Using a hazard profiling approach for developing an Occupational Health and Safety Management System in small to medium sized enterprises

by

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Thesis

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Abstract

Managing workplace safety risks in small to medium sized enterprises (SMEs) using an occupational health and safety management system (OHSMS) has had mixed success, both in Australia and internationally. Numerous barriers exist, manifested within the operational constraints of SMEs, and further contributed to by the availability of informative standards more suited to larger enterprises than SMEs.

Research indicates that generally SMEs do develop an OHSMS, claiming its completeness and value, although such systems often contain few elements, indicating limited knowledge of what is required. A lack of targeted strategies, expertise and costs in establishing an OHSMS compound this situation. Accordingly, SMEs need to develop their OHSMS by adopting planning methods relevant to their business profile, and produce sufficient elements within the OHSMS that are congruent with informative standards to claim its comprehensiveness and effectiveness.

This research aims to determine whether a hazard profile, systematically built to the characteristics of the SME, can identify and record the SME's hazards and be used as a gateway to visually map hazards into an OHSMS structure defined and selected by the SME, hence adding to its relevance, functionality and effectiveness.

Hazard profiling was trialled as a case study across four SMEs operating within the heavy engineering and transport sector within the city of Mackay in the state of Queensland, Australia. A qualitative inquiry was conducted, using data collection methods consisting of observation, interviews and focus groups. Research participants having an influential role in the organisation in relation to its governance participated in the development of the hazard profile and its mapping to the OHSMS.

Analysis of the data was conducted by first examining the perspectives and worldviews of research participants within a constructivist research paradigm. A critical realist analysis of events arising from the hazard profiling activities was also used to determine the causal mechanisms contributing to those worldviews and the resultant events. In this respect, the research contributes to an analytical approach that investigates the causality associated with socially constructed knowledge.

Findings indicated that a hazard profile can be developed by SMEs and can contribute to identification and mitigation of previously unidentified hazards and associated risks. Linkages between a hazard profile and the SME's safety system are less clear, presenting opportunities for further inquiry in this area. The research concludes by

drawing on themes and events arising from socially constructed knowledge and its causality as inputs in the planning and development of a hazard profile for SMEs.

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Publications

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1 Introduction

Small businesses in many industrialised nations form a major component of most business sectors and make a significant contribution to the economy (Cunningham, Sinclair & Schulte 2014; Papworth 2015; Targoutzidis et al. 2014). In Australia, small businesses account for forty-five percent of all persons employed and contribute approximately twenty percent of Gross Domestic Product (ABS 2016a). However, many small businesses face challenges across areas within their operations, where structural vulnerability and limited resources and expertise hinder the management of occupational health and safety (OHS) hazards (Bahn & Kitching 2013; Loosemore & Andonakis 2007) and the development of effective management systems (Floyde et al. 2013). Occupational Health and Safety Management Systems (OHSMS) in particular present challenges in their establishment and implementation, resulting in a lack of comprehensiveness and completeness, and leading to situations where the 'identification, management and documentation of safety [hazards and consequent] risks are problematic' (Bahn & Kitching 2013, p. 1).

Where hazards are not identified, a lack of congruence can exist between the hazards created by the work and the effort invested in their management using an OHSMS. Organisations within Australia operating under the model work health and safety legislation are required to eliminate or minimise risks to health and safety (SWA 2017c). According to the *Work Health and Safety Act 2011 Qld* (2011, s. 18) the person conducting the business or undertaking (PCBU) should have knowledge about the hazards and consequent risks created by the business. This is the apex of where the challenges originate. If an organisation is not fully cognisant of the hazards it creates, then it cannot manage them in a systemic manner.

Work health and safety legislation within Australia requires that businesses develop approaches to identify hazards and manage them through a systems approach (Work Health and Safety Act 2011 (Qld), s.19); for example planning and implementing risk assessments followed by the development of work procedures as an outcome of the risk assessment. However, SMEs may not have the resources, expertise or tools to identify hazard sources across their operations (Cunningham & Sinclair 2014), nor to methodically align hazards to an OHSMS (Champoux & Brun 2003).

This research project proposed that SMEs acknowledging the challenge participate in research that trialled a strategy to firstly visually map their hazards in broad groups against particular business functions, termed a 'hazard profile'. Once completed, the

SME would determine the profile's ability to support alignment between the SME's characteristics and its OHSMS. Visual mapping and its use within the activity of hazard profiling is discussed in Chapter 3 Methodology of this dissertation. The research was undertaken in the state of Queensland, Australia during the course of 2018.

The hazard profiling process was applied to all sections of the SME's operations, in order that all hazards have the opportunity to be captured within broad groups representing the business. Alignment was then sought to the relevant structures within the OHSMS used by the SME (see Chapter 2, Section 2.7).

The term SME is a relatively universal term used in developed economies within Australia, North America and Europe (Bragatto, Ansaldi & Agnello 2015; Makin & Winder 2009). Within this research, it is used to define enterprises having between ten to fifty employees, as this represents congruence with international research parameters used for SMEs (Arocena & Nunez 2010; Legg et al. 2014).

1.1 The matter under examination

The genesis of the researcher's underpinning philosophies associated with this research project commenced over twenty years ago. In the 1990's, the researcher worked as a safety practitioner, providing various training services to small and large enterprises operating in diverse operational environments. What became apparent soon after the commencement of these services were the stark differences in the ways OHS was managed. It was evident that smaller enterprises, whilst often creating the same types of hazards as others within the same industry, were challenged to put into practice a range of measures to manage OHS as used by the larger enterprises.

This prompted the researcher to reflect on the contributory factors to such situations and seek answers to the following questions:

- What was it that prevented the smaller enterprises from making the same investments in the management of OHS hazards?
- Could these small businesses see benefits in managing OHS as did the larger organisations?

Contemplating answers to these questions led to feelings of frustration and curiosity as to the source of the problem or if indeed there was a definable source. These reflections moulded the ontological views of the researcher, although a search for the epistemology supporting these observations was not made at the time. This interest continued until such a time when the researcher was able to undertake this research for personal and

professional reasons. The leading question that underpinned this research enquiry was as follows:

- Why do small businesses have so much difficulty in managing safety and what should they do first?

The epistemology surrounding this question will now be introduced and linked to key elements arising from the researcher's evolving ontology that culminated in the formulation of the research aim, objectives and research questions posed in this project.

Research published in the past fifteen years regarding SMEs and their management of OHS hazards has found that many experience difficulties due to structural vulnerability, insufficient resourcing and available expertise (Deighan 2009; Clarke et al. 2012; Bahn & Kitching 2013; Masi & Cagno 2015; Schwatka et al. 2018). Solutions offered to address these issues have directed attention to scaled approaches used by industry associations, government regulators and agencies (Curran & Blackburn 2011; Zanko & Dawson 2012; Holmes & Gupta 2015) and the operational performance of such systems (Yorio, Willmer & Moore 2015; Podgorski 2015).

The identified difficulties experienced by SMEs and their proposed solutions found in much of the literature during this period are largely consistent in their approach, identifying barriers and symptoms but not offering much insight into how they might be addressed to identify OHS hazards from the outset. The case for this research gains significance and necessity given the proportionately greater number of SMEs when compared to large enterprises operating within many industrialised nations (DIISRTE 2012; EU-OSHA 2017; Legg et al. 2015).

A study focussing on the improvement of OHSMS conducted by Makin (2009, p.113) proposed that an OHSMS should be developed with consideration for the individual needs of the organisation in association with its hazard profile. A similar view is suggested by Micheli and Cagno (2010, p. 730) where a 'modelisation of the enterprise' should be developed prior to the initiation of OHS interventions, indicating that the internal context of the SME should be considered when conducting research and interventions within SMEs. An OHS intervention is defined by Masi and Cagno (2015, p. 227) as 'an attempt to improve safety and health conditions in workplaces by means of targeted activities and initiatives'. The construction of a hazard profile is a targeted activity that may contribute to OHS outcomes.

This led the researcher to explore what a hazard profile comprises, and determine whether this would be of use to SMEs in addressing some of the difficulties experienced in establishing an OHSMS. Research by Makin (2009) used hazard profiles to prepare for the development of an OHSMS using the already established Software, Hardware, Environment and Liveware (SHEL) model developed by Edwards (1998) to frame the hazard profiles. Further discussion on the SHEL model is provided in Chapter 2, Section 2.7.

