared to provide a psychologically safe space for employees to effectively share their views. The study found evidence that providing dedicated opportunities for employees to express themselves in informal, small groups, in their local workplace and with facilitators they could gravitate towards encouraged shop floor workers to speak up. This aligns with some of the research on the effectiveness of group huddles (Lee et al., 2023) and helps answer Hirak et al.'s (2012) call to understand how psychological safety develops in real world settings.

Similarly, the SLAM process provided employees with physical time and opportunities to identify hazards and a mechanism for ensuring that their issues were captured by supervisors. These were used by the shop floor teams to raise issues and actions which were visibly displayed by supervision on A3 sheets in the workplace to show employees that their safety voice had been heard. This element was also designed to apply pressure on supervisors to act and allowed employees to hold their supervisors accountable for progressing their issues. This sought to harness a sense of felt obligation for constructive change by supervisors which Liang et al. (2012) highlighted as a critical antecedent in employee voice generally.

Yet despite this focus on the response to safety voice, it was clear that actions from both the SLAM process and SHE & Biscuits events were not effectively managed or fed back to the team (see section 6.4.2). The reasons suggested by the interview participants for this poor action management included the time taken in a large organisation to initiate change, excessive demands on the supervisors and the

reliance on contractors; each of whom have their own priorities and resourcing challenges. There was also confusion about who was responsible for progressing safety actions, which may have been exacerbated by the introduction of the SHE Enabler Group, given that some supervisors assumed that members of the SHE Enabler Group were leading on their closure. This was an unintended consequence of the intervention which was not fully appreciated when the SHE Enabler Group was formed. It also suggests that the intervention did not adequately address the issue of supervisor motivation to respond effectively to employees' safety concerns which points to the fact that more could have been done to harness the influence of leadership in the facility to ensure that actions were being progressed. Studies have shown that culture change initiatives often lead to unintended and often undesired outcomes amongst employees because of management and leadership behaviours (Harris & Ogbonna, 2002). It could be argued that these leadership factors were underestimated in this research. When the lack of action is considered in the context of Social Exchange Theory (Blau, 1964) one might anticipate that, over time, this may have served to reinforce the perception amongst employees that it is futile to speak up. A lack of action and feedback was identified by Miliken et al. (2003) as a major factor in influencing silence. This may have increased cynicism amongst employees about the importance of safety within the organisation and led to the withdrawal of safety voice. Indeed, it is plausible that, over the longer term, the intervention may have adversely impacted safety voice within the target facility.

Other elements of the intervention also did not work as anticipated. The SHE Enabler Group and a supporting communications campaign was formed to help overcome perceived barriers to engaging with supervisors by offering an alternative route for raising safety concerns. It was also designed to empower employees through the SHE Enabler Group to take an active role in safety by flattening the hierarchy in the organisation which has been shown to be effective in other studies (Hechanova-Alampay & Beehr, 2001). Yet, shop floor workers did not use members of the group to express impromptu safety voice. This may have been because other avenues for speaking up, such as DSUM's or speaking directly to their supervisors, were preferable to employees. Another reason may have been that the SHE Enabler Group was in its infancy and may have been perceived by shop floor workers as lacking the perceived credibility and power to initiate change. Marshall et al. (2013)

has demonstrated that when individuals were faced with uncertainty about decision-making, they sought support from those who were in higher status roles, possessed experience and were perceived as trustworthy and approachable; all of which took time to establish. It is likely that the short duration of the intervention did not provide enough time for the SHE Enabler Group to gain the trust of shop floor employees. On reflection, incorporating a leadership sponsor to champion the SHE Enabler Group and its activities may have increased the focus on the group, built credibility amongst employees and helped to ensure that safety actions were tracked to completion. By lending distal support to the group where it was needed rather than being directly involved in its activities (which may have deterred shop floors from participating), a leadership sponsor may have helped the SHE Enabler Group overcome challenges and created a perception, amongst group members, that the SHE Enabler Group was empowered and trusted to initiate change.

Some interview participants suggested that employees who volunteered for the SHE Enabler Group were negatively labelled by their peers for participating. This was an unintended outcome which may have served to discourage members of the SHE Enabler group from proactively engaging shop floor workers regarding their issues and may have motivated employees to withhold their safety voice or seek another avenue for verbalising their safety concerns. Underpinning this negative labelling of SHE Enabler Group members was the shop floor culture which viewed stepping out from the in-group norms as undesirable. This 'name-calling' may have been used by shop floor workers to define and show other in-group members the circumstances when individuals were stepping close to the acceptable boundaries of in-group behaviour. The in-group saw themselves as people who 'get the job done' whereas supporting an employee representative group was perceived by some as a distraction to their production goals. It was evident that the numbers attending the SHE Enabler Group meetings began to dwindle over time which was partly associated with a lack of action by the supervision team to initiate change and partly as a consequence of being negatively labelled by peers. This was a nuanced influence on safety voice that was not fully appreciated during the intervention design and not brought to light through the use of the behaviour change wheel (Michie et al., 2014).

The communications and promotions were another aspect of the intervention which appeared to play a minor, supportive role. The posters, banners, mugs and pop-up banners that were used to promote safety voice and, in particular, the SHE Enabler Group as safety voice targets were noticed by the interview participants. They provided a backdrop to the introduction of the SLAM and SHE & Biscuits interventions and were intended to link the various strands of the intervention together. However, their impact on encouraging individuals to raise issues to the SHE Enabler Group was limited. Several interview participants stated that safety promotions were already ubiquitous across the workplace and perceived the safety voice promotions as simply an addition to the plethora of messages already present. It is plausible, that by not clearly differentiating the safety voice promotions from pre-existing communications messages, shop floor workers may have associated the safety voice promotions and consequently the wider intervention as initiated and implemented by members of the SHE team; a group that were perceived by the shop floor as the out-group and who frequently used safety posters and banners to encourage safer behaviours. (This may have been compounded for those who recognised the researcher as a member of the SHE team.) This potential association between the research project and the out-group may have discouraged employees from wholeheartedly embracing the safety voice project and using the SHE Enabler Group as a target for their safety voice, which was a factor not fully appreciated during the intervention design. In hindsight, it may have been beneficial to remove the pre-existing posters well before the launch of the safety voice campaign to demarcate one communications campaign from another or to have used different types of media that were very different to what had been hitherto used.

Another element of the intervention that was intended to help improve safety conversations and elicit safety voice from the shop floor workers was the safety coaching training provided by a recognised training provider. This was delivered to supervisors and members of the SHE Enabler Group to equip them with the knowledge and skills to tease out safety insights and experiences from shop floor workers. However, this classroom-based training was criticised by a number of the delegates who attended. Some of the supervisors believed they already possessed effective employee engagement skills and felt they had nothing to learn. Other members of the SHE Enabler Group, who were shop floor workers, felt

uncomfortable being put on the course and engaging in unusual role play exercises in an unfamiliar classroom setting. It suggests that this classroom-based, interactive approach was inappropriate for the target audience and that more consideration should have been given to the style and type of training that was provided. If the training underwhelmed or overwhelmed the participants, it is likely that members of the SHE Enabler Group would have avoided using coaching skills or at worst may have avoided engaging teams in safety related interactions altogether. This may be another factor as to why employees did not engage with SHE Enabler Group members with their safety issues and was another unintended consequence that was not foreseen when designing the intervention. These nuanced implications of the style and type of training was also not fully appreciated when safety conversation training was identified as an intervention through the use of the Behaviour Change Wheel methodology. It highlights again that the Behaviour Change Wheel must be used with a degree of caution and prior insight about how an intervention should be deployed.

7.5. Theoretical contribution

The research offers five key implications that contribute to theory and academic research on safety voice, the factors which underpin it and interventions to increase it. This study is the first that examines safety voice in aircraft manufacturing which is a safety critical environment in which shop floor employees work together in stable environments for long durations (see Section 1 and 2.2. for the workplace context). Accordingly, it provided insights into the importance of ingroup and outgroup dynamics in shaping safety voice and identified the relevance of Social Identity Theory (Tajfel & Turner, 1979) in understanding safety voice and safety silence behaviours. The study revealed that employees often prioritised silence to speaking up about their colleagues' unsafe behaviours which reflects the findings of other research (Brondino et al., 2012; Miliken & Morrison, 2003). This is logical, given in aircraft manufacturing, employees tend to work together in small, stable work teams for long periods of time and are therefore motivated to maintain harmonious relations. However, the research also found that employees expressed pride and even enjoyment at calling out the occasions when outgroup members, such as

leadership exhibited unsafe behaviours. This use of silence to protect one group but safety voice to expose another appeared to be one way in which shop floor employees differentiated and reinforced the boundaries between ingroup and outgroup members which is a novel finding in the safety voice literature. It also identifies the need to expand the construct of safety voice to include this element associated with protecting and differentiating in-group values, norms and behaviours from those of an out-group.

Secondly, this study underlined the importance of taking an ecological perspective when exploring the factors which influence safety voice behaviours at shop floor level. Previous research has separately considered the importance of hazard factors (Manapragda & Bruk-Lee, 2016), leadership (Conchie et al., 2012), supervisor openness (Tucker & Turner, 2015) and supportive co-workers (Tucker et al., 2008) as antecedents to safety voice behaviours. However, this research found evidence that safety voice is a complex, nuanced behaviour that is influenced by a wide range of systems, people and processes that operate at a multitude of levels. This support's the view that safety voice is best understood from an ecological perspective (Noort et al., 2019a).

Thirdly, this study demonstrated how psychological safety can be developed. The SHE & Biscuits events appeared to create an environment in which shop floor employees felt willing to speak up about safety concerns, observations and ideas. These market stall events were informal, supported by leaders, widely promoted and were facilitated in small groups and by facilitators to whom employees could gravitate. The presence of co-workers and incentives also served to stimulate discussion and a long list of improvements was generated. From a design perspective, these events were drawn from the findings of other studies associated with leadership (Salazar et al., 2014), huddles (Lee et al., 2023), supervisor openness (Tucker & Turner, 2015) and incentives (Habyarimana & Jack, 2011). Thus, the SHE & Biscuits events helped to answer Hirak et al.'s (2012) call to demonstrate how psychological safety can be developed in a real world setting.

Fourthly, the study demonstrated how shop floor workers used safety voice strategies which was a novel finding. For this group these were clandestine ways of

addressing unsafe acts in which shop floor employees raised concerns about the unsafe behaviours of their co-workers in a way that protected their identity and mitigated the perceived negative social consequences that may arise from engaging in conflict. This finding helps in understanding how safety voice occurs (Noort et al., 2019a) and also places safety voice into the literature relating to conflict in the workplace (Bochatay et al., 2019).

Finally, this research explored the use of the BCW in the development, design and implementation of a multi-faceted safety voice intervention in a complex environment. The BCW has been used extensively by many researchers in a wide range of environments and aided in engaging stakeholders, prioritising behaviours and developing the intervention. However, this research identified shortfalls relating to its use which mirror the challenges that other researchers have faced. These included practical challenges associated with the design templates (Surendran et al., 2023; Mitchell, 2011; Beyene et al., 2019) and ambiguity about how to subjectively refine and select behaviours and intervention functions (Whittal et al., 2021). Ogden (2016) in particular, has been highly critical about how the BCW drives a behavioural intervention down a certain path and fails to reflect the variability in behaviour or the experience and knowledge of the behaviour change practitioner. These criticisms were borne out in this research project particularly in relation to the deployment of safety coaching training which revealed that the BCW failed to identify the specifics of how interventions should be deployed.

7.6. Study strengths, limitations and future research

There are several strengths associated with the research. From the perspective of transferring learning into the workplace, this safety voice project has demonstrated the importance of engaging the workforce about the barriers and enablers to behaviour before interventions are designed. This is one of the fundamental elements of 'understanding the problem' which is a first phase of the Behaviour Change Wheel (Michie et al., 2014). This process helped to identify a wide range of nuanced factors which influenced safety voice which may not have been fully understood or appreciated. These factors were analysed and informed the design of

a behaviour change intervention which was aimed at addressing the specific issues and challenges faced by supervisors and employees in the target facility.

The intervention also highlighted the importance of creating physical opportunities for shop floor workers to engage in safety voice behaviour. Interventions like the SHE & Biscuits events and SLAM provided dedicated opportunities which, in themselves, demonstrated a commitment on behalf of the organisation that employee safety voice was valued. The manner in which the SHE & Biscuits events were delivered also appeared to create an environment of psychological safety in which employees could express their safety concerns in small groups with colleagues of their choosing. The study also revealed the importance of managing actions, holding supervisors to account for their management and providing timely effective feedback to those who have safety concerns in order to ensure they feel their issues are being considered and taken seriously. These are lessons that can be applied in other industries.