This research has sought an alternative approach for the construct of a hazard profile, based on enabling an SME to use its own business contexts and operating frameworks for the design and implementation of interventions in order to foster positive drivers and outcomes in the identification and management of OHS hazards. Cagno, Masi and Leao (2016, p 114) propose that further research is required in this area in order to understand the 'contextual factors affecting OSH (OHS) interventions, with a clarification of the hierarchical relationship among the factors'. These frameworks are based on the structures and governance practices identified as the organisational context (Cole 2019, p. 74), and the operational context comprising the design and implementation strategies used within the business activities (Cole 2019, p 57).

Prior research has identified interrelated variables associated with organisational and operational contexts (Makin 2009; Cagno, Masi & Leao 2016), but these have not been explored in unison. These variables are hazard profiling, the internal operational context of the SME and the applicability of the OHSMS used by the SME. These formed the foundations of the research questions (see Figure 1.1). This study sought to establish what approach would be relevant and meaningful for SMEs to commence the process of hazard identification. Could the use of a methodology involving hazard profiling that employs consideration for the internal context of the organisation and its OHSMS contribute to usable information and strategies to manage hazards within the OHSMS?

In addition to these variables, three contextual factors relating to interventions for SMEs and their impact on the business context were identified in research. They comprised:

1. The relevance and alignment of approaches to stakeholder perspectives that provides significance and meaning to adopted strategies (Hasle & Limborg 2006; MacEachen et al. 2010).
2. The incorporation of internal organisational context that considers internal influences affecting the SME (Makin 2009; Micheli & Cagno 2010).

3. The utilisation of a participatory approach (Pandey 2013) which can facilitate the engagement of tacit knowledge across the understandings and practices of the organisation.

A synthesis of these interrelated variables and contextual factors led to design research questions that incorporate them into a framework of inquiry. The associations between these is shown in Figure 1.1. The aim and objectives of this research (see Section 1.2) combine the variables and contextual factors in determining whether their integration assists in mapping and managing OHS hazards for SMEs.

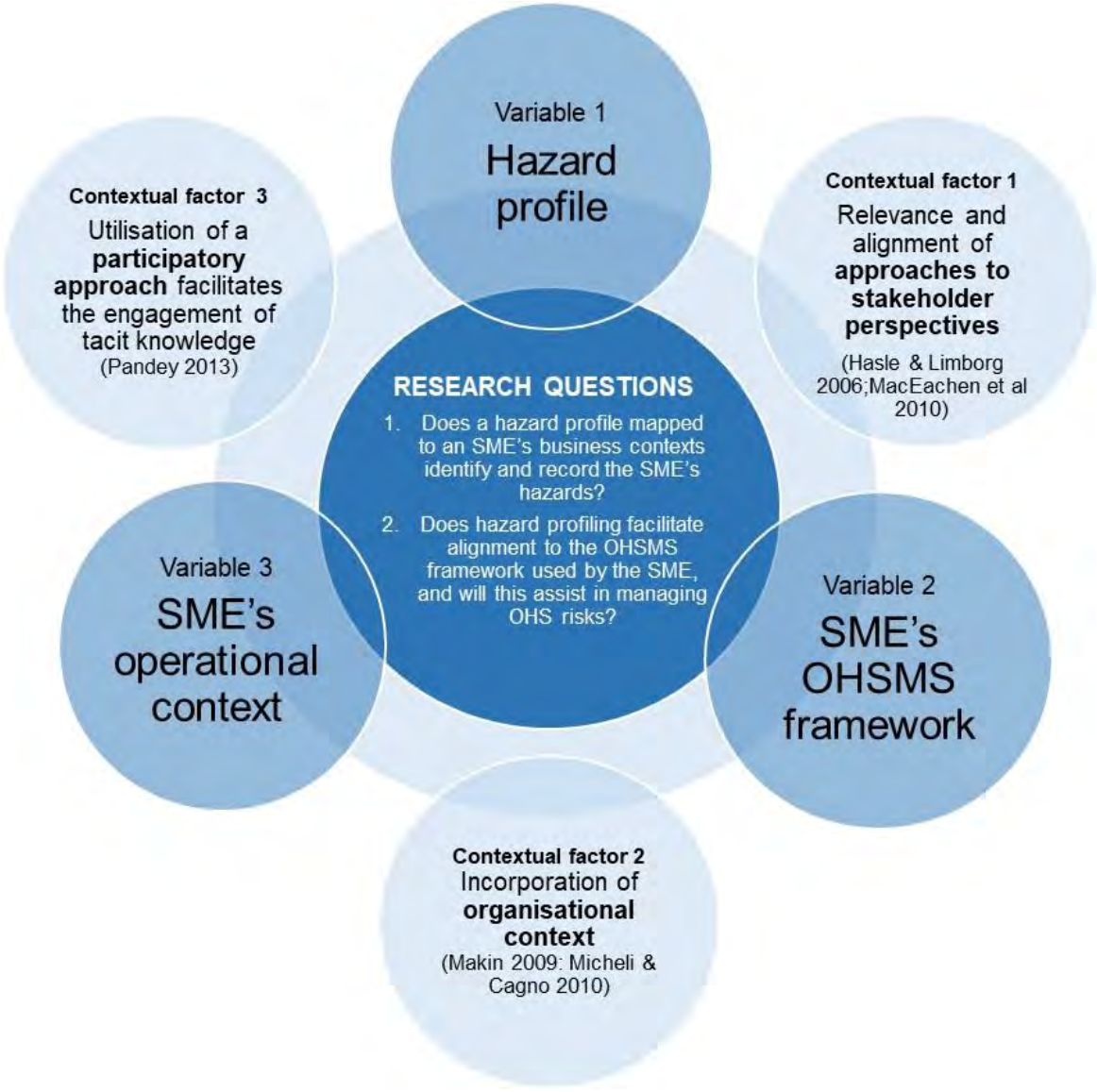


Figure 1.1 Synthesis of research variables and contextual factors contributing to the research questions

Source: Adapted by author 2019 from cited sources.

A synthesis of these variables and contextual factors can better articulate the intent of the research. Figure 1.1 depicts how the research questions are underpinned by three variables that can also be influenced by the contextual factors, being the hierarchical relationships resulting from the organisational context and interrelated operational contexts. These relationships are incorporated into sections 1.2 and 1.3, relating to the research aim, research objectives and the research questions.

1.2 Aim and objectives

This research was designed to explore one way in which the hazard recognition strategy of using a hazard profile can be employed by SMEs to assist in the management of OHS risks in the OHSMS. The research aim therefore is to establish whether the use of hazard profiling enables a determination of the safety risk within an SME and its ability to contribute to the development of the OHSMS for the SME.

The objectives of the research are:

1. To determine whether hazard profiling can be undertaken by mapping and aligning the profile to the SME's business contexts, in order to provide SME owners with a known hazard database.

2. To validate whether hazard profiles can be aligned to the OHSMS framework by a SME, thereby providing an association between known hazards and how they are to be managed in an OHSMS.

Once hazards are identified, the SME may seek to operationalise the hazard profile by constructing an OHSMS aligned to the profile, but the planning and implementation of an OHSMS by the SME were not within the scope of this research.

1.3 Research questions

The research questions are designed to express and test congruence between an SME's identified workplace hazards and the systems used to manage the consequent OHS risks arising from those hazards. The research questions are as follows.

1. Does a hazard profile mapped to an SME's business contexts identify and record the SME's hazards?

2. Does hazard profiling facilitate alignment to the OHSMS framework used by the SME, and will this assist in managing OHS risks?

The research questions are aligned to the research objectives and research aim in Table 1.1, where the keywords are marked in bold typeface for ease of referral to Figure 1.1.

Table 1.1: Alignment of research questions to the aim and objectives of the research

Aim	Research Objectives	Research Questions
To establish whether the use of hazard profiling enables a determination of the safety risk within an SME and its ability to contribute to the development of the OHSMS for the SME.	1. To determine whether hazard profiling can be undertaken by mapping and aligning the profile to the SME's business contexts, in order to provide SME owners with a known hazard database.	1. Does a hazard profile mapped to an SME's business contexts identify and record the SME's hazards?
	2. To validate whether hazard profiles can be aligned to the OHSMS framework by a SME, thereby providing an association between known hazards and how they are to be managed in an OHSMS.	2. Does hazard profiling facilitate alignment to the OHSMS framework used by the SME, and will this assist in managing OHS risks?