The research also identified that shop floor employees pursued different safety voice strategies to mitigate inter-personal risks, depending on the nature of the hazards and the social context. This was a novel concept that is worthy of further investigation. It would be interesting to research how and why safety voice strategies are formed, when they are used, for what issues and the extent to which they are successful. In this regard, parallels could also be drawn with the research conducted by Noort et al, (2021b) on muted safety voice which could be interpreted as weak signals that employees are dissatisfied with the safety behaviour or their colleagues or the organisational safety arrangements in place.

However, there are several limitations of the research worth noting. Firstly, it was conducted in a single facility with a relatively small population of shop floor employees in a traditional machine shop environment. It may have been the case that the cultural issues identified in the target location would have differed had the study been replicated elsewhere, and that the intervention may have yielded different findings. It is therefore recommended that this research is replicated in other environments within aircraft manufacturing, such as chemical treatments facilities, maintenance and aircraft fitting.

Secondly, the timeframe of the intervention was of a relatively short duration (2 months) and may not have given the opportunity for elements like SLAM and the SHE Enabler Group to become embedded. A longer study may have provided more information about how safety voice is influenced over the longer term and how interventions can be modified over time, to yield optimum results. It would also be interesting to carry out a follow up study in the same organisation to understand whether the interventions were sustained and whether employee safety voice increased or declined over time.

Thirdly, from a qualitative perspective, the positionality of the researcher as an employee of the target organisation and partial insider also had advantages and disadvantages (Berger, 2015). As a partial insider, the researcher was able to understand the language and terminology used by interviewees as well as the production context and safety processes that were discussed. Having a personal knowledge of some of the key stakeholders from a leadership, supervisory, communications and SHE perspective also provided access to participants and helped to ensure that the intervention was delivered in a manner that was structured, professional and in line with budgetary and time constraints. However, as a partial insider, this positionality could also have led to incorrect assumptions being made, bias and even defensiveness, if employees raised issues about aspects of safety that had involved the researcher in their capacity as an employee. Efforts were made to mitigate this risk of bias by adopting a reflexive approach and ensuring that the research was closely supervised by independent academic supervision. Nonetheless, these factors may have influenced the type of questions that were posed to the interview participants, the analysis and the themes that were developed. Similarly, as a partial insider, the researcher may have been perceived by the interview participants as a member of the out-group, which may have deterred them from being as open and honest as they may have been with an independent researcher. Future studies should therefore consider the use of an independent researcher to elucidate whether that would yield more detailed data.

The research methods employed in the study also changed from the original design to focus predominantly on qualitative sources of data. The original intention was to

design and deploy a safety voice questionnaire at pre and post intervention to measure change in the antecedents of safety voice as well as speaking up behaviours. However, the completion rates of the pre-intervention questionnaire fell far below expectations and, as a result, the quantitative elements were abandoned. One explanation for the low completion rates of the survey was the influence of the COVID-19 pandemic which coincided with the launch of the questionnaire as discussed previously (see Section 4.17). Against this backdrop, it is highly likely that the completion of the safety voice questionnaire was not viewed as a priority to supervisors or employees generally. It is also the case that employees may have been exhausted by completing so many surveys and that another questionnaire on safety voice proved unpopular. In hindsight, utilising or adapting pre-existing questionnaires that were issued by the organisation to gauge employee attitudes to safety during the COVID-19 pandemic may have been more palatable to the business and may have yielded wider insights about employee attitudes to safety voice. This was borne out by Tedone and Lanz (2024) and Abrams et al. (2023) who studied safety voice in healthcare organisations during the pandemic. The abandonment of the survey prevented a detailed understanding regarding the antecedents of safety voice, their interaction and the specific aspects of the intervention that facilitated behaviour change. This was an original objective of the research study. It is therefore recommended that future real-world studies associated with safety voice interventions employ quantitative measures as part of the research approach, such as those recently developed by Mathisen et al. (2023).

There were other limitations associated with the study. Leadership has been highlighted as a key factor in influencing safety voice by several researchers (Conchie, et al., 2012; Hirak et al., 2012; Cakir et al., 2023) but the leadership behaviour “To verify that safety actions have been completed” was identified for consideration but omitted from the intervention design on the grounds that leaders have little spare time and that their involvement may have undermined the role of supervision. On reflection, this was an oversight. Had leaders been engaged on the closure of actions, it is likely that supervisors would have been more motivated to progress employee concerns to completion. Similarly, leadership support to the SHE Enabler Group may have also helped to add credibility to the group. Future studies

should explore how the influence of leadership can be best utilised as part of a multi-faceted intervention strategy to shape safety voice.

When taken together, the mixed success of the multi-faceted safety voice intervention aligns with the findings of Violato (2022) and Jones et al. (2021) who suggested that deploying safety voice interventions in complex organisations often yield indeterminate results.

7.7. Impact

The findings from this safety voice research have helped to expand the body of knowledge relating to safety voice on a number of levels. Firstly, it has highlighted the benefits of adopting an ecological perspective to safety voice in view of the complex range of organisational, group, individual and hazard factors which influence whether employees speak up or not. It was also one of the first studies to explore safety voice in aircraft manufacturing which is a safety-critical environment in which the failure to speak up can lead to catastrophic consequences. This real-world research not only identified the influencing factors associated with safety voice, but also involved the design and implementation of a measurable, multi-faceted intervention to increase employee's willingness to speak up. There are few studies that have attempted safety voice-related behaviour change in a large and complex manufacturing organisation.

This research project also used the framework of the BCW in order to identify the critical safety voice behaviours and develop the behaviour change intervention which was a novel approach in this context. Interviews were conducted with shop floor employees and supervisors in order to understand their experiences, as well as their levels of capability, opportunity and motivation relating to speaking up behaviours. It could be argued that the depth of analysis exceeded the requirements of the BCW to 'understand the problem.' However, this process generated new insights about the cultural and social nuances which influenced speaking up behaviours. In so doing, shortfalls were identified associated with the use of the BCW, particularly around its failure to take into account these complex but powerful cultural forces. The findings

revealed the importance of shop floor identity as a factor in shaping safety voice which is a novel finding and suggests that Social Identity Theory (Tajfel, 1979) is important to speaking up behaviour. This appeared to influence not only the type of issues that were raised to supervisors but also how they were raised. Indeed, shop floor employees were reluctant to speak up on issues that risked damaging harmonious relations with the group or if voicing concerns could arouse the unwanted interest of an outgroup comprising leadership and the wider SHE team. In these circumstances, some employees used clandestine safety voice strategies in order to mitigate the perceived negative consequences of speaking up which is another novel finding.

The impact of the research has been significant, not least of all in the target organisation, which is one of the largest manufacturers in the UK. Some of the interventions endured beyond the conclusion of the project and were integrated into the daily routines of shop floor workers. The SHE & Biscuits intervention was highly successful in creating a psychologically safe environment in which employees were willing to express their safety concerns and ideas. In the target organisation, this became an intervention which was viewed as good practice and was adapted and widely used by the organisation across a range of different facilities and sites in both the shop floor and office environment. Moreover, it is still being used today with teams using SHE & Biscuits events to escalate issues but also to engage on particular topics or raise awareness about key hazards. The SHE & Biscuits intervention highlighted one example of how psychological safety can be developed in a male-dominated heteronormative culture.

Similarly, the SLAM intervention, which was pioneered as a mechanism for providing shop floor employees with physical opportunities to identify and escalate issues, also became a daily activity across the manufacturing and aircraft maintenance environments. This was viewed as a simple but effective way of starting a daily conversation about safety between a supervisor and their team. SLAM was adopted by other manufacturing areas as a replacement to conducting arbitrary pre-work checks and became a standard across the target organisation. Moreover, the good practice was shared, not only in the Air Sector but beyond the organisational

boundary to other Group Business Units in the UK and overseas, with colleagues in the US developing a version of SLAM as a means of discussing safety issues.

The importance of safety voice has also been recognised and incorporated into the organisation's SHE training and engagement activities. Safety voice now features in the SHE induction for new starters; it is a key strand in safety promotions and forms a key element of quarterly 'stand down' activities in which teams stop their normal work activities to engage in conversations based on safety-related ethical scenarios. The importance of creating a psychologically safe environment in which employees can express themselves also features in part of the "Managing SHE" and 'Leading SHE" training programme which all people managers in the organisation are required to attend every 3 years.

The concept of a SHE Enabler Group also matured following its inception as part of the research. Whilst its influence on safety voice was limited, the SHE Enabler Group in the target facility continued to meet on a regular basis beyond the conclusion of the project and generated a range of employee engagement activities including a children's safety poster competition, environmental engagement activities and prostate cancer sessions. This group also highlighted to the organisation the potential of involving and empowering employees in shaping their workplace. This has helped to create a number of employee resource groups across the organisation that meet on a regular basis with a focus on promoting engagement and good causes amongst their teams.

7.8. Dissemination

The learning from aspects of this safety voice project have been shared with a range of stakeholders from both academia and industry. From an academic perspective, I have presented the findings of the pre-intervention interviews to three cohorts of students on the MSc Behaviour Change course at the University of Derby to help them understand the strengths and weaknesses of applying the Behaviour Change Wheel in a real-world context. In addition, I have also submitted an entry into the 2025 three-minute thesis competition; a format developed by the University of

Queensland in which doctoral students are required to deliver a verbal presentation about their topic and its significance in under 3 minutes. I have also delivered guest lectures and Q&A sessions at the University of Derby which were open to behaviour change students and other post graduate students interested in leadership. These enabled me to discuss the implications of conducting research in an industrial setting and to reflect on aspects of the study, its significance and how I could have approached the research differently. A future aim is to develop one or more research papers on the findings of my studies for publication in academic journals such as Safety Science or the Journal of Safety Research.

From an industry perspective, in 2022, findings of the pre-intervention interviews about the factors which influence safety voice were presented to the Lancashire Branch of the Institute of Occupational Safety & Health (IOSH) – a group of about 100 safety practitioners representing a number of industries in the North West of England. This was intended to help them understand the challenges employees face when evaluating safety-related situations and to raise awareness about range of factors which influence speaking up behaviours. An article on safety voice was also written and submitted to the IOSH Magazine which is disseminated to over 50,000 safety practitioners on a monthly basis. This article is currently under revision.

In addition, a wide range of stakeholders within the target organisation have been engaged on the safety voice project findings. In 2021, the researcher was a guest speaker at an internal safety culture forum on the topic of safety voice which was developed for approximately 150 employees representing Quality, Product Safety, Flight Safety and SHE. The findings of the pre-intervention interviews were discussed and the nature of the intervention was also outlined to explain the challenges associated with employees speaking up. The delegates were particularly interested in the reasons behind silence and the cultural factors associated with in-groups and out-groups which had not been hitherto understood.

Moreover, in 2023 I spoke at the organisation's Manufacturing Conference which was attended by 200 senior leaders. This provided an opportunity to give an overview of the importance of creating a psychologically safe environment for teams to discuss safety and featured an overview of the project and the lessons learned.

I am also engaging with industry conference organisers to explore the feasibility of delivering a talk to safety professionals from around the UK at national events such as the SHE Show, the Health & Safety event and the Health & Safety at Work conference.

In summary, Chapter 6 has evaluated the wider research project and conclusions were drawn about the implications of the study from an academic and wider industry perspective. It also briefly described the wider impact of the research project and highlighted how the findings had been disseminated to date and the plans in place for future dissemination.

8. Conclusion

This mixed methods study sought to understand the factors which influence safety voice in aircraft manufacture and to design and implement an intervention designed to increase employees' willingness to express their safety voice. In order to explore the factors which underpinned safety voice and safety silence behaviours, a series of extensive pre-intervention interviews were conducted with 20 shop floor employees and supervisors. The scope of the interviews and the depth of the thematic analysis was one of the strengths of the research. The findings of the interviews revealed that safety voice is a complex behaviour that is underpinned by a wide range of hazard, individual, group and organisational factors that can be best be understood from an ecological perspective. Factors such as supervisor openness, the nature of the hazard and the response to safety voice were found to be critical antecedents to whether shop floor workers in aircraft manufacture would speak up or remain silent. The findings also revealed the presence of nuanced in-group and out-group dynamics which influenced employees' willingness to speak up, the nature of the issues they raised and the strategies used to express their safety voice. These safety voice strategies, which employees used to escalate safety issues whilst mitigating the potential negative social consequences of speaking up, were one of the novel findings of the research.