Source: Author, 2019.

1.4 Key concepts and fundamentals associated with the thesis

The establishment of the research questions and research objectives introduces concepts that require defining in order to contextualise and apply the research. These concepts and associated definitions will now be addressed.

1.4.1 Small to Medium Sized Enterprises (SMEs)

Definitions for characterising and classifying small and medium sized organisations vary across the globe and are based on various factors. A definition used by the Australian Bureau of Statistics (ABS 2016) uses employee numbers, recognising three broad categories being a micro business (0-4 employees), a small business (5-19 employees) and a medium sized business (20-199 employees).

A similar but broader classification is used by policy makers and researchers in the United Kingdom, where a combined classification representing small and medium sized businesses are those having employee numbers under 250 (Curran & Blackburn 2011). Classifications for SME's in Canada (Government of Canada 2016) and the United States (SBA 2018) use employee numbers of more than 500 to determine differences between SME's and large enterprises.

Classifications within Europe also use employee number, turnover and balance sheet total as guides to classify SME eligibility for various support measures provided by

government agencies (European Commission 2015), highlighting factors that influence and contribute to the classification of SMEs.

Presently, there is no universally used description to classify SME's. However, classifying small and medium sized organisations according to the number of employees may be a useful baseline measure for determining the differences in how small and medium sized organisations might operate (Legg et al. 2009, p. 22).

Some patterns have emerged from studies seeking to establish an association between the size of an SME and its preparedness to adopt OHS interventions to improve safety outcomes. There is research regarding characteristics of SMEs having small employee numbers (0-4) that proposes additional divisions for micro businesses (Cagno, Masi & Leao 2016). These findings also suggest that the seeking of a knowledge base and engagement of consultants are important drivers for safety improvement outcomes in micro businesses and are prioritised over the investment of the SME's own resources into OHS management.

As firm size increases so too does the willingness for an SME to invest in OHS interventions. A study by Knuckey et al. (2002) examined conventions and processes under which an SME operates, proposing an association between the size of an organisation and the adoption of business systems, with firms that employ over 20 staff tending to adopt formalised governance structures and business systems when compared to smaller firms. Other research undertaken by Micheli & Cagno (2010) found that small and medium sized enterprises having between 10 and 250 employees placed a higher value and commitment on investment in OHS interventions. Consequently, these findings have guided this research project to include SMEs having greater than 10 employees, increasing the likelihood of them engaging as research participants.

Although it may not be prudent to conduct research of SMEs under one broad grouping, the research objectives seek to associate hazard profiling with an OHSMS, and so require testing in enterprises that would facilitate such research. For this reason, the research has been applied to organisations having between 10 to 50 employees, although the results articulated in the findings may apply equally across a micro business (0-4 employees), a small business (5-19 employees) and a medium sized business (20-199 employees). The terms SMEs, small business, small firms and small enterprises are used synonymously in this research in order to align terminologies used within various international literature.

1.4.2 Hazard

The research sought to associate the variable of an SME's operational context with a hazard profile (Figure 1.1), thereby linking hazard groupings with the adopted framework of the business. The defining of a hazard is required in order to establish a context for its introduction as a research variable and utilisation in the identification of hazards and construct of hazard profiles.

The term 'hazard' can be found in contexts including the workplace and community settings (Pryor 2019), road safety (Stuckey 2012; European Commission 2017) and emergency management (COAG 2011; Islam & Ryan 2016). Hazards can also arise from natural occurrences of geological, biological or hydrological sources (UNISDR 2009); for example, the uncontrolled movement of water in proximity to industrial and urban areas leading to flooding. Some guidance material provided by OHS authorities specialise in diverse hazard classifications for agents such as chemicals (OHSA 2016) and food safety (Standards Australia 2005). With such a broad range of definitions and uses, the term requires further defining for this research.

Within the context of the workplace, the International Organization for Standardization (2009) has defined the term 'hazard' broadly as a 'source of potential harm'. According to Standards Australia (2001), the term is expressed in more specific terms as a 'source or a situation with a potential for harm in terms of human injury or ill-health, damage to property, damage to the environment, or a combination of these' (Standard Australia 2001, p 3), providing a substantial structure for the use of the term in a number of contexts and situations relating to injury or ill-health.

The Australian Work Health and Safety *How to manage work health and safety risks Code of Practice 2018* (SWA 2018a) provides a similar definition and assists to contextualise various groups of hazards. The code itemises potential physical hazards such as electricity and others across diverse sources such as 'a repetitive job, bullying and violence at the workplace' (SWA 2018a, p 11). Various publications used for training persons in OHS risk management also promote classifications of hazards by classes; for example, physical, chemical and biological hazards (Stoll, McGill & Ritchie 2014, p 141).

A consistent theme in these definitions is the reference to a hazard as something having the potential for harm. A logical sequence to avoid harm proposes that a hazard must be identified in order to be managed (SWA 2011; Standards Australia 2013a) and that various strategies can be used in order to identify sources of harm.

When relating sources of harm to technological contexts in a workplace, Flaus (2013, p. 16) defines a hazard as something ‘associated with a system or piece of equipment involving significant energy levels, or a substance that may trigger damaging chemical or biological reactions’, associating the source of potential harm with an energy source.

The recognition of OHS hazards as energy sources having the potential for harm has been used in models that classify and express OHS hazards as potentially damaging sources of energy (Haddon 1973; Viner 2015; Bahr 2015: Galves et al. 2016). According to Viner (2015, p. 34), recognising hazards by the identification of energies located on points in a linear ‘space transfer mechanism’ between the energy source and the receiver is a useful strategy in identifying the energy source and potential intervention points. However, other classifications also require consideration in the search for influential factors that have the potential for harm.

One such classification that warrants attention is sociotechnical factors that have been explored in sociotechnical systems theory research since the 1990’s (Waterson et al. 2015). These relate to hazards arising from non-linear internal factors within the work performed and the equipment used, and include the technical systems, the allocation of human resources to the prescribed work, structures of governance and industrial relation matters (Hudson 2014; Hollnagel, Wears & Braithwaite 2015; Carayon et al. 2015). All of these factors may be found within the SME; that is, its systems and the organisation of work and both require consideration when conducting a hazard profile. Linkages may also exist between social and technical systems and sociotechnical factors external to the work environment; for example, the influence of regulatory and economic drivers (Rasmussen 1997; Carayon et al. 2015).

Other subsets of sociotechnical systems may be found where hazards are present as human factor influences, for example where multiple hazards exist in hazardous and complex production systems (Kjellen & Albrechtsen 2017) such as petrochemical processing plants. The control of hazards in these environments rely on the interface of plant, personnel and operating practices to ensure the integrity of the operating systems that includes consideration for cognitive capacities and limitations, for example with work performed in control rooms.

Consideration of sociotechnical factors when identifying hazards has been referred to as a cross-disciplinary approach (Parchment 2013), where the connections and relationships between sociotechnical factors should be sought in ‘pushing the boundaries to identify new, emerging and unknown hazards’ (Parchment 2013, p. 50) rather than

investing time predominantly in the identification of known hazards. Seeking to identify sociotechnical relationships may offer an additional way to address the complexities and connections that underpin the emergence of hazards in current workplace contexts, in addition to other models such as potentially damaging sources of energy.

Therefore, the broad term acknowledging a hazard as a source of potential harm regardless of its source was retained in the classification of a hazard within the research, rather than focussing solely on narrower classifications such as potentially damaging sources of energy. Consideration for the organisation and its context was given in hazard identification by utilising the classification framework of the SME's activities, products and services (see Chapter 2, Section 2.3) as an application of the sociotechnical context to the identification and classification of hazards for the SME's hazard profile. This assisted in identifying the greatest possible spectrum of hazards for each SME, thereby ensuring a greater opportunity to address the objectives within the research.

This research has identified hazards and characterised them into broad groups as seen through the eyes of the research participants within the SME in their sociotechnical context but has not sought to address the allocation of risk values to the hazards through a process of quantification.

To allocate a risk description or risk value by way of a 'measure to which a number or rank can be ascribed' (Cross 2012, p. 3) would require a considerable undertaking that is beyond the scope of this research. The concept of risk should be visited briefly in order to establish the relationship between hazard and risk. At times, hazard and risk might be used to denote the same meaning and effect when they are two different, but interrelated concepts (Cross 2012).