Another aim of the research was to explore ways of measuring both safety voice behaviours and the effectiveness of a multi-faceted safety voice intervention by carrying out surveys at pre and post intervention. A 50-item questionnaire was developed and disseminated to approximately 1000 shop floor workers. However, the response rate fell significantly below expectations and was deemed to have low statistical power. The quantitative aspects were therefore abandoned. Underpinning this decision was the timing of the survey which coincided with the introduction of new safety controls to mitigate the risk of contracting the COVID-19 virus. The target organisation had already conducted several surveys about the adequacy of these arrangements prior to the launch of the safety voice questionnaire which may explain the poor take up rate. From a methodological perspective, the uptake rates of the questionnaire revealed the importance of context in implementing surveys. The abandoned quantitative study was one of the limitations of the research because it

failed to provide further insights into the measurement of safety voice behaviours and the effectiveness of the intervention on speaking up.

A third aim of the research was to develop and implement a safety voice intervention with the aim of increase employees' safety voice behaviours using the Behaviour Change Wheel (Michie et al., 2014). The BCW framework was found to be an effective tool in supporting the design of a multi-faceted intervention and helped to specify, prioritise and analyse the critical behaviours that were important to safety voice. In particular, the simplicity of the COM-B model helped in engaging stakeholders on the factors which influence behaviour and the TDF provided a comprehensive list of behaviour change options from which to select. However, using the BCW was not a straightforward process. There were multiple tables to complete; many of these appeared to duplicate one another. The terminology used in the BCW was also challenging for operational stakeholders to understand and the BCW did not provide useful guidance in terms of how and in which order interventions should be deployed or who should lead in their deployment. In addition, the BCW lacked guidance regarding how the APEASE criteria should be used to make judgements about the suitability of behaviours. Perhaps more importantly, whilst the BCW identified behavioural deficiencies which needed to be addressed by the intervention, it did not identify the nuanced factors which influenced the effectiveness of the delivered intervention. This was particularly pertinent to the delivery of training for key stakeholders which was identified through the BCW. However, the location, delivery method and individual delivering the training appeared to be critical in terms of its success, but this was not identified through the use of the BCW.

A final aim of the research was to understand which behaviour change interventions influenced safety voice behaviours in aircraft manufacture. The multi-faceted intervention was delivered over a two-month period in a machine shop facility and comprised aspects of communications, the establishment of a SHE Enabler Group, education and training as well as improved processes around hazard identification, discussion and feedback. The findings from the post-intervention interviews revealed that providing dedicated, psychologically safe opportunities for shop floor workers to express their safety voice was the most successful element of the intervention.

Known as SHE & Biscuits events, these sessions were popular; they used incentives to encourage participation and provided employees with the opportunity to discuss and report a wide range of safety concerns and ideas. They also helped leadership demonstrate their commitment to employee safety and served to yield lots of safety issues. Another successful element of the intervention was the Stop, Look, Assess and Manage (SLAM) process which required shop floor employees to conduct regular hazard spotting activities, prompted daily safety conversations and helped visibly capture safety issues on public boards to create pressure on supervisors to respond in a timely manner. However, it became apparent in the post-intervention interviews that despite eliciting safety voice, in many circumstances, supervisors lacked the time, motivation or power to progress these actions in line with employee expectations, particularly those which required the input of other agencies such as external contractors. This revealed the influence of leadership, supervisor, cultural and organisational factors in influencing safety voice on the shop floor and may have had an adverse impact on safety voice over the longer term.

Other limitations associated with the delivery of the intervention included the fact that the safety voice communications did not stand out because of other existing promotional messages in the workplace and that safety coaching training was poorly received by shop floor employees. The research also identified several long-standing cultural factors which hindered the expression of safety voice. These included the desire for shop floor employees to maintain harmonious relations, to avoid unwanted scrutiny by leaders and the inadequate response to employees' safety voice. These cultural factors were apparent in both the pre-intervention and post-intervention interviews which suggests that, from a cultural perspective the short-term intervention failed to significantly change these ingrained organisational norms and beliefs about speaking up.

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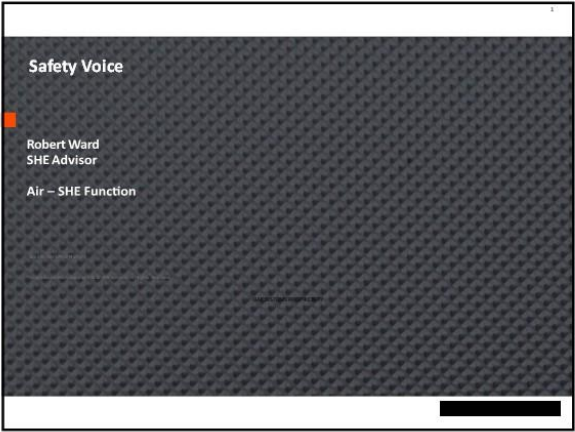
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Appendices

Appendix 1 – Briefing Pack to explain and secure senior management support for the Safety Voice project



Appendix 2: INTERVIEW – QUESTION SCHEDULE

INTRODUCTION

- Take interviewees through the Participation Information Sheet regarding the purpose of the study and their role
- Emphasise the confidential nature of the interview
- Emphasise the fact they can withdraw from the interview at any time.
- Field any questions or queries.
- Supply contact details for further queries or questions.
- Ask them to sign the consent form.

INTERVIEW QUESTIONS

- 1) What would you say is the most reported issue here on-site? (Introductory question)
- 2) How do you report safety concerns?
- 3) What type of information might you report?
- 4) What happens when you raise safety issues? (*Who takes it forward? How do you know it's being progressed?*)
- 5) What's the process for reporting safety ideas and suggestions? (*Is this different to reporting concerns?*)
- 6) Do you think employees always speak up when safety is at risk?
- 7) Why might some employees be reluctant to speak up about safety?
- 8) How does the organisation (i.e. supervisors and managers) respond when you raise issues and ideas about safety? What do you think drives their response?
- 9) To what extent does the organisation want to hear about your safety experiences?
- 10) If someone makes a mistake that could impact safety – how are they treated (by the organisation and their peers)?
- 11) If one of your co-workers raised an issue or idea about safety – how are they treated by the organisation? / How would they be viewed by the rest of the team?

- 12) To what extent does the organisation keep you informed about the progress of your safety suggestions / concerns?
- 13) If you could change one thing about the way the safety reporting is approached here— what would it be?

INTERVIEW – CLOSE

First and foremost, thank you for participating in this interview. The information you have provided today will be used in my final report and will also to help shape the design of a safety intervention that aims to improve rates of employee safety voice.

I'd like to reiterate the fact that your personal information will remain anonymous and that, whilst your views and comments may be included in the report, they will not be linked to you in any way. Indeed, no individual will be named in the study findings; a summary of which will be made available for you to review. If you wish to withdraw from the interview you have a two week window in which to do so.

If you wish to contact me to access a summary of the findings or if you have any queries whatsoever, my contact details are r.ward18@unimail.derby.ac.uk or I can be contacted on 07801 715131. Or if you have any further comments or queries about this interview or how your information will be used, you can also my academic supervisor, Andrew Baird via email at a.baird@derby.ac.uk or via The University of Derby at Kedleston Road, Derby, DE22 1GB. Meanwhile my line manager, XXXX can be contacted at alison.XXXX or XXXX. Thank you once again

Appendix 3 – Table showing an example of the thematic analysis undertaken of the pre-intervention interviews.

Interviewee	Role	Area	Meaning Unit	Code	Category	Theme
Employee 1	Employee	S3B	Its then passed on to a subcontractor, if you will. If they say they've done it doesn't seem to be any completion from our management to go around. It takes somebody else to say "they haven't done it."	No follow up on subcontractor performance	Subcontractors not held accountable	Response to safety voice
Employee 1	Employee	S3B	Well there was a guy who got an electric shock – well a sort of electric shock. The main lights over there on Sunday morning. He goes to switch the lights on. So one of them - he jumped back cause it sort of arced. We had it reported last October	Voice due to incident	Safety voice	Response to safety voice
Employee 1	Employee	S3B	Emcor said they'd fixed it. Well they hadn't. I'm not saying it was a proper shock. It just made him jump – do you know what I mean? But things like that – they seem to get away from them.	Inadequate response to Facilities issues	Inadequate response	Response to safety voice
Employee 1	Employee	S3B	I don't know the exact details about what they said. But I think they're supposed to send Andy Fresney or Ben Prescott? I think its Andy Fresney – they send him a completion note to say that they've done it. Because he said "I've had a completion over the last day or so and I know about that"	Unsure about feedback process	Feedback	Response to safety voice
Employee 1	Employee	S3B	I was in the car park and pointed out where they were wrong to the Emcor guys. They'd done a couple of them but obviously there's no-one to police it	No follow up on subcontractor performance	Subcontractors not held accountable	Response to safety voice
Employee 1	Employee	S3B	he sent me an email saying according to Emcor they'd now shut it. That was on Friday. So I've got to go and see him this morning to tell him several are still out.	Inadequate response to Facilities issues	Inadequate response	Response to safety voice
Employee 1	Employee	S3B	There's a thing called a blaster - it's in the middle. It takes the paints off and stuff. There's leaks all over that and I must admit when I brought it up. As a union rep, I said, "Well, if it carries on, I'm gonna have to shut machine down.	Safety Voice and threats to shut down	Safety voice	Us
Employee 1	Employee	S3B	And before Christmas, we were having a weekly meeting and updates about how to get this better - than they did attend and they got a firm in to go and do some training	TU threats lead to action	Positive Response to voice	Response to safety voice

Employee 1	Employee	S3B	...So those aspects of it were very good. It was only through being pushed, if you will.	Emcor have to be pushed to act	Motivators of response	Us
Employee 1	Employee	S3B	to what extent do you feel that that that threat of shutting the machine down prompted the response? I think it was like a finality for most of them. It helped move it a long, maybe. Right, right I'm not saying it was - but things seem to shift a bit quicker.	Emcor have to be pushed to act	Motivators of response	Response to safety voice
Employee 1	Employee	S3B	I think that the management's addressing them initially	Employee issues lead to management action	Positive Response to voice	Response to safety voice
Employee 1	Employee	S3B	. And then it's pass the buck to "it's not really me - that's facilities," or "that's not me that's somebody down site" Andy something or other "there's three things against him" or "we'll will organise a meeting" but not I've not seen anything about it yet.	Nobody takes accountability for action	Inadequate response	Response to safety voice
Employee 1	Employee	S3B	Some things are brought up at the monthly meetings	Opportunity to voice	Opportunity to voice	Them
Employee 1	Employee	S3B	Every month they put up charts about accidents and all that. The emphasis is on zero accidents obviously. But not really	Org commitment to safety	Priority of safety	Them
Employee 1	Employee	S3B	I suppose I get to learn more because of the Union thing, but I don't think people get told directly about how that thing has been shut down.	Feedback is inadequate	Feedback	Them
Employee 1	Employee	S3B	You've got the opportunity to say, well, it hasn't been shut down.	Opportunity to voice	Opportunity to voice	Safety voice mechanics
Employee 1	Employee	S3B	individually you can see your supervisor or the manager	Opportunity to voice	Opportunity to voice	Supervisor openness
Employee 1	Employee	S3B	I mean, I'm quite happy doing it but some people aren't as vocal are they?	Confidence to voice	Individual factors	Us
Employee 1	Employee	S3B	Its other people's nature isn't it? It's not sort of threats or anything or scared, or nervous maybe. I've been here 40 years so I'm not really bothered. Well its not that I'm not bothered - I'm not bothered going to see a manager or anything - but younger blokes and some people don't like conversing with them	Confidence to voice	Individual factors	Us

Appendix 4 - Table analysing “what needs to happen” in order for the target behaviours to be realised

Stakeholder	Behaviours	What / Instruments/ When / Where	Capability		Opportunity		Motivation		THEME 1			THEME 2	THEME 3		
			Physical	Psych	Social	Physical	Automatic	Reflective	Subtheme 1.1	Subtheme 1.2	Subtheme 1.3		Subtheme 3.1	Subtheme 3.2	Subtheme 3.3
Supervisors	Communicate clear expectations to their teams about the issues that warrant safety voice	Team meeting; workplace rules & standards and visible reminders	N/A	Must understand the importance of safety voice & psychological safety. Must know how to set ground rules for open & honest discussions & remember to apply them. Must understand the safety reporting mechanisms available & how/when they should be used	Supervisors must be open to potentially new ways of conducting meetings and willing to trust others.	Must have physical opportunity to engage team members on the importance of speaking up and clarifying issues.	N/A	Must appreciate the importance of employee safety voice as a means of directing improvements		X					
Supervisors	Proactively consult with teams on safety issues and improvements	In workplace and in all interpersonal interactions with teams	NA	Must know how to engage in effective safety conversations. Must understand benefits of engaging teams. Know how to build rapport; how to tease out safety issues; how to escalate problems to supervisors and the confidence to speak with teams.	Must be socially acceptable to engage team members on a regular basis; adopting a "caring position" Must have trusted relationships with team members	Must have physical opportunities and time to talk with team members about safety. Must have physical, regular contact with team members	Must resist urge to make assumptions about unsafe behaviours and to adopt a curious approach to safety non-compliance. Must resist urge to assume people are ok in their roles and coping.	Must weigh the long terms benefits of gaining trust of teams as opposed to issuing warnings and threats for non-compliance. Must feel motivated to improve the work environment for teams.			X				
Supervisors	To provide adequate opportunities for teams to express their safety voice	In workplace, team meetings, via supervisors, online systems, colleagues	N/A	Must create, harness and utilise daily interactions with teams to explore their safety experiences. Must understand and mitigate the barriers which prevent employees from speaking up. Must be able to remind employees to speak up	Must feel comfortable engaging teams and individuals on safety in the workplace. Must feel it is acceptable to take time to gauge employees views on safety	Must be able to create time, and opportunities to discuss safety with individuals and teams. Must have the time and ability to act if issues arise	N/A	Must understand the safety & business benefits of effective employee engagement			X		X		
Supervisors	Encourage & remind teams to express safety voice	In workplace, team meetings, with individuals; prompts in workplace	N/A	Must be able to identify & seize opportunities to encourage safety voice. Must remember to discuss the importance of speaking up on safety.	Must be acceptable to encourage more problems, issues and challenges and for employees to support their resolution.	Must have the physical capacity to be able to oversee more issues & challenges in the short term. Must have opportunities & prompts to remind teams to speak up	Must avoid leaping to immediate solutions and believe that team can have alternative and better solutions.	Must understand the longer term benefits that safety voice can bring to the wider team.							

Supervisors	To visibly capture track and provide timely feedback to their teams on safety issues	In workplace using visual display boards		Must remember to capture issues raised by team. Must understand the importance of providing feedback to teams and must be aware of action progress	Must be socially acceptable to visibly capture a range of issues & ideas. Must feel social pressure from above and below to provide feedback.	Must have physical opportunity & resources to visibly capture issues and ideas raised by team. Must have physical opportunities (time / opportunity) to feed back safety issues to teams.	Must resist temptation to downplay problems raised by the team.	Must recognise the importance of treating team inputs fairly. Must feel the importance of providing feedback to the team, Must be driven by actions process								X
Supervisors	To proactively address safety issues raised by employees	In workplace; in SHE & business reviews		To be able to prioritise issues appropriately based on resources, risk and business environment. Must understand risk assessment process. Must know when and how to escalate issues to senior management	Must be an expectation that employee issues are addressed promptly. Must feel supported by senior managers to prioritise safety. Must be acceptable for supervisors to request additional support. Must feel senior managers welcome bad news	Must have physical resources and funds to be able to address employee issues. Must have physical escalation mechanisms to highlight key issues	Must resist fear of escalating issues that require senior management input	Must recognise the value of installing improvements on the safety culture. Must feel that senior management want to hear bad news and that escalation is worthwhile								X
Employees	Identify, appraise and speak up about hazards or issues	In workplace		Knowledge of hazards in the facility. Must remember to look for uncontrolled hazards or issues in the workplace. Must recognise the importance of speaking up , when safety voice is appropriate and how to express safety voice effectively.	Must be acceptable to broach unsafe conditions / behaviours with colleagues. Must be a common understanding that challenge is constructive and not designed to create conflict. Challenge must be done in a way that does not embarrass / humiliate the individual	Need physical hazard identification opportunities designed to uncover safety problems & issues. Must have sufficient time to perform safety checks and a platform to raise issues. Must be opportunities to view colleagues working in the workplace and to speak to them.	Must avoid urge to walk past. Need to resist the urge to stay silent on safety	Need to reflect on the nature of the hazards & whether action can be taken to mitigate or escalate it.		X						
Employees	To accept safety challenge from their peers	In workplace and in one to one situations		Must appreciate that safety voice is associated with caring for others. Must know how to receive challenge tactfully.	Must have common understanding that challenge is coming from a place of care. Must have faith that challenge won't lead to conflict	Must have time to consider & reflect on experience of being challenged	Must be prevented from feeling threatened by the challenge	Need to feel that challenging colleagues is an expression of their caring and not a direct criticism of working practices.	X							
SHE	To investigate emergent safety issues in a manner that is proportional to the severity of the incident	Accident and near miss investigations	N/A	Must understand how to investigate issues with understanding and empathy to get to root causes.	Must feel no pressure to reach quick assumptions or to jump to conclusion about immediate causes. Must feel no pressure to bow to production pressures.	Must have sufficient time to carry out root cause investigations	Must resist temptation to automatically blame employees for shortcomings	Must have an open mind about the origins of SHE issues.				X				

SHE	Provide and maintain systems for the reporting & capture of safety voice information	Independent online confidential safety reporting mechanisms and action tracking		Must understand importance of maintaining reporting mechanisms and how to ensure reporting can be made easy for employees. Must provide information on how to use systems	Must provide systems that are simple and acceptable for end-users	Must provide an effective mechanism for reporting safety issues to those who need it.	N/A	Must understand the value in creating and maintaining effective reporting system for teams.							
SHE	Proactively consult with teams on safety issues and improvements	Face to face discussions, meetings	N/A	Must understand the importance of consulting with teams to secure their commitment and understand their issues.	Must feel it is acceptable & important to engage teams on safety interventions before committing resources to new initiatives	Must have the time and opportunity to gather stakeholder views on safety interventions.	Must resist temptation to deploy interventions without consulting with teams	Must believe that securing employee commitment is important to developing effective interventions.				X			
FM Contractors	Respond productively to Facilities issues raised by the teams	Response via email or by visibly fixing issues raised	N/A	To be able to prioritise issues appropriately based on resources, risk and business environment.	Must be an expectation that reported issues are addressed in a timely fashion based upon risk and contractual obligations	Must have physical resources and funds to be able to address employee issues	N/A	Must recognise the value of installing improvements on the safety culture.							X

Appendix 5 – Survey items and their origins

Variable Category	Survey Item	Source
Work related injuries	In the last month, have you experienced any of the following: superficial wound (strain or sprain, scratch or abrasion); cut, laceration or puncture (open wound); work related burn or scald; and bruise or contusion. [Never / Once / Two or three times / More than five times]	Tucker & Turner (2015)
	Did you report that injury to your supervisor/employer? [Yes / No]	Tucker & Turner (2015)
Control variables	I fear that I could get hurt at this job [Strongly Disagree / Disagree / Undecided / Agree / Strongly Agree]	Tucker & Turner (2015)
	I fear that I could have an accident at this job [Strongly Disagree / Disagree / Undecided / Agree / Strongly Agree]	Tucker & Turner (2015)
Safety Voice	Rate how frequently, in your main job, you engage in the following behaviours:	Tucker & Turner (2015)
	Tell my supervisor about the consequences of dangerous working conditions [1 - Almost Never to 7 - Almost Always]	Tucker & Turner (2015)
	Group together with co-workers and take safety concerns to the supervisor [1 - Almost Never to 7 - Almost Always]	Tucker & Turner (2015)
	Tell my supervisor about hazardous work [1 - Almost Never to 7 - Almost Always]	Tucker & Turner (2015)
	I make suggestions about how safety can be improved. [Strongly Disagree / Disagree / Undecided / Agree / Strongly Agree]	Tucker et al. (2008)
	I discuss new ways to improve safety with my colleagues or boss. [Strongly Disagree / Disagree / Undecided / Agree / Strongly Agree]	Tucker et al. (2008)
	I tell my colleague who is doing something unsafe to stop. [Strongly Disagree / Disagree / Undecided / Agree / Strongly Agree]	Tucker et al. (2008)
	I report to my boss if my colleagues break any safety rules. [Strongly Disagree / Disagree / Undecided / Agree / Strongly Agree]	Tucker et al. (2008)
	I inform the TU/boss when I notice a potential hazard. [Strongly Disagree / Disagree / Undecided / Agree / Strongly Agree]	Tucker et al. (2008)
Ideas for improving safety	I have ideas about how to improve safety at my workplace [Strongly Disagree / Disagree / Undecided / Agree / Strongly Agree]	Tucker & Turner (2015)
	I have ideas about how my job could be made safer [Strongly Disagree / Disagree / Undecided / Agree / Strongly Agree]	Tucker & Turner (2015)
Perceived Coworker Support for Safety (PCSS)	My co-workers are ready to talk to fellow employees who fail to use safety equipment / procedures [Strongly Disagree / Disagree / Undecided / Agree / Strongly Agree]	Tucker et al. (2008)
	My co-workers are prepared to stop others from working dangerously [Strongly Disagree / Disagree / Undecided / Agree / Strongly Agree]	Tucker et al. (2008)
	My colleagues encourage each other to work safely [Strongly Disagree / Disagree / Undecided / Agree / Strongly Agree]	Tucker et al. (2008)
	My supervisor cares about my safety opinions	Tucker & Turner (2015)

Supervisor openness to safety concerns	[Strongly Disagree / Disagree / Undecided / Agree / Strongly Agree]	
	My supervisor is interested in ideas and suggestions regarding safety [Strongly Disagree / Disagree / Undecided / Agree / Strongly Agree]	Tucker & Turner (2015)
	Good safety ideas get serious consideration from my supervisor [Strongly Disagree / Disagree / Undecided / Agree / Strongly Agree]	Tucker & Turner (2015)
	When suggestions are made to my supervisor, they receive fair evaluation [Strongly Disagree / Disagree / Undecided / Agree / Strongly Agree]	Tucker & Turner (2015)
Perceived Organisational Support for Safety (POSS)	The company takes the safety ideas of employees seriously [Strongly Disagree / Disagree / Undecided / Agree / Strongly Agree]	Tucker et al. (2008)
	The company is quick to respond to the safety concerns of their employees [Strongly Disagree / Disagree / Undecided / Agree / Strongly Agree]	Tucker et al. (2008)
	The company encourages employees to voice their concerns about safety [Strongly Disagree / Disagree / Undecided / Agree / Strongly Agree]	Tucker et al. (2008)
Affective Commitment	This organisation has a great deal of personal meaning to me [Strongly Disagree / Disagree / Undecided / Agree / Strongly Agree]	Tucker & Turner (2015)
	I would be very happy to spend the rest of my career with this organisation [Strongly Disagree / Disagree / Undecided / Agree / Strongly Agree]	Tucker & Turner (2015)
	I really feel as if this organisation's problems are my own. [Strongly Disagree / Disagree / Undecided / Agree / Strongly Agree]	Tucker & Turner (2015)
Identity	I have a lot in common with other shopfloor workers [Strongly Disagree / Disagree / Undecided / Agree / Strongly Agree]	Andersen et al. (2018)
	I feel strong ties to other shop floor workers [Strongly Disagree / Disagree / Undecided / Agree / Strongly Agree]	Andersen et al. (2018)
	I find it difficult to form a bond with other shop floor workers [Strongly Disagree / Disagree / Undecided / Agree / Strongly Agree]	Andersen et al. (2018)
	I don't feel a sense of being "connected" with other shop floor workers [Strongly Disagree / Disagree / Undecided / Agree / Strongly Agree]	Andersen et al. (2018)
	I really "fit in" with other colleagues from the shop floor [Strongly Disagree / Disagree / Undecided / Agree / Strongly Agree]	Andersen et al. (2018)
	In a group of shop floor workers, I really feel that I belong. [Strongly Disagree / Disagree / Undecided / Agree / Strongly Agree]	Andersen et al. (2018)
Safety Silence - Self	I do not speak up to my supervisor when.... *I feel that it could lead to a negative perception of me [Strongly Disagree / Disagree / Undecided / Agree / Strongly Agree]	Manapragada & Bruk-Lee, (2016)
Safety Silence - Other	*I don't want to start a dispute between others [Strongly Disagree / Disagree / Undecided / Agree / Strongly Agree]	Manapragada & Bruk-Lee, (2016)