1.4.3 Risk

Existing risk-based legislation pertaining to OHS found within regulatory frameworks in many developed nations (SWA 2017c; UK 2017; European Commission 2014) requires the identification of OHS hazards and the management of the risks arising from those hazards.

The International Organization for Standardization (2009) provides guidance on basic vocabulary for risk management, defining 'risk' generically as 'the effect of uncertainty on objectives'. The standard ISO 31000:2018 provides an identical definition and promotes the standard for its application to 'managing any type of risk …throughout the life of the organization and can be applied to any activity, including decision making at all levels'

(ISO 2018, p. 1). Risk is similarly recognised as a ‘concept based on events, consequences and uncertainties’ by some researchers (Aven, Renn & Rosa 2011, p. 1076).

Within the OHS context as it applies to a workplace, risk arises from the presence of hazards. The risk can be ascribed by the provision of a description for an event or situation that could occur, which leads to particular consequences (Standards Australia 2013, p. 11). A risk can also be expressed as a ‘number or rank … related to the extent to which potential outcomes are of concern’ (Cross 2012, p. 3) where ‘uncertainties can be expressed through probabilities’ (Aven 2010, p. 623). Parchment (2013, p. 6) summarises the differences between hazard and risk succinctly, proposing that a hazard can be ‘identified and characterised …whereas risks are often quantified’.

The measure of a risk, that is the determination of how certain or uncertain a particular effect may be, is undertaken by considering ‘a combination of the likelihood and magnitude of specified consequences’ (Cross 2012, p. 4). This is the process of risk analysis and evaluation once OHS hazards are identified (ISO 2018, p. 12), and seeks to understand the risks arising from the hazard exposure and the sufficiency of the controls used to avoid or reduce the potential harm associated with the hazard.

The research objectives and research questions established for this project (see Table 1.1) sought to focus on the identification and classification of hazards within an SME, but not their associated risks. The hazard profile associated with the research questions necessitated the establishment of a boundary that would exclude some elements of the broader process of risk management as prescribed in the international standard for risk management ISO 31000 (ISO 2018). The complexities and time investment required for the process of risk analysis and evaluation were beyond the scope of this research.

1.4.4 Hazard Identification

The determination of what a hazard is and the subsequent adoption of hazard identification strategies are logical and necessary requirements in the assembly of a hazard profile. Methods and language used in the identification of hazards lead to a discussion of a hazard’s characteristics and allocation to a hazard profile category selected by the SME.

The process of hazard identification is examined in Table 1.2. Definitions have been sourced from an Australian and New Zealand Standard that provides guidance on the development of OHSMS (AS/NZS 4804:2001), an Australian regulator (WorkSafe

Victoria), a published conceptual framework (OHS Body of Knowledge) and an international guide to risk management terminology (ISO/Guide 73:2009). This comparison identifies a commonality of language applied to the process.

Table 1.2: Comparison of Hazard Identification definitions in relevant standards

AS/NZS 4804:2001	SafetyMAP	OHS Body of Knowledge	ISO/Guide 73:2009
KEY DEFINITION			
Hazard identification	**Hazard Identification**	**Hazard as a concept**	**Risk management - Vocabulary**
'The process of recognising that a hazard exists and defining its characteristics'.	'The process of recognising that a hazard exists and defining its characteristics'.	Various definitions for a hazard are provided from a number of sources, including regulators, standards and professional publications.	Hazard is a 'source of potential harm'. 'Note 1 to entry: Hazard can be a risk source'. Process of finding, recognizing and describing risks (1.1)
SUPPORTING DESCRIPTORS			
'The process of finding all items, activities and situations, products and services that could give rise to injury or illness. This would generally involve consideration of: (a) the type of injury or illness that is possible; (b) the situations or events, or combination of circumstances, that could give rise to injury or illness; and **(c)** the way work is organised and managed'.	'The identification of hazards in the workplace should consider: a) legislative requirements, relevant codes of practice, standards and other guidance material; b) the circumstances or conditions which have the potential to cause injury, illness or property damage; c) the types of injury, illnesses and property damage likely to occur; and d) past injuries, incidents and illnesses'.	Suggests that 'tailoring different definitions and classifications of hazards to different contexts and purposes, and modifying these as our understanding of complex systems and systemic failure develops' is a strategy that OHS professionals can engage in.	Risk identification 'Process of finding, recognizing and describing risks'.
SOURCE			
Standards Australia (2001, pp. 3 & 25)	WorkSafe Victoria (2002, p pp 11 & 23)	Pryor (2019, p 12)	ISO (2009, p 11)

Source: Created by the author and adapted from sources as cited, 2019.

Common themes evident from the comparisons in Table 1.2 include the requirement to recognise the existence of a hazard and the agents, mechanisms and systems that contribute to its manifestation, persistence and intensification. These definitions were introduced to research participants within the SME using baseline questions (see

Appendix 7: Hazard Profiling for Small to Medium Sized Enterprises – Background material, protocols and initial briefing), in order to determine research participant knowledge of concepts regarding a hazard, hazard identification and their links to OHSMS.

Hazard identification strategies, for example the conduct of inspections, consultation with workers and review of information as advocated by key OHS regulatory authorities (HSE 2018; OSHA 2018b; SWA 2011) were consequently used in the construct of hazard profiles, in order to best capture the widest possible range of hazards endemic to each business.

1.4.5 Hazard profiling

Hazard profiling is a loosely coupled term applied in different ways across literature pertaining to occupational health and safety, and warrants clarification here for the context of this research. The construct of a hazard profile follows the defining of what constitutes a hazard and can be associated with a reflection of the units or divisions of an organisation to which the profile is applied.

The classification of hazards has been subject to the development of formalised hazard models in occupational health and safety literature over the past forty years. Some prominent models include damaging energies as discussed in Chapter 1, Section 1.4.2, and the work system context (Macdonald 2005, cited in Pryor, 2019, p. 9), both of which provide detailed classification frameworks. Other models combining energies with psychosocial and latent hazards can be found within publications by regulatory authorities (Workplace Health and Safety Queensland 2011) and OHS textbooks (Rausand 2011; Reese 2016). All of these hazard models were considered for use in building a hazard profile.

Ultimately, a hazard profile designed for an organisation should reflect OHS hazards present or having the potential to be present within the organisation, displayed as a list of hazard groupings. These groupings should be allocated to a framework aligned to the particular things the organisation is engaged in, that is its business functions. Two variables requiring alignment for a hazard profile are the type of hazard groupings and the particular framework selected for the profile.

To use any one grouping, for example, in classifying all hazards by energies, may lead to omissions in other areas of the SME where hazards exist. In order to capture a broad and potentially thorough representation of OHS hazards in the SME’s hazard profile,

groupings that could incorporate energies, but also sociotechnical factors and other models provided in literature by various regulatory authorities were offered for consideration as an initial starting point.

The adoption of an initial framework comprising activities, products and services was used for the hazard profile. This is a broad classification provided in a number of standards including AS/NZS 4084 (Standards Australia 2001a), OHSAS 18001 (BSI 2007) and AS/NSZ ISO 45001 (AS/NZS ISO 2018) that prescribe requirements for an OHSMS as a foundation for organisations to consider in determining the scope of its business and operating frameworks. This initial framework could be used or adapted by SMEs to purpose-fit the organisation.

Based on the three elements of activities, products and services, this classification framework required incorporating an organisation's operations and was therefore a logical starting point for the development of each SME's hazard profile. The framework was able to accommodate sociotechnical contexts, for example human resources and structures of governance to the identification of hazards and the agents, mechanisms and systems that contribute to the manifestation and persistence of hazards. This afforded opportunities to capture broad and comprehensive hazard groupings for each SME.

1.4.6 Occupational Health and Safety Management System (OHSMS)

To meet the research objective of determining whether hazard profiles can be aligned to a selected OHSMS framework by a SME, an OHSMS needs to firstly be defined and then applied in a selected context, that is in a particular organisation. The definition provided for an OHSMS within the relevant Australian standard *AS/NZS 4804:2001*, and similarly expressed in others such as the British Standard *OHSAS 18001:2007* is as follows:

> That part of the overall management system which includes organizational structure, planning activities, responsibilities, practices, procedures, processes and resources for developing, implementing, achieving, reviewing and maintaining the OHS policy, and so managing the risks associated with the business of the organization. (Standards Australia 2001a, p. 4).