Safety Silence - Other	*I think that my coworker(s) will lose respect for me [Strongly Disagree / Disagree / Undecided / Agree / Strongly Agree]	Manapragada & Bruk-Lee, (2016)
Safety Silence - Relationship	*I feel that others may retaliate against me for speaking up [Strongly Disagree / Disagree / Undecided / Agree / Strongly Agree]	Manapragada & Bruk-Lee, (2016)
Safety Silence - Relationship	*I feel that speaking up will make it difficult to work with others [Strongly Disagree / Disagree / Undecided / Agree / Strongly Agree]	Manapragada & Bruk-Lee, (2016)
Safety Silence - Climate	*My supervisors are not open to hearing about safety issues [Strongly Disagree / Disagree / Undecided / Agree / Strongly Agree]	Manapragada & Bruk-Lee, (2016)
Safety Silence - Climate	*My supervisors are not strong supporters of safety [Strongly Disagree / Disagree / Undecided / Agree / Strongly Agree]	Manapragada & Bruk-Lee, (2016)
Safety Silence - Climate	*I feel that my supervisor(s) won't take action [Strongly Disagree / Disagree / Undecided / Agree / Strongly Agree]	Manapragada & Bruk-Lee, (2016)
Safety Silence - Climate	*My organization does not make safety a priority [Strongly Disagree / Disagree / Undecided / Agree / Strongly Agree]	Manapragada & Bruk-Lee, (2016)
Safety Silence - Job	*I feel that I cannot speak honestly and openly in my organization [Strongly Disagree / Disagree / Undecided / Agree / Strongly Agree]	Manapragada & Bruk-Lee, (2016)
Safety Silence - Climate	*I feel like my supervisors are not doing their job to address the issue [Strongly Disagree / Disagree / Undecided / Agree / Strongly Agree]	Manapragada & Bruk-Lee, (2016)
Safety Silence - Issue	*The safety issue does not put anyone at risk [Strongly Disagree / Disagree / Undecided / Agree / Strongly Agree]	Manapragada & Bruk-Lee, (2016)
Safety Silence - Issue	*The safety issue does not endanger anyone [Strongly Disagree / Disagree / Undecided / Agree / Strongly Agree]	Manapragada & Bruk-Lee, (2016)
Safety Silence - Issue	*The safety issue does not affect other people [Strongly Disagree / Disagree / Undecided / Agree / Strongly Agree]	Manapragada & Bruk-Lee, (2016)
Safety Silence - Job	*I have a heavy workload [Strongly Disagree / Disagree / Undecided / Agree / Strongly Agree]	Manapragada & Bruk-Lee, (2016)
Safety Silence - Job	*I am too busy at work to speak up [Strongly Disagree / Disagree / Undecided / Agree / Strongly Agree]	Manapragada & Bruk-Lee, (2016)
Safety Silence - Job	*I am under heavy time pressures at work [Strongly Disagree / Disagree / Undecided / Agree / Strongly Agree]	Manapragada & Bruk-Lee, (2016)

Appendix 6 – Final Questionnaire used in Study 2

Questionnaire on Safety, Risk & Speaking Up

My name is Robert Ward and I work in the Air Sector SHE function at Samlesbury. I have a particular interest in how we best utilise the wealth of experience and expertise that shopfloor workers have in relation to safety matters and am currently conducting PhD level research into “employee safety voice” in conjunction with the University of Derby.

I'm interested in learning more about how willing workers are to express their concerns, ideas and suggestions aimed at improving safety in the workplace. As part of my studies, I would like to invite you to complete a questionnaire that will ask you about your experiences and your thoughts about this. In order to participate you must be aged 18 or over, have no people management or supervisory responsibilities and be directly employed by XXXXX.

This survey will help me to create XXXXX-specific initiatives that are based on your real-world experiences.

It is completely up to you to decide if you would like to take part and should take approx 15 minutes to complete. Your name, work area, etc are not gathered so your identity is not known at all. Please be honest and open in your replies.

You might decide that, after taking the survey, you want to have your data removed- you can do this for 2 weeks after you complete the survey. In order to ensure I can retrieve your questionnaire, you will be asked to generate a unique identifying code based on the day of the month on which your birthday falls and the first three letters of your mother's first name. To withdraw your information, you should simply email me by contacting me via my email address below, quoting your unique self generated code.

The survey closes on 31st March 2021.

There may be some questions which explore similar themes within the questionnaire - this is intentional as I am exploring these issues in depth. All answers are important, so please answer all questions honestly. There are no 'correct answers.' I am just after an honest view of your current work situation.

If you have any questions about the survey or the wider research project, please email me at XXXX. Alternatively you can contact my academic supervisor, XXX or via his contact address at The University of Derby, Kedleston Road, Derby, DE22 1GB.

I really appreciate your input!

GDPR Statement

We will be collecting data from your participation in this study. We need these data to explore your views relating to employee safety voice, and also in the public interest of enhancing academic research. This is the legal basis on which we are collecting your data and while this allows us to use your data, it also means we have obligations towards you to:

- not seek more information from you than what is essential and necessary for the study.
- make sure that you are not identified by the data by anonymising it using ID codes;
- use your anonymised data only for the purposes of this study and for any relevant publications that arise from it.
- store data safely in password-protected databases to which only the named researchers have access
- not keep your information for longer than is necessary (usually for seven years);
- safely destroy your data by shredding or permanently deleting them

The University of Derby will act as the Data Controller for this study. This means that the University is responsible for looking after your information and using it properly. Researchers on the project with access to the data are highly qualified and experienced and have been very careful to ensure the security of your data. The study was approved for its ethical standards by The University of Derby College of Life and Natural Sciences Research Ethics Committee. However, in the unlikely event

that you feel you need to make a complaint regarding the use of your information, you can contact the Data Protection Officer at the University of Derby: James Eaglesfield (01332) 591762 or the Information Commissioners Office 0303 123 1113.

Further information about the project can be obtained from Robert Ward at the University of Derby, Kedleston Road, Derby DE22 1GB. He can be contacted on XXXXX or at XXXXX

Informed Consent

By ticking the box below, you are agreeing that:

1. you have read and understood information above and the purpose of the questionnaire,
2. you understand how the information you have provided will be used.
3. you are volunteering to take the survey, no one has insisted you do this.
4. the report can be used in university assessments, and research publications, and will be shown to managers at XXXX.
5. you understand that you can withdraw your information up to two weeks after this survey closes.

☐

I understand and consent to the use of the data

Employee Safety Voice questionnaire

Unique Identifying Code (for withdrawal, if necessary)

Develop a unique code so your questionnaire can be identified and withdrawn up to 2 weeks from the date the survey closes, if you should so wish. Your code should be based on the following questions: • What day of the month is your birthday? • What are the first three letters of your mother's first name'. So, if your birthday was 1st January, 1970 and your mother's first name was Catherine, your code would be 01cat.	My unique identifying code is:

About you

Before we ask about your thoughts of safety, please tell me about you (all this will not be linked with your answers in the final report).

Please put an x in the box that is appropriate.

Name of area where you work							
S610			S3A			S1	
Age in years – tick one only				Number of years employed at XXXXX – tick one only			
18 to 20		41 to 50		One year or less		Between 21 years and 30 years	
21 to 30		51 to 60		Between one year and 10 years		Between 31 years and 40 years	
31 to 40		60 and over		Between 11 years and 20 years		More than 41 years	
Gender	Male		Female		Prefer not say		

Instructions for answering questions

Please answer the questions with respect to your recent experiences in XXXXX.

Please read each statement and indicate how much you agree or disagree with the statement, by putting an X in the appropriate box.

Employee Safety Voice						
		Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
1	I make suggestions about how safety can be improved.					

Employee Safety Voice						
		Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
2	I discuss new ways to improve safety with my colleagues or boss.					
3	I tell my colleague who is doing something unsafe to stop.					
4	I fear that I could get hurt at this job					
5	I really “fit in” with other colleagues from the shop floor					
6	My co-workers are prepared to stop others from working dangerously					
7	My supervisor cares about my safety opinions					
8	I fear that I could have an accident at this job					
9	I report to my boss if my colleagues break any safety rules.					
10	I inform the Trade Union/boss when I notice a potential hazard					
11	I have ideas about how to improve safety at my workplace					
12	My supervisor is interested in ideas and suggestions regarding safety					
13	My co-workers are ready to talk to fellow employees who fail to use safety equipment / procedures					
14	I feel strong ties to other shop floor workers					
15	My colleagues encourage each other to work safely					
16	I have a lot in common with other shopfloor workers					
17	I have ideas about how my job could be made safer					
18	The company takes the safety ideas of employees seriously					
19	Good safety ideas get serious consideration from my supervisor					
20	The company is quick to respond to the safety concerns of their employees					

Employee Safety Voice						
		Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
21	The company encourages employees to voice their concerns about safety					
22	When suggestions are made to my supervisor, they receive fair evaluation					
23	I find it difficult to form a bond with other shop floor workers					
24	I don't feel a sense of being "connected" with other shop floor workers					
25	I would be very happy to spend the rest of my career with this organisation					
26	I really feel as if this organisation's problems are my own.					
27	This organisation has a great deal of personal meaning to me					
28	In a group of shop floor workers, I really feel that I belong.					
Incidents at Work						
		Never	Once	Two or three times	More than 4 times	
29	In the last month, have you experienced any of the following: • superficial wound (strain or sprain, scratch or abrasion); • cut, laceration or puncture (open wound); • work related burn or scald; • bruise					
30	Did you report that injury to your supervisor/employer?	Yes		No		
Raising Concerns						
	Rate how frequently, in your main job, you engage in the following behaviours:	All of the time	Most of the time	Often	Sometimes	Hardly ever
31	Tell my supervisor about the consequences of dangerous working conditions					
32	Group together with co-workers and take safety concerns to the supervisor					
33	Tell my supervisor about hazardous work					
Issues that affect Safety Voice						

Employee Safety Voice						
		Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
	I do <i>not</i> speak up to my supervisor when....	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
34	I feel that it could lead to a negative perception of me					
35	I don't want to start a dispute between others					
36	I think that my coworker(s) will lose respect for me					
37	I feel that others may retaliate against me for speaking up					
38	I feel that speaking up will make it difficult to work with others					
39	My supervisors are not open to hearing about safety issues					
40	My supervisors are not strong supporters of safety					
41	I feel that my supervisor(s) won't take action					
42	My organization does not make safety a priority					
43	I feel that I cannot speak honestly and openly in my organization					
44	I feel like my supervisors are not doing their job to address the issue					
45	The safety issue does not put anyone at risk					
46	The safety issue does not endanger anyone					
47	The safety issue does not affect other people					
48	I have a heavy workload					
49	I am too busy at work to speak up					
50	I am under heavy time pressures at work					

Thank you for your time

Thank you for completing this questionnaire. The information you have provided today will help my understanding of safety voice and will also to help shape the design of a safety intervention that aims to create a safe and supportive working environment at XXXXX. The findings from this study will also be used to inform industry and academic stakeholders about the importance of workers' experiences and thoughts in improving safety.

If you decide that, after taking the survey, you want to have your data removed- you can do this for two weeks after you complete the survey by contacting me, quoting the unique reference code you generated at the outset of the survey. This was a combination of the day of the month of your birthday and first three letters of your mother's maiden name. If you wish to do this or if you have any queries whatsoever, my contact details are XXXXX .com or I can be contacted on XXXX. Or if you have any further comments or queries about this survey or how your information will be used, you can also my academic supervisor, XXXX via email at XXX@derby.ac.uk or via The University of Derby at Kedleston Road, Derby, DE22 1GB.

Meanwhile my line manager, XXX can be contacted at XXXXX. Thank you once again.

Appendix 7 - Flyer provided to promote the questionnaire.



Want to participate in research?

Speaking up about safety

What is the research about?

BAE Systems SHE Advisor, Robert Ward is a part time student at the University of Derby and is recruiting participants for a research study to explore employees' experiences and perceptions of speaking up about safety.

This study may help to better understand the types of safety issues that are raised and those that are withheld, the motivations which influence speaking up behaviour and the perceived consequences of speaking up about safety.

Am I eligible?

You are eligible to participate in this study if you are at least 18 years of age or older and are a shop floor worker in either S3A, S610 or S1 Building.

What do I have to do?

The study will take place during work's time and your participation will last up to 15 minutes. It will involve completing a questionnaire that can be completed either electronically via an email link or by a hard copy paper version supplied by your supervisor or SHE Associate.

For how long will the questionnaire be open?

The window for completing the questionnaires will open on XXX and remain open for 4 weeks.

What are the next steps?

You will receive an email link on XX/XX/2021 with instructions on how to complete the survey. This is not a phishing email.

Alternatively you can acquire a paper survey from your supervisor or local SHE representative.

Do I have to participate?

No. Remember, your participation is completely voluntary and you do not have to complete a questionnaire, if you do not wish.

However, your participation can improve our understanding of speaking up on the workplace which can, in turn, help to improve aspects of SHE for you and your colleagues.

What if I have a concern about the research?

If you have any concerns, my contact details are [REDACTED]

If you have any further comments or queries about this survey or how your information will be used, you can also contact my academic supervisor, Andrew Baird via email at a.baird@derby.ac.uk or via The University of Derby at Kedleston Road, Derby, DE22 1GB.

Meanwhile my [REDACTED] line manager, [REDACTED], can be contacted at [REDACTED]@baesystems.com or [REDACTED]. Her postal address is [REDACTED].

For more information contact [REDACTED]

[REDACTED]

T: [REDACTED]

E: [REDACTED].com

T: +44 (0)XXXXX | **M:** XXX | **E:** XXXX
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

Appendix 9 - The descriptive statistics from Study 2 are below:

Variable	N	Min	Max	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
DEMO - Location	46	1	3	1.8913	0.87504	0.218	0.35	-1.683	0.688
DEMO - Age	46	2	6	3.6522	1.09985	0.118	0.35	-0.622	0.688
DEMO - Years employed	46	0	6	2.7174	1.54435	0.423	0.35	-0.68	0.688
DEMO - Gender	46	1	3	1.2609	0.64755	2.26	0.35	3.507	0.688
SAFETY VOICE - I make suggestions about how safety can be improved.	44	1	5	2.2273	0.96119	0.834	0.357	1.351	0.702
SAFETY VOICE - I discuss new ways to improve safety with my colleagues or boss.	45	1	5	2.2667	0.80904	1.083	0.354	2.242	0.695
SAFETY VOICE - I tell my colleague who is doing something unsafe to stop.	45	1	4	1.8444	0.73718	0.613	0.354	0.306	0.695
CONTROL VARIABLES - I fear that I could get hurt at this job	45	2	5	3.5333	0.94388	-0.27	0.354	-0.793	0.695
IDENTITY - I really “fit in” with other colleagues from the shop floor	45	1	4	2.2222	0.82266	0.583	0.354	0.136	0.695
PCSS - My co-workers are prepared to stop others from working dangerously	45	1	3	1.9778	0.69048	0.029	0.354	-0.812	0.695
SUPERVISOR OPENNESS - My supervisor cares about my safety opinions	45	0	4	2.1778	0.86047	0.089	0.354	0.305	0.695
CONTROL VARIABLES - I fear that I could have an accident at this job	45	2	5	3.5778	0.9412	-0.406	0.354	-0.699	0.695
SAFETY VOICE - I report to my boss if my colleagues break any safety rules.	45	0	4	2.7333	0.91453	-0.737	0.354	0.761	0.695
SAFETY VOICE - I inform the Trade Union/boss	45	1	4	2.2444	0.90843	0.435	0.354	-0.446	0.695

Variable	N	Min	Max	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
when I notice a potential hazard									
IDEAS - I have ideas about how to improve safety at my workplace	45	1	3	2.2667	0.68755	-0.402	0.354	-0.796	0.695
SUPERVISORS OPENNESS - My supervisor is interested in ideas and suggestions regarding safety	45	1	4	2.3556	0.82999	0.484	0.354	-0.157	0.695
PCSS - My co-workers are ready to talk to fellow employees who fail to use safety equipment / procedures	45	1	4	2.3111	0.66818	0.025	0.354	-0.108	0.695
IDENTITY - I feel strong ties to other shop floor workers	45	1	5	2.4889	0.89499	0.433	0.354	0.331	0.695
PCSS - My colleagues encourage each other to work safely	45	1	4	2.0667	0.71985	0.282	0.354	0.006	0.695
IDENTITY - I have a lot in common with other shopfloor workers	45	1	5	2.3778	0.91176	0.474	0.354	0.399	0.695
IDEAS - I have ideas about how my job could be made safer	45	1	4	2.4222	0.75344	0.11	0.354	-0.183	0.695
POSS - The company takes the safety ideas of employees seriously	45	1	5	2.0667	0.93905	1.069	0.354	1.341	0.695
SUPERVISOR OPENNESS - Good safety ideas get serious consideration from my supervisor	45	1	4	2.2444	0.90843	0.435	0.354	-0.446	0.695
POSS - The company is quick to respond to the	45	1	5	2.4444	1.11916	0.247	0.354	-0.907	0.695

Variable	N	Min	Max	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
safety concerns of their employees									
POSS - The company encourages employees to voice their concerns about safety	45	1	4	2	0.73855	0.354	0.354	-0.064	0.695
SUPERVISORS OPENNESS - When suggestions are made to my supervisor, they receive fair evaluation	45	1	4	2.2889	0.84267	0.113	0.354	-0.542	0.695
IDENTITY - I find it difficult to form a bond with other shop floor workers	45	2	5	3.8222	0.83364	-0.388	0.354	-0.225	0.695
IDENTITY - I don't feel a sense of being "connected" with other shop floor workers	45	1	5	3.4889	1.05792	-0.391	0.354	-0.202	0.695
AFFECTIVE COMMITMENT - I would be very happy to spend the rest of my career with this organisation	45	1	5	1.6	0.88933	1.915	0.354	4.366	0.695
AFFECTIVE COMMITMENT - I really feel as if this organisation's problems are my own.	45	1	5	2.8	0.86865	0.409	0.354	0.627	0.695
AFFECTIVE COMMITMENT - This organisation has a great deal of personal meaning to me	45	1	5	2.4444	0.75545	0.693	0.354	1.914	0.695
IDENTITY - In a group of shop floor workers, I really feel that I belong.	45	1	5	2.3556	0.93312	0.618	0.354	0.364	0.695
WORK INJURIES - In the last month, have you experienced any of the	44	1	3	1.2955	0.59375	1.912	0.357	2.654	0.702

Variable	N	Min	Max	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
following: •superficial wound (strain or sprain, scratch or abrasion); •cut, laceration or puncture (open wound); •work related burn or scald; •bruise									
WORK INJURIES - Did you report that injury to your supervisor / boss?	43	1	2	1.9302	0.25777	-3.501	0.361	10.755	0.709
SAFETY VOICE - Rate how frequently,you...Tell my supervisor about the consequences of dangerous working conditions	44	1	5	3.3182	1.55178	-0.328	0.357	-1.503	0.702
SAFETY VOICE - Rate how frequently,you...Group together with co-workers and take safety concerns to the supervisor	44	1	5	3.5682	1.40427	-0.542	0.357	-1.171	0.702
SAFETY VOICE - Rate how frequently,you...Tell my supervisor about hazardous work	44	1	5	3.2955	1.50317	-0.36	0.357	-1.392	0.702
SAFETY SILENCE - I do not speak up to my supervisor when....I feel that it could lead to a negative perception of me	43	1	5	3.5116	1.12063	-0.403	0.361	-0.498	0.709
SAFETY SILENCE - I do not speak up to my supervisor when....I don't want to start a dispute between others	43	1	5	3.3721	1.13438	-0.078	0.361	-1.086	0.709
SAFETY SILENCE - I do not speak up to my supervisor when....I think that my	43	2	5	3.4884	1.03215	0.101	0.361	-1.1	0.709

Variable	N	Min	Max	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
coworker(s) will lose respect for me									
SAFETY SILENCE - I do not speak up to my supervisor when....I feel that others may retaliate against me for speaking up	42	1	5	3.5476	1.04069	-0.61	0.365	0.141	0.717
SAFETY SILENCE - I do not speak up to my supervisor when....I feel that speaking up will make it difficult to work with others	42	1	5	3.4762	0.99359	-0.323	0.365	-0.327	0.717
SAFETY SILENCE - I do not speak up to my supervisor when....My supervisors are not open to hearing about safety issues	42	1	5	3.7619	0.93207	-0.822	0.365	0.845	0.717

ANOVA ^a						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	458.659	18	25.481	2.261	.038 ^b
	Residual	236.716	21	11.272		
	Total	695.375	39			

Coefficients ^a						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	43.697	12.037		3.630	0.002
	Ideas combined average	-3.727	1.291	-0.583	-2.888	0.009
	PCSS combined average	-0.058	1.808	-0.008	-0.032	0.975
	Identity combined average	-1.939	1.625	-0.234	-1.193	0.246
	POSS Combined average	-2.056	1.803	-0.390	-1.140	0.267
	DEMO - Location	-0.272	0.822	-0.054	-0.330	0.744
	DEMO - Age	-0.353	0.665	-0.093	-0.531	0.601
	DEMO - Years employed	-0.636	0.567	-0.223	-1.121	0.275
	DEMO - Gender	-1.322	1.069	-0.215	-1.236	0.230
	Injuries	1.367	2.364	0.112	0.578	0.569
	Control variables	0.961	0.859	0.208	1.118	0.276
	Supervisor openness	-0.147	2.098	-0.024	-0.070	0.945
	Affective commitment	-0.219	1.852	-0.031	-0.118	0.907
	Silence self	0.333	1.063	0.086	0.314	0.757
	Silence other	-2.116	1.319	-0.499	-1.604	0.124
	Silence relationship	2.422	1.560	0.492	1.553	0.135
	Silence issue	-1.227	1.096	-0.231	-1.120	0.275
	Silence job	-1.293	1.166	-0.252	-1.109	0.280
	Silence climate	0.782	2.148	0.135	0.364	0.719

a. Dependent Variable: 2015 Safety voice combined average

Appendix 11

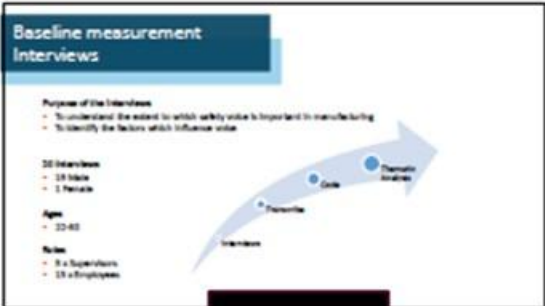
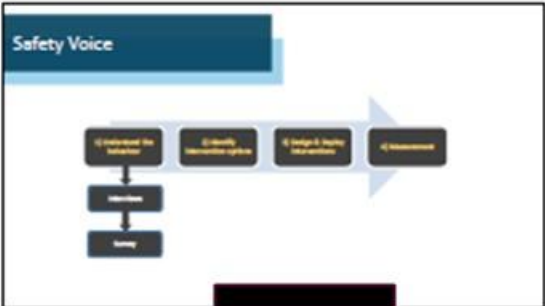
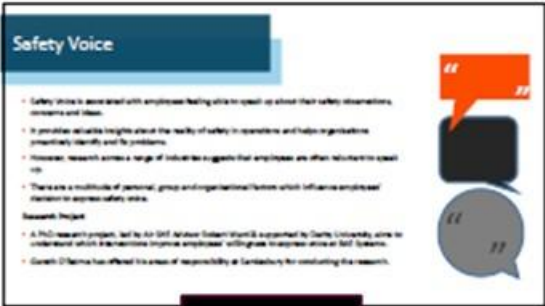
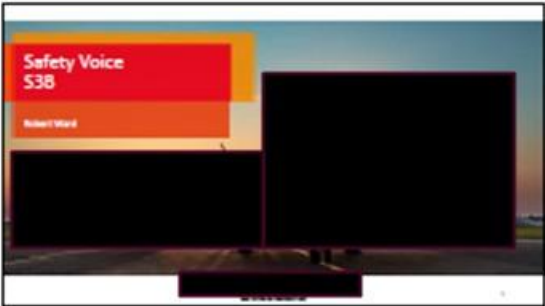
Results of the Multiple Regression to identify the factors which influence the variable safety voice (Tucker et al. 2008)

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.897 ^a	0.804	0.636	0.37484

ANOVA ^a						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	12.085	18	0.671	4.778	<.001 ^b
	Residual	2.951	21	0.141		
	Total	15.036	39			

Coefficients ^a						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.037	1.344		0.771	0.449
	Ideas combined average	0.659	0.144	0.700	4.571	0.001
	PCSS combined average	0.289	0.202	0.272	1.432	0.167
	Identity combined average	0.021	0.181	0.017	0.114	0.910
	POSS Combined average	0.246	0.201	0.318	1.222	0.235
	DEMO - Location	-0.059	0.092	-0.080	-0.639	0.529
	DEMO - Age	-0.044	0.074	-0.079	-0.598	0.556
	DEMO - Years employed	0.087	0.063	0.208	1.374	0.184
	DEMO - Gender	-0.040	0.119	-0.044	-0.336	0.740
	Injuries combined average	-0.243	0.264	-0.136	-0.921	0.368
	Control variables combined average	-0.010	0.096	-0.014	-0.100	0.922
	Supervisor openness combined average	-0.123	0.234	-0.134	-0.526	0.605
	Affective commitment combined average	-0.150	0.207	-0.143	-0.727	0.475
	Silence self-combined average	-0.063	0.119	-0.110	-0.533	0.600
	Silence other - combined average	0.022	0.147	0.035	0.148	0.884
	Silence relationship - combined average	-0.210	0.174	-0.290	-1.203	0.242
	Silence issue - combined average	0.026	0.122	0.033	0.210	0.835