The standard *AS/NZS 4804:2001* has promoted the sharing of management systems principles relating to OHS with others such as environmental management and quality management, and the recognition of an OHSMS as a subsystem within the overall management system. However, recent international

developments have introduced a more compelling requirement to integrate OHS management into business functions and planning.

The newly published international standard *AS/NZS ISO 45001:2018* for OHSMS (AS/NZS ISO 2018) defines OHSMS by combining and cross-referencing the definition for an OHSMS with that for a management system and for an OHS policy. An OHSMS is defined in the standard as either the management system or part of the management system that is a 'set of interrelated or interacting elements of an organisation to establish policies and objectives and processes' to 'achieve the OHS policy': the policy being 'to prevent work-related injury and ill health to workers and to provide safe and healthy workplaces' (AS/NZS ISO 2018, p 3). This definition provides an integrated systems approach for the design of OHSMS, making a compelling case for consideration of the interaction of OHS management to related management system components used within operational and strategic decisions.

Guidance provided within both the Australian/New Zealand standard (Standards Australia 2001a) and the international standard (AS/NZS ISO 2018) to assemble and utilise a functioning OHSMS is underpinned by a suite of elements such as responsibilities, consultation, hazard identification and control and training that ought to be considered by organisations when developing their OHSMS. There is research that identifies positive results between OHSMS and safety performance where such elements are adopted and the organisation is adequately resourced (Barbeau et al. 2004; Fernández-Muñiz, Montes-Peon & Vázquez-Ordas 2008; Robson et al. 2007; Gervais et al. 2009; Arocena & Nunez 2010; Bornstein & Hart 2010). However, the suggested structure for an OHSMS found within these standards is highly prescriptive (see Chapter 2, Section 2.1) and relies on organisations being adequately resourced to develop an OHSMS (Gallagher 2000: Bluff 2003, Legg et al. 2015).

While these standards may be challenging for SMEs to adopt due to barriers associated with adequate human, financial and physical resources (Garengo & Biazzo 2013; Bahn & Kitching 2013; Masi & Cagno 2015), embracing particular contextual guidance provided within the standard may be useful as a first step for SMEs seeking to establish an OHSMS (see Chapter 2, Section 2.4).

This research has aimed to establish whether incorporating characteristics of the internal context as outlined in the standard AS/NZS ISO45001:2018 and other literature into hazard profiling can contribute positively to the development of the OHSMS for an SME, thereby promoting the immediate utilisation of strategies and interventions. Such an

approach may better suit the organisation, its contexts and the ways in which it operates its systems (Borys et al. 2012). The linkage between internal context and hazard profiling lies in the sequential and iterative approach exemplified within the risk management process (Flaus 2013: ISO 2018) where hazard identification follows the establishment of various contexts used for examining the organisation's objectives and the environment it operates within.

Standards such as *AS/NZS 4804:2001* (Standards Australia 2001a, p. 12) and *AS/NZS ISO 45001:2018* (AS/NZS ISO 2018, p 12) promote hazard identification as a core component of OHSMS and encourage organisations to adopt methodologies to identify hazards. Although the practice of assembling a hazard profile is not mentioned within either standard, the research proposed that a hazard profile is a potentially useful method for hazard identification. The research intended to determine whether hazard profiling would be a useful method for identifying and recording ways in which OHS hazards are initially identified and aligned to the OHSMS.

The adoption of these standards or some other framework offering similar guidance is essential for SMEs in order to meet the regulatory requirements prescribed in safety legislation (UK 2017; SWA 2017c) and legally binding requirements operating as directives within the European Union that need to be adopted by each member state (EU-OHSA 2017b). In doing so, the creation of a hazard profile may address one core provision of Australian State and Territory work health and safety legislation adopted by most states under model work health and safety laws. The legislation requires the person conducting the business or undertaking (PCBU), and if a corporation, its corporate officers to have knowledge about the hazards and risks created by the business (Work Health and Safety Act 2011 (Qld), s. 18 & 27) in order to provide 'safe systems of work' to manage the identified hazards (Work Health and Safety Act 2011 (Qld), s. 19).

In seeking to address the legislative requirement to manage hazards and risks created by the business, this research sought to couple knowledge of hazards recorded in a hazard profile with their alignment in the systems used to manage them, being the OHSMS of an SME.

1.5 Significance of the research

The premise of this study is that existing tools and frameworks for the systematic identification of hazards in SMEs are inadequate. This research investigates a method by which SMEs can broadly identify the core hazards created by the business and

establishes hazard profiling as a legitimate and comprehensive initial strategy to identify and align hazards and their management to the ways in which SMEs function.

If hazards are not systematically identified across the SME by examining all the organisational and operational contexts, the consequences can be grave and measured in workplace incidents, injuries, illnesses and workplace fatalities. A hazard profile has the potential to be aligned to the contexts of the business and to the OHSMS, by providing opportunities for the determination of where hazards are managed within the system, affording a more comprehensive and effective system.

This research establishes a process for SMEs to develop a hazard profile but does not develop a resource. Rather, the research offers a processual method for hazard profiling, culminating in a usable primary strategy for the development of a hazard profile. SMEs can design their own hazard profile according to their own organisational and operational contexts that reflect how the business operates in the present and foreseeable future.

2 Literature Review

This research sets out to identify and enhance an understanding of the body of knowledge and practices relating to the key concepts associated with the aim and research objectives of this dissertation. This literature review provides accumulated findings and consolidation on what is known with regard to the research questions, and names potential gaps that are incorporated in the research methodology within this dissertation.

The key concepts of hazard, risk, hazard identification and hazard profiling as applied to SMEs and OHSMS (see Chapter 1, Section 1.4) reside within the synthesis of research variables and contextual factors that contribute to the research questions (see Figure 1.1). The literature was examined to assist in identifying current knowledge and practices in the field where these concepts have been researched or used as interventions to assist SMEs in hazard identification and hazard management.

2.1 Methodology for the Literature Review

A research literature review has been defined as a 'systematic, explicit, and reproducible method for identifying, evaluating, and synthesizing the existing body of completed and recorded work produced by researchers, scholars and practitioners' (Fink 2014, p.3). Using this definition as a benchmark for the conduct of a literature review, a detailing of its design and methodology was paramount in providing a level of assurance in relation to its merit, authenticity and reproducibility.

Vom Brocke et al. (2009, p. 2215) propose that a literature search process needs to be 'documented rigorously' in order to provide clarity on how it was executed and that 'methodological rigour' and 'reliability and validity of the search process' are paramount in planning the foundation of the literature review (Vom Brocke et al. 2009, p. 2210). A review is more likely to be reproducible if the methods used are explicitly described, thereby potentially offering a reliable and valid approach that enables other researchers in the field to ground further research utilising a similar review process. A systematic and methodical approach was adopted for this literature review to avoid shortcomings that can include a lack of specific scope, omissions of significant literature and biased selection of literature that is in accordance with the worldviews of the researcher (Grant & Booth 2009).

Prior to embarking on the literature review, the researcher sought particular approaches that could assist in establishing a methodical and objective review in order to furnish

comprehensive findings. Guidelines for literature reviews have been proposed by Torraco (2005) and by Okoli and Schabram (2010), where detailed checklists and plans are proposed. A classification system was sought to assist in guiding the framework of the review and facilitate its scope. Early proponents of the need to adopt a methodology for the planning of a literature review (Jackson 1980; Cooper 1985; Slavin 1986) proposed broad guiding principles to assist in planning literature reviews and knowledge synthesis. Cooper's Taxonomy of Literature Reviews (1988) has been widely adopted (Randolph 2009) as a methodology for the planning of a research review.

Cooper's Taxonomy was selected to guide this literature review. Its broad base of characteristics and subdivisions offers scope and breadth in selecting what is appropriate to align with the research objectives in framing a methodology for the literature review. Cooper's Taxonomy of Literature Reviews (1988) incorporates the characteristics of focus, goal, perspective, coverage, organisation and audience. Each characteristic comprises foci that can be used to frame and direct the researcher's efforts during the review. Cooper's taxonomy was primarily directed towards scholarship (Cooper 1985) but can be applied to a literature review such as this one, where it is used as a predecessor to the research (Boote & Beile 2005, p. 3; Randolph, 2009). Such an approach can support the need for methodical research synthesis (Chalmers, Hedges & Cooper 2002), where research bias may be addressed through the determination of applicable characteristics that pertain to the research questions.