Appendix 12 – Presentation pack to senior leaders & supervisors prior to intervention launch



Survey

Purpose of the survey

- To measure safety voice aspects in manufacturing
- To identify the factors which influence voice

Less than 20 surveys were submitted

- Was unable to gain a clear understanding of safety voice behaviours

Next Steps

- To progress with a qualitative research project

7



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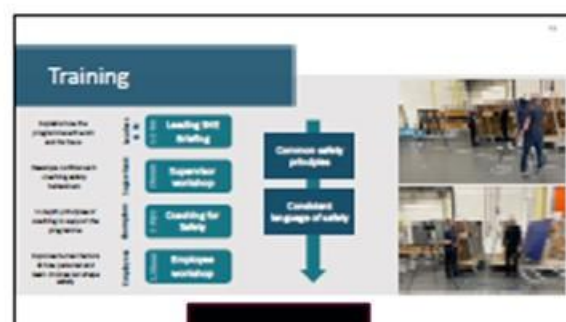
Safety Voice Intervention Design

Area	Intervention	Target Audience	Duration	Frequency	Location	Resources	Notes
Training	Leadership Skills Training	Supervisors	1 day	Quarterly	Workshop	Trainer, Materials	Focus on safety voice aspects
Training	Supervisor Workshop	Supervisors	1 day	Quarterly	Workshop	Trainer, Materials	Focus on safety voice aspects
Training	Coaching for Safety	Supervisors	1 day	Quarterly	Workshop	Trainer, Materials	Focus on safety voice aspects
Training	Employee Workshop	Employees	1 day	Quarterly	Workshop	Trainer, Materials	Focus on safety voice aspects
Training	Common safety principles	Supervisors	1 day	Quarterly	Workshop	Trainer, Materials	Focus on safety voice aspects
Training	Consistent language of safety	Supervisors	1 day	Quarterly	Workshop	Trainer, Materials	Focus on safety voice aspects

9



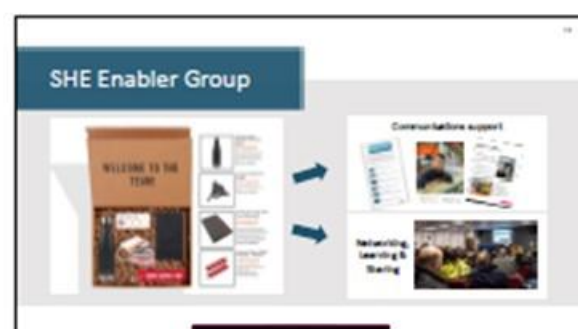
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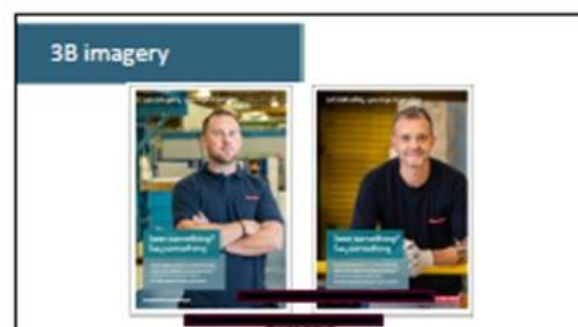
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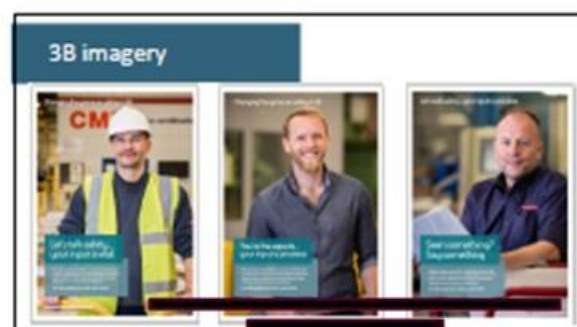
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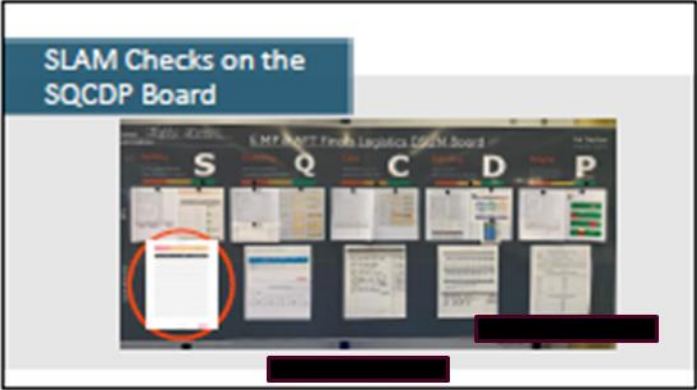
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17



18



Appendix 13 – Flyer to recruit SHE Enabler Group members

Change begins with you

Change is happening.

There are plans in place to transform safety, health and environment within [redacted] to make it the place where we're inspired to become our best and do our best work.

Work has already started, but this is just the beginning. We're looking for individuals to champion SHE change and actively lead in shaping the working environment for everyone's benefit.

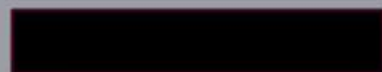
If you're enthusiastic, like a challenge and are passionate about making a difference – then the SHE Champion role is for you.

You don't need any particular SHE skills or knowledge. Just a positive attitude and a willingness to get involved. Training will also be provided and there will be lots of support and opportunities for sharing ideas and experiences with colleagues from around the business.

For more information, visit the SHE Champions webpage.

Together we can make the Air Sector a better place to work.

We can make it happen.



Appendix 14 – Information outlining the role of the SHE Enabler Group

SAFETY HEALTH & ENVIRONMENT

SHE Enabler Group members – role and responsibilities

The overall objective of this role is to support employees in shaping and improving aspects of SHE in the workplace.

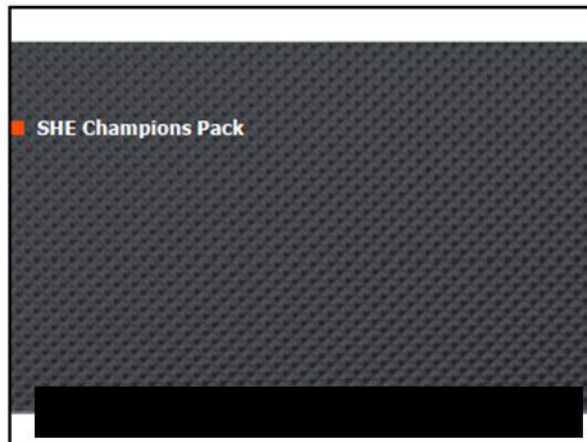
The following points outline the basic role and responsibilities of a SHE Enabler:

1. Locally lead the organisation and planning of SHE engagement activities to identify employee insights regarding barriers to safe working and where improvements are required.
2. Undertake local monitoring of SHE behaviours to identify improvements and track change over time.
3. Ensure local SHE communications are appropriate, visible and frequently updated.
4. Encourage the expression of employee ideas, observations and concerns that impact SHE.
5. Discuss and raise opportunities to improve SHE culture with the site, business and SHE functional teams for consideration.
6. Share best practice amongst fellow SHE champions.
7. Attend local SHE meetings as appropriate.
8. Coach supervisors and employees to improve engagement on SHE issues.
9. Keep stakeholders informed about the output of actions raised.
10. Reinforce positive behaviours through local reward & recognition.
11. These activities should typically take no more than 2 - 4 hours a month.

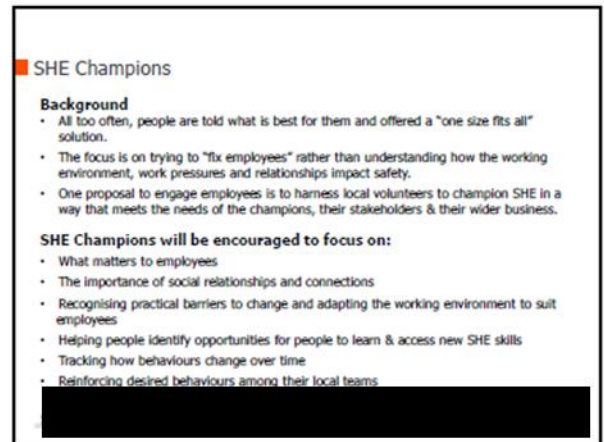
Training

No formal SHE training is required for this role, although supporting briefings and coaching training will be arranged for SHE enablers. New SHE Enablers will be briefed on the above points by the SHE functional contact. Topic requirements and specific briefings will be delivered through ad hoc meetings and events with their local or site SHE point of contact.

Appendix 15 – Presentation slides to SHE Enabler Group members



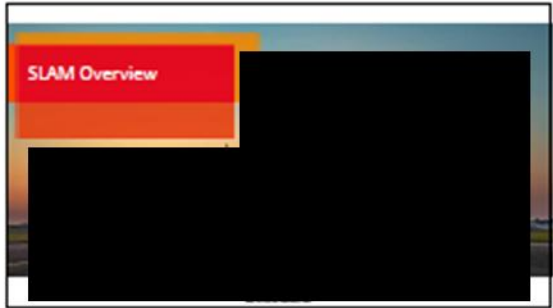
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Appendix 16: SLAM presentation to key stakeholders



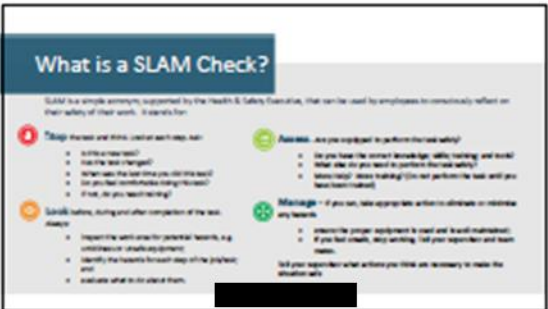
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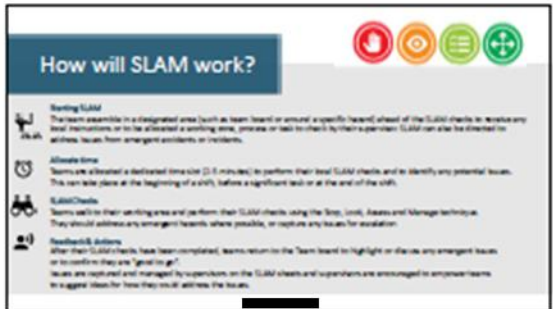
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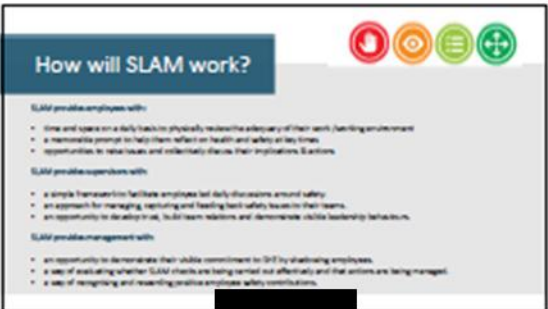
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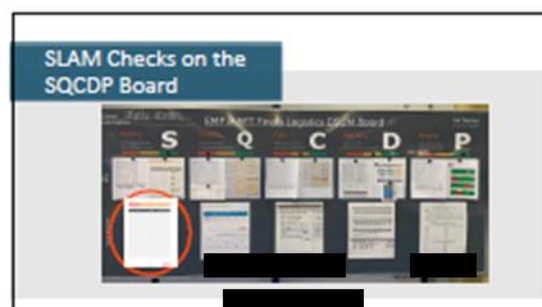
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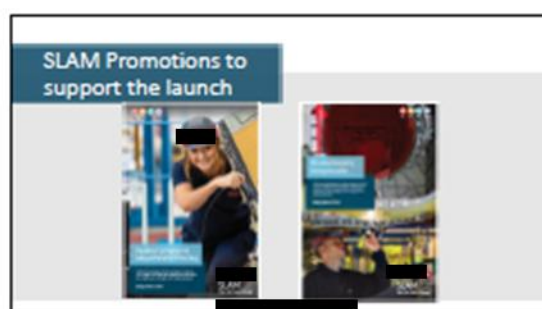
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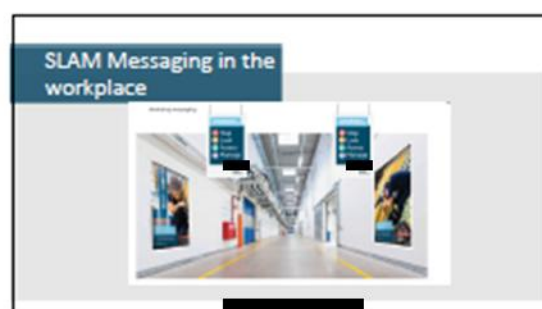
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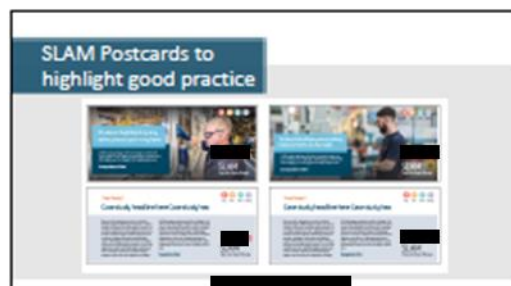
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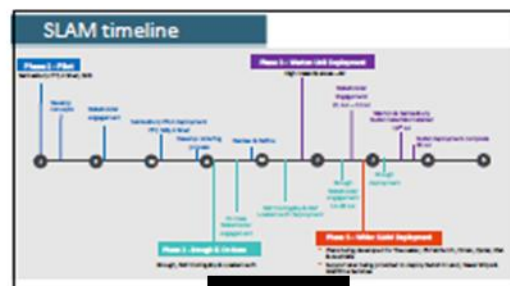
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SLAM Feedback

Read over the list of results we have seen an increase of greater than 40% in SLAM related opportunities generated by the SLAM process in comparison to other safety initiatives.