Cooper's Taxonomy is summarised in Table 2.1. Each characteristic in the taxonomy itemises the foci that may be selected as part of the literature review strategy. The table also provides an overall rationale for each characteristic and associated foci as proposed by Cooper (1985) and identifies the selected foci within each characteristic to be applied in guiding this literature review against the key concepts associated with the research questions (see Chapter 1, Section 1.4) in the final column of Table 2.1. The key concepts are drawn from Figure 1.1 which outlines a synthesis of the research variables and contextual factors associated with the research that are built into the research questions.

The table serves as both a foundation for this literature review and a summary of how the literature was examined. Some foci have been marked as non-applicable due to their disassociation with the key concepts and research questions, and were therefore not used to guide the literature review

Table 2.1: Cooper's Taxonomy of Literature Reviews and selected elements used for this literature review

Characteristics	Foci	Rationale	Selected categories & link to research question
Focus	Research outcomes	A determination of the content that is of interest to the reviewer	*The search for findings and relationships among the key concepts within research already conducted*
	Research methods		*Search for key variables and methods of analysis, and for methodical strengths or weaknesses in other research*
	Theories		*A search for the existence of theories linking the key concepts associated with the thesis*
	Practices or applications		*Search for the existence of documented interventions and their link to the key concepts and research questions*
Goal	Integration (a) Generalization	What the reviewer anticipates will be achieved by the review	*The search for central issues relating to the key concepts and research questions*
	(b) Conflict resolution		Not applicable
	(c) Linguistic bridge-building		Not applicable
	Criticism		Not applicable
	Identification of central issues		*The search for identifiable central issues and established associations between the key concepts arising from past research*
Perspective	Neutral representation	A distillation of the literature and presentation of either a neutral position or determining the value of paradigms and philosophies (espousal)	Not applicable
	Espousal of position		*The seeking of an accumulation and synthesis of the literature to support an association between the key concepts*
Coverage	Exhaustive	Determines to what extent the literature has been accessed and how the literature has been evaluated in terms of its merit and relevance for inclusion	Not applicable – time available to search for every topic and item prohibitive
	Exhaustive with selective citation		*Selection of literature defined by particular key concepts, publication sources and age*
	Representative		Not applicable – all literature in scope to be included
	Central or pivotal		Not applicable – all literature in scope to be included
Organisation	Historical	How the literature is organised, either by chronology, by concept and theme or by literature that has used similar methods	Not applicable – not relevant to the research objectives
	Conceptual		*Selection and presentation of literature according to key concepts and themes*
	Methodological		*A synthesis of findings may lead to a discussion of results that propose a new concept to be researched*
Audience	Specialized scholars	The specification that determines the intended audience that the review is aimed at	*Dissertation - Supervisors, reviewers and examiners*
	General scholars		Not applicable
	Practitioners or policymakers		Not applicable
	General public		Not applicable

Source: Adapted from Cooper (1985)

2.2 Summary of foci used in the literature review

The adopted structure for this literature review using Cooper's Taxonomy employed a themed approach as identified in the characteristic regarding organisation (Table 2.1), where the presentation of identified relevant literature was made according to a conceptual approach incorporating key concepts and themes.

In addressing other characteristics within the taxonomy, the goal and focus of the review was reflected in a search for the central issues relating to the key concepts and research questions. These are linked to the characteristic of perspective, where a determination of the value was sought between the key concepts arising from past research that may not have previously been synthesised.

Prior to examining literature related to the themes (see Chapter 2, Section 2.4), the foci that considers literature research methods and the characteristic of coverage that determines the selection of literature can be explained in terms of the literature search process.

2.3 The Literature search process

The approach adopted with the literature search sought an extensive coverage of the available literature, incorporating an integrated number of search strings along with a wide number of publication types and key academic databases (see Chapter 2, Sections 2.3.1 – 2.3.4). Cooper's foci names this type of coverage as exhaustive (see Table 2.1).

2.3.1 Establishment of keywords

The key concepts associated with the research questions, research aim and research objectives (see Table 1.1) were entered as an initial trial search using an online academic and research discovery system Ex Libris' Primo (Wells 2016). The use of electronic based online academic and research discovery systems are a leading mechanism used for researching content stored by academic and research libraries (Wells 2016). The identification of relevant literature was searched for through the use of an academic research database, Ex Libris' Primo linked to a number of Literature Vendor Databases including Scopus, ProQuest, EBSCO, Elsevier Springer, Wiley and Taylor & Francis (Levy & Ellis 2006, p. 187).

The key words 'SME', 'OHSMS' and 'Hazard Profile' were used in the title search of particular works and publications. Several results, appearing as journal article titles, produced secondary words or word strings containing synonyms that could be associated with the initial key words and used in consecutive searches.

Rowley & Slack (2004, p. 35) propose that a search strategy is defined by ‘building blocks’ that incorporate synonyms and associated phrases within the search string. This prompted the researcher to develop a keyword classification to allocate search findings within two search strings (see Figure 2.1 and section 2.3.2) that aligned closely with the research questions.

Results obtained from this initial search string were firstly organised against the three keywords of ‘SME’, ‘OHSMS’ and ‘Hazard Profile’, from which titles to works and publications could be allocated. Each level reflected a scaffolded structure and potential association of importance in relation to the research topic (Figure 2.1), This exercise culminated in a keyword guide (Figure 2.1) used to create a keyword search and provided the basis for search strings related to each keyword.

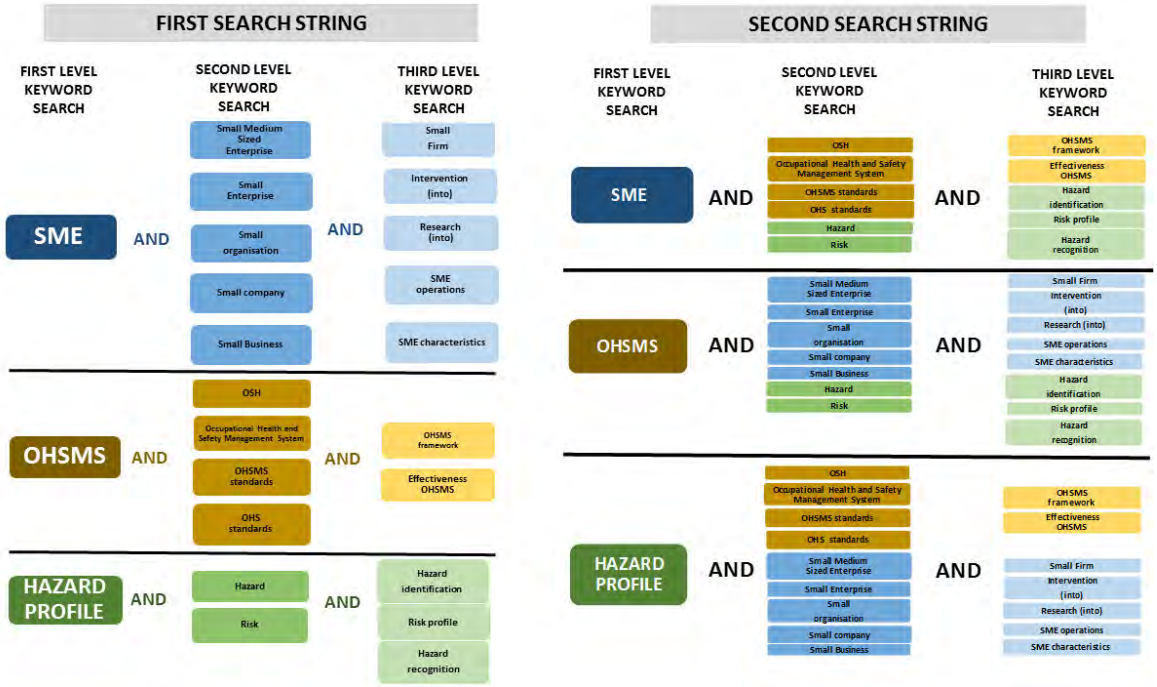


Figure 2.1: Literature review search parameters: Keyword guide for data search
Source: Author, 2019.

2.3.2 The use of search strings

The search process involved the conduct of two search strings. Firstly, the construct of a search string incorporated the selection of the first level keyword, followed by the second level keyword and then the third level keyword, all from the same parameter relating to either SMEs, OHSMS or a hazard profile. As an example, the first line of the keyword search following the order shown in Figure 2.1 required the entry ‘SME’, ‘Small Medium Sized

Enterprise' and 'Small Firm'. Each combination exhibited in Figure 2.1 was utilised in the first search string search.