Andy Clifton
Head of SLAM Initiatives

SLAM gives us an opportunity to highlight any SLAM issues in the system. It is a daily step but it leads to the positive action.

Employee's View

It is in the early stages but SLAM is where the staff who are working. While we might be waiting for input, the employees can see an impact on our needs, getting them.

September 2017

The first in Chemical Treatment Plant has been a positive experience for the team and in particular the simplicity of the SLAM approach has been clear and.

Mark Williams
Production Manager

SLAM has provided clear direction on daily tasks and expectations for SLAM, as it leads to a positive step for team.

Employee's View

SLAM has reinforced our daily checks and has helped keep the focus on reducing barriers to safe working. It appears to be working well!

SEP 2017

Images shown: SLAM Deployed at Full Scale

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SLAM Summary

- The SLAM initiative
 - Is simple to remember and can easily be integrated into the working day
 - Provides dedicated time for safety at key points
 - Encourages employee participation in SLAM and the proactive raising of issues
 - Benefits supervisors, employees and management
 - Can be linked with reward & recognition processes

Next steps on the pilot

- This is a pilot and we're eager to capture employee feedback on the process and how it can be improved.

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Deploying SLAM

Design Considerations	Order SLAM materials	Planning SLAM launch	Rolling out SLAM	Monitoring SLAM
- Ensure design team are aware of the SLAM process and the importance of the SLAM process in the overall safety strategy. - Ensure design team are aware of the SLAM process and the importance of the SLAM process in the overall safety strategy. - Ensure design team are aware of the SLAM process and the importance of the SLAM process in the overall safety strategy.	- Ensure design team are aware of the SLAM process and the importance of the SLAM process in the overall safety strategy. - Ensure design team are aware of the SLAM process and the importance of the SLAM process in the overall safety strategy. - Ensure design team are aware of the SLAM process and the importance of the SLAM process in the overall safety strategy.	- Ensure design team are aware of the SLAM process and the importance of the SLAM process in the overall safety strategy. - Ensure design team are aware of the SLAM process and the importance of the SLAM process in the overall safety strategy. - Ensure design team are aware of the SLAM process and the importance of the SLAM process in the overall safety strategy.	- Ensure design team are aware of the SLAM process and the importance of the SLAM process in the overall safety strategy. - Ensure design team are aware of the SLAM process and the importance of the SLAM process in the overall safety strategy. - Ensure design team are aware of the SLAM process and the importance of the SLAM process in the overall safety strategy.	- Ensure design team are aware of the SLAM process and the importance of the SLAM process in the overall safety strategy. - Ensure design team are aware of the SLAM process and the importance of the SLAM process in the overall safety strategy. - Ensure design team are aware of the SLAM process and the importance of the SLAM process in the overall safety strategy.

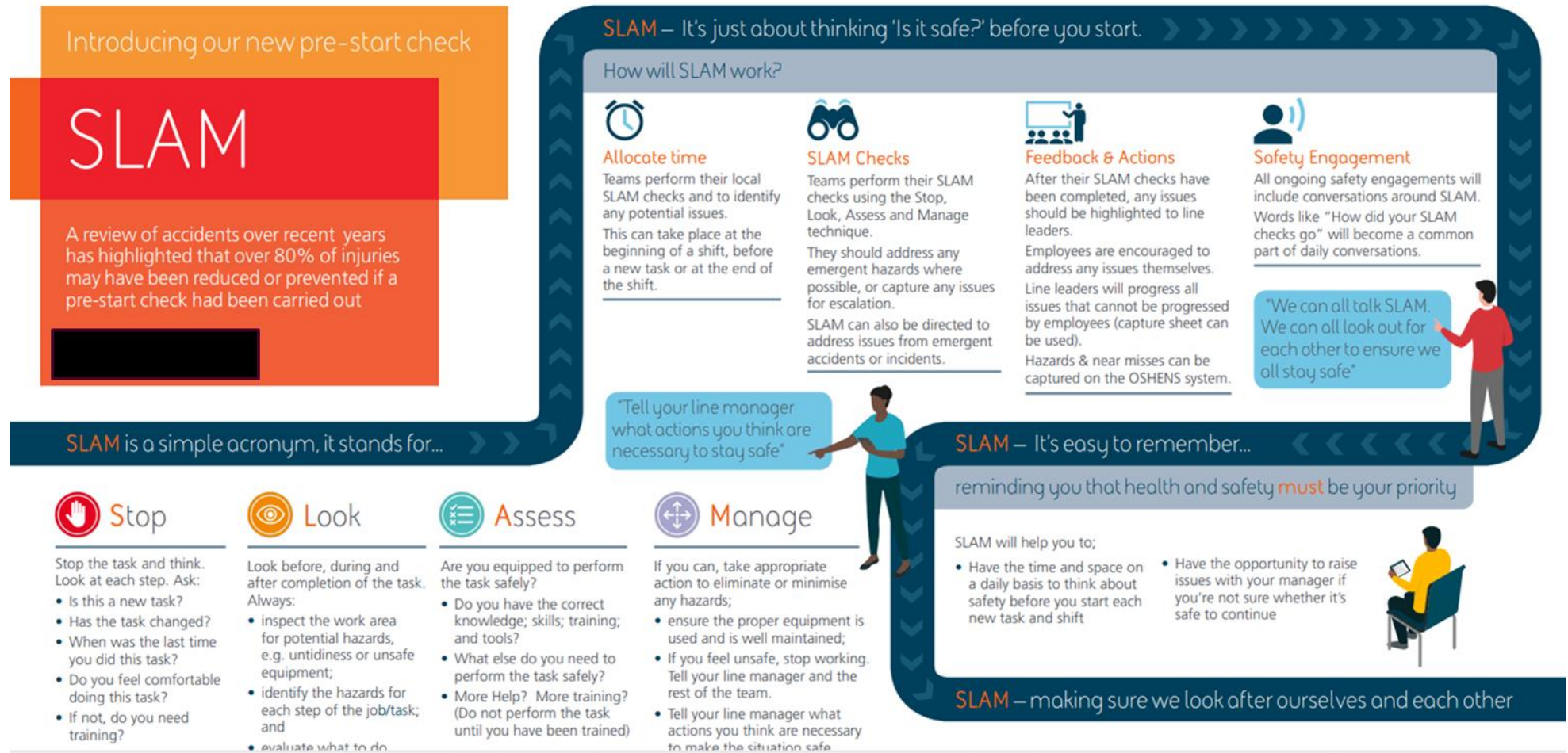
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Appendix 17 – SLAM Process Infographic



Appendix 18: SLAM Tool box talk to support its deployment by Supervisors

Safety Health & Environment

Stop, Look, Assess & Manage (SLAM)

Background

In order to make sure that everyone stays safe at work, it's vital that any potential safety issues are raised as soon as possible. This enables potential safety problems to be put right before accidents can happen.

Assess - Are you equipped to perform the task safely?

- Do you have the correct knowledge, skills, training, and tools?
- What else do you need to perform the task safely?
- More Help? More training? (Do not perform the task until you have been trained)

Manage - if you can, take appropriate action to eliminate or minimise any hazards

- ensure the proper equipment is used and is well maintained;
- if you feel unsafe, stop working. Tell your supervisor and team mates;
- Tell your supervisor what actions you think are necessary to make the situation safe.

How will SLAM work?



1) SQCDP Board

The team assemble at the SQCDP board ahead of the SLAM checks to receive any local instructions or to be allocated a working zone, process or task to check by their supervisor.



2) Allocate time

Teams are allocated a dedicated time slot (2-5 minutes) to perform their local checks and to identify any potential issues. This can take place at the beginning of a shift, before a significant task or at the end of the shift.



3) SLAM Checks

Teams walk to their working area and perform their SLAM checks using the Stop, Look, Assess and Manage technique. They should address any emergent hazards where possible, or capture any issues for escalation.



4) Feedback & Actions

After their SLAM checks have been completed, teams return to the SQCDP board to highlight or discuss any emergent issues or to confirm they are "good to go". Issues are captured, tracked and managed by supervisors on the SLAM sheets and supervisors should encourage teams to provide ideas for how they could address the issues.

NOTE: This is a pilot. Existing pre-use checks should not be used whilst SLAM is being trialled. Employee feedback about how to improve the process should be actively sought and will be welcomed by the site SHE team.

The role of Management & Executives in SLAM

Leaders have a key role to play by ensuring that the SLAM checks are being carried out effectively and that actions are being tracked and managed. In addition, leaders can demonstrate their commitment to employee safety by shadowing teams as they carry out their SLAM checks to understand and discuss their issues and challenges. In addition, positive safety contributions by teams can be recognised by utilising the safety awards process.

employees themselves. As well as being operational "sharp end" than things aren't quite right and where

highlighted by employees as an

to encourage people to speak up checks, Check for Safety and Good to go became confusing.

process for monitoring safety at the plant and empowers employees

into at the start of 2021.

space for employees to stop and

for unsafe equipment;

[illegible]

Appendix 20: Post intervention Interview – QUESTION SCHEDULE

INTRODUCTION

- Take interviewees through the Participation Information Sheet regarding the purpose of the study & their role
- Emphasise the confidential nature of the interview
- Emphasise the fact they can withdraw from the interview at any time.
- Field any questions or queries.
- Supply contact details for further queries or questions.
- Ask them to sign the consent form.

INTERVIEW QUESTIONS

1. To what extent has the profile of SHE changed in here over the last few months? What have you experienced?
2. Has SHE reporting changed in here?
3. What avenues are available for reporting safety concerns here? Has it improved?
4. What type of information do employees report? Has this changed?
5. What happens when safety issues are raised? (*Who takes it forward? How do you know it's being progressed? Has anything changed recently?*)
6. What's the process for reporting safety ideas and suggestions? (*Is this different to reporting concerns?*)
7. Do you think employees are more likely to speak up when safety is at risk than they were six months ago?
8. Are there any reasons why some employees might still be reluctant to speak up about safety?
9. How does the organisation (i.e. supervisors and managers) respond when you raise issues and ideas about safety? What do you think drives their response? Has anything changed?
10. To what extent does the organisation want to hear about your safety experiences?
11. If someone makes a mistake that could impact safety – how are they treated (by the organisation and their peers)?

12. If one of your co-workers raised an issue or idea about safety – how are they treated by the organisation? / How would they be viewed by the rest of the team?
13. To what extent does the organisation keep you informed about the progress of your safety suggestions / concerns? Has this changed?
14. If you could change one thing about the way the safety reporting is approached here– what would it be?
15. Is there anything else you'd like to raise which hasn't been discussed in the interview?

INTERVIEW – CLOSE

First and foremost, thank you for participating in this interview. The information you have provided today will be used in my final report and will also to help shape the design of a safety intervention that aims to improve rates of employee safety voice.

I'd like to reiterate the fact that your personal information will remain anonymous and that, whilst your views and comments may be included in the report, they will not be linked to you in any way. Indeed, no individual will be named in the study findings; a summary of which will be made available for you to review. If you wish to withdraw from the interview you have a two week window in which to do so.

If you wish to contact me to access a summary of the findings or if you have any queries whatsoever, my contact details are XXXX or I can be contacted on XXXX. Or if you have any further comments or queries about this interview or how your information will be used, you can also my academic supervisor, XXX via email at XXXX or via The University of Derby at Kedleston Road, Derby, DE22 1GB. Meanwhile my line manager, XXXX can be contacted at XXXX or XXXXXX. Thank you once again