The second search string displayed on the right in Figure 2.1 required combining the first and second level keyword with a third level keyword from each of the other parameters. Third level keywords were obtained as synonyms from publications within each search. As an example, 'SME' was combined with 'Small Medium Sized Enterprise' and 'Hazard Identification', the latter being drawn from a different parameter. Each possible combination was explored in the search using this approach.

The process of backward and forward searches (Webster & Watson 2002, p. xvi) was used to ensure relevant literature was captured. The backward process involves reviewing older literature that is derived from the references cited in each article itself and a forward search involves the review of additional sources that appear in the search results when entering the search string query. Both backward and forward searches were used with each identified source in order to find a potentially greater suite of relevant literature.

The process of keyword searches described above illustrates a detailed and potentially useful methodology for future researchers to evaluate whether the particular topic being researched has been sufficiently matched with a similar search. The documentation of search string combinations is recommended for researchers as a record to draw on for review and expansion of the searches undertaken.

2.3.3 Use of key academic databases

This discovery system provided access to a number of diverse, multiple data sources within the single interface of the discovery system, reducing the requirement to search in separate indexes and catalogues for publications that might otherwise be separated in the search string used. The establishment of this strategy required the adoption of a methodical approach to select publications that would yield relevant information related to the search strings and underlying research questions.

2.3.4 Selection of publications

Research in small business has spanned a period since at least the 1970's (Blackburn & Smallbone 2008; Curran & Blackburn 2011). However, research in OHS matters associated with SMEs has only gained prominence since the 1990's (Fonteyn, Olsberg & Cross 1997: Champoux & Brun, 2003). This was reflected in this literature review where relevant published literature containing the first search string keywords (see Figure 2.1) dated no earlier than 1988.

It has been suggested by Baker (2000, p. 222) that the researcher should seek out ‘those sources most likely to contain a summary or overview of the key issues relevant to a subject’. Baker recommends influential and pioneering textbooks or reference books as a starting point. A search for these using the search strings and databases discussed in this chapter (section 2.3.1) had revealed a limited availability of textbooks or reference books directly related to SMEs and the management of safety.

Alternatively, peer-reviewed journal publications were identified as a reliable source of current literature in the field. Peer review is widely seen as ‘an essential component of scholarly communication … that facilitates the publication of primary research in academic journals’ (Ware 2008, p. 109), where researchers can be assured of a high level of quality and ‘use published work with confidence’ (Davison et al. 2005, p. 969). Articles published in peer-reviewed journals comprised a majority of the identified and selected literature within this literature review.

Other sources of literature identified for review included theses, research reports, legislation and publications provided by international government sources, industry bodies, professional associations and conferences using the keyword search in academic research databases, Google Scholar and Google (see Figure 2.1).

Proceedings of conferences were confined to those papers incorporating the first level keyword search (Figure 2.1) such as conferences organised by Understanding Small Enterprises (USE 2017), an organisation that aims to improve OHS research and interventions in SMEs by convening an annual international conference and publishing its proceedings. Other individual conference papers were considered for selection based on the author’s credentials, affiliations and whether the author was also published elsewhere in peer reviewed journals.

The transdisciplinary nature of the keywords searched, spanning the disciplines of Management, Quality and OHS yielded results in a variety of journals and articles. The selection of particular papers to be analysed required the incorporation of some determined criteria. The criteria established for initial selection was defined by the keyword search (Figure 2.1) where at least two words from the keyword search criteria were identified either within the title of the publication or within the abstract, where available.

Results of the initial search in each publication were analysed for the selected foci from Cooper’s Taxonomy (Table 2.1) using the title, abstract, findings, discussion and recommendations. Selected papers were consequently examined in depth for consistency

and adherence to the search parameters and significance in relation to the research aim, objectives and research questions.

An indication determining that the search for literature was near completion became apparent when a number of sources reintroduced familiar findings and recommendations, and a dearth of articles provided new material. However, the conclusion of the literature review search ended with the final editing of this dissertation, as a small number of relevant, most recent publications were identified near the finalisation of the thesis.

2.4 The nature and operational context of SMEs

A literature review should commence with ‘a broad conception of what is known about the topic and potential areas where knowledge may be needed’ (Torraco 2005, p. 359). This literature review commences by defining and describing characteristics associated with SMEs and what is known in relation to the potential influences regarding hazard management. Following this, gaps are identified within the development of OHSMS by SMEs. The literature review then proposes a conceptual model that will be applied to the research methodology in this project.

2.4.1 Defining an SME by size

No measure exists internationally for defining a small business or SME (Cunningham, Sinclair & Schulte 2014; Hall 2002; Micheli & Cagno 2010). Some measures used internationally incorporate a combination of employee numbers along with commercial measures that include annual turnover and annual balance sheets to determine qualification for financing measures and support programmes (SBA 2017; European Commission 2015). Such combined classifications are not aligned to the objectives of this research, and therefore were not be used to define an SME.

Classification using employee numbers as a measure of size is a useful approach aligned to the objectives and research questions as summarised in Table 1.1. One such classification used by the Australian Bureau of Statistics (see Chapter 1, Section 1.4.1), organises SMEs into broad categories, where a micro business (0-4 employees), a small business (5-19 employees) and a medium sized business (20-199 employees) comprise the classification framework. This literature review includes SMEs as those having up to 250 employees, in order to align numerical classifications with other international classifications (European Commission 2015), thereby potentially capturing a broad spectrum of literature targeting SMEs.

2.4.2 The growth of SMEs

SMEs are a significant contributor to the economies of many developed countries, where they comprise a majority of businesses (Hall 2007; Eakin, Champoux & MacEachen 2010; Cunningham & Sinclair 2014; Cagno et al, 2014; Walters & Wadsworth 2016). The European Commission reports that '99.8 of the 20.8 million enterprises active in 2010 in the non-financial sector were SMEs', providing 67 per cent of employment within that sector (EC 2013, p. 159), while Hall (2007, p. 30) reports that the number of SMEs operating in China exceeds the combined total of the United States and Europe. Within Australia, small and medium businesses contributed to 55 per cent of the provision of goods and services to the economy in 2017-2018 (ABS 2018).

Various factors have contributed to the increased number of SMEs in operation across the world. In the period 1980 to 1999, interrelated economic drivers and trade liberalisation contributed to the downscaling of large organisations and the public sector (Frick & Walters 1998; Bluff & Gunningham 2003; Targoutzidis & Karakoltsidis 2009; European Commission 2013). These changes were preceded by the recession of the 1970's and 1980's (Mallett & Wapshott 2017) and occurred in order to meet the international economic demands for lower priced services, increased trade and the need for technical innovation.

The contraction of large organisations into smaller ones evolved over this time in a process described by Jones and Kierzkowski (2001) as fragmentation. The fragmentation of large-scale production into blocks that specialise in part of a supply chain has contributed to the growth of SMEs (Christensen & Pouflet 2006; Lim & Kimura 2010), aiding increases in commerce and employment growth over the last thirty years (Borrows & Curran 1989; ABS 2000; Lim & Kimura 2010).

This consequent growth in the number of SMEs has drawn the attention of researchers seeking factors that hinder the development of SMEs (Curran & Blackburn 2011; Holmes & Gupta 2015). Some research has focussed on their management of OHS hazards (Hasle & Limborg 2006; Breslin et al. 2010; Kelloway & Cooper 2011), finding that SMEs face challenges not similarly experienced by large enterprises. SMEs are not merely a scaled version of a large enterprise. Many distinct factors characterise the operation of SMEs in ways that contribute to their management of OHS hazards. One distinct difference in the operation of many SMEs compared to large enterprises is the volume of contract work in which SMEs engage.

2.4.3 SMEs and contract work

One resultant effect of the increase in numbers of SMEs across many industrialised nations has been an outsourcing of specialised skills and escalation of contract work (Kelloway & Cooper 2011), driven by economic needs that favour casual workers, such as in the services sector (Buchler, Haynes & Baxter, 2009). SMEs tend to experience volatile and cyclic demands for their goods and services coupled with increased demand for hours of work performed (Mayhew 2002; Bluff & Gunningham 2003; Legg et al. 2009) in order to meet production demands requested by external clients.

Many SMEs operate at the lower end of a supply chain (Croucher et al. 2013, p19), exacerbating the pressure exerted on companies to meet supply chain demand. These demands can lead to favourable situations for some SMEs, where the continuity of contracts necessitate the retention of specialised labour. However, unfavourable consequences can arise where the loss of markets or contacts in a volatile marketplace can lead to a shortness of continuing work, requiring employees to seek alternative employment as various business ventures subside and at times reform under a new company to exploit new markets (ASMFEO 2016). Uncertain employment tenure in SMEs (Walters & Lamm 2003; Lamm 2014) and its link to continuity of business is a feature that typifies many SMEs (Thornley, Jeffreys & Appay 2010), where the unstable nature of available work contributes to the cyclic engagement and retrenchment of workers.

Casual work is a dominant feature of many industrialised nations such as the United States of America (Kalleberg 2009) and many countries in Europe (Krestos & Livanos 2016). Casual work within Australia in 2016 experienced levels in the order of 22 percent (ABS 2016b), a figure likely to increase in the foreseeable future as labour markets continue to adjust to increased precarious employment (CEDA 2015; BCEC 2018). Issues regarding turnover and retention of staff have been addressed by some SMEs seeking to enhance human resource capital (Croucher et al. 2013); for example, with the introduction of flexible work arrangements (Kotey 2017) in order to retain staff.

The resultant nature of market demands and human resourcing affect several operational concerns in SMEs. The systematic arrangements for managing OHS hazards that assist in accident prevention are challenged by factors including the economic viability and continuity of the business (Hasle at al. 2012), a transient labour force (Lamm & Walters 2003) and a lack of risk management capability (Gao, Sung & Zhang 2011) due to a lack of human resources capacity and capability. The effects of these forces can be considered in the context of the rates of accidents experienced by SMEs when compared to large enterprises (Sorensen, Hasle & Bach 2007; Gervais et al. 2009).

2.4.4 SME rates of injuries and illnesses

Work-related injury rates among SMEs are at least equal to, if not higher in some industries when compared to large enterprises within industrialised countries including the United States of America (Mendeloff et al. 2007; Cunningham, Sinclair & Schulte 2014), Italy (Micheli & Cagno 2010) and some nations in Europe (Gervais et al. 2009). This is also the case within Australia, where serious claims made for workers' compensation in the period 2014-2015 within the private sector for enterprises having 20-200 employees are higher than the rate for larger enterprises in five states and two territories (SWA 2017a, p. 9).

However, such rates may not reflect the true number of injuries sustained during employment in SMEs. Some sources detail the under reporting of injuries by SMEs (Probst, Brubaker & Barsotti 2008; Fabiano, Curro & Pastorino 2004; Brooks 2008; Legg et al. 2015). These can be attributed to various factors. Firstly, many SMEs place a lack of importance on minor injuries (Hasle, Kines & Anderson 2009; Legg et al. 2009, p 83), considering them of little consequence rather than good fortune that the consequences were not more severe. Secondly, the nature of precarious employment and subcontracting present difficulties in tracking workers moving to secondary worksites under the direction of the SME (Loosemore & Andonakis 2007; Walters & Wadsworth 2016), where incidents at those worksites may not be recorded and communicated.

Two other reasons should be considered regarding the levels of underreporting in SMEs. Many may be reluctant to report injuries due to a potential escalation in workers' compensation premiums (Targoutzidis et al. 2014, p. 13). Furthermore, many SMEs tend to employ friends and family members (Legg et al. 2015; Mallett & Wapshott 2017). This may foster a 'self-protective attribution bias' within a group (Kouabenan et al. 2001, p 553), where potentially unique social networks may impact on the objective necessity to report injuries and learn from incidents, believing they can otherwise be managed within the familial environment of the group.

The rates of work-related illnesses experienced by workers in SMEs is less clear. The incidence of these is more difficult to quantify, principally due to the challenges of disease diagnosis and reporting by practitioners (Walters & Wadsworth 2016, p57) and latency periods associated with many occupational diseases (SWA 2014, p1). Consequently, these factors challenge the collation and continuity of data regarding work-related illnesses that is available from SMEs (Holizki, McDonald & Gagnon 2015).

The transience of employees due to the nature of precarious employment within SMEs (Morse et al. 2004; Targoutzidis et al. 2014) also presents challenges in tracking worker ill

health as employees move from one organisation to another. At a global level, reliable statistics on patterns of work-related disease is lacking for SMEs and large enterprises (Rushton 2017).

These factors suggest that occupational illnesses in SMEs may be experienced at similar levels to those found in large enterprises, as is the case with work-related accident rates. A lack of clear data providing the incidence of disease in relation to size of the enterprise (Legg et al. 2015) should not explicitly indicate that employees in SMEs experience fewer illnesses associated with occupational factors.

2.4.5 SME knowledge of OHS legal requirements

The under reporting of injuries and illnesses may also be attributed to SMEs inadequate knowledge of OHS laws. Many SMEs do not allocate appropriate resources and expertise to the planning and implementation of an OHSMS (Hasle & Limborg 2006; Legg et al. 2014; Cagno et al. 2013) for which the knowledge and compliance with OHS laws is a critical factor. Larger organisations are more likely to employ an OHS professional (Floyde et al. 2013) or engage consultants to inform them of legal requirements and how these should be addressed within the OHSMS.

A lack of application of legal requirements in managing OHS hazards by SMEs may also be apportioned to the design of current self-regulatory legislation operating in many developed economies such as the United States of America (OSHA 2018a), the United Kingdom (UK 2017), Australia (SWA 2017c) and as legally binding directives for individual member states within Europe to adopt (EU-OHSA 2017b). This legislation is ‘principle-based’ (Loosemore & Andonakis 2007, p. 580), requiring organisations to follow acts, regulations, codes of practice and associated standards, and to manage hazards arising from business activities by adopting a risk management approach. Risk management requires the identification, management and review of hazards and associated risks (SWA 2017c). It also necessitates the adoption of plans and methodologies within business frameworks to develop a risk management system to drive its use (Flaus 2013, p 60), in turn requiring knowledge and human resources that many SMEs may not possess.

Principle based OHS legislation that prescribes general duties on key members in a chain of authority and supply of products and services was initially designed in the 1970’s, targeting suitably resourced large enterprises (Bluff, Gunningham & Johnstone 2004) that have since fragmented and contracted into smaller enterprises. Organisations are required to manage the hazards arising from their work activities, utilising systems that adopt a risk management approach. The continuing design and application of such legislation raises questions

regarding the ability of SMEs to recognise and adopt risk-based legislation (Barrett, Mayson, & Bahn, 2014).

Many SMEs are not resourced with sufficient human capital (Harney & Nolan 2014; Sinclair & Cunningham 2014) to address all aspects of the business, including the requirement to understand, guide and implement a risk management system to address the management of OHS hazards (Legg et at. 2015). A two-year study conducted in the state of Western Australia by Huang and Brown (1999, p. 76) identified systemic issues facing SMEs that transcend business management boundaries. These included general management issues relating to human resourcing and planning, comprising 3 percent of the reported difficulties that SMEs face in the conduct of their business.

The resourcing of suitable human capital may also require business networking practices external to the organisation. Some SMEs are challenged to establish and maintain social capital through appropriate business networks in order to exchange knowledge and in turn create opportunities for development of their business systems, including the OHSMS (Gao, Sung & Zhang 2011). Reasons for this may include isolation from larger industry networks (Champoux & Brun 2003; Cunningham, Sinclair & Schulte 2014) and the lack of facilitative strategies provided by external entities such as regulators (Limborg, Gron & Jensen 2015). The adoption and advancement of practices that adopt social capital principles are required by SMEs in order to foster a knowledge base and long-term growth (Gervais et al. 2009).

2.4.6 The adoption of risk-based approaches by SMEs

The challenges faced by SMEs to comprehend and utilise legislation incorporating principles of risk management may be exacerbated by the worldviews of some operators within SMEs. A study of small construction and metals engineering businesses (Hasle, Kines, & Andersen 2009) found that SMEs consign accidents to unforeseen situations beyond their influence or control. A ‘fatalistic attitude towards emergency planning’ has been reported by Makin (2009, p272) at a medium sized chemical processing plant, and Eakin (2010) has noted workers in SMEs accepting risks as an integral part of the work. A comprehensive literature review examining the influence of OHS in small business (MacEachen et al. 2008) found that such organisations invariably focus on the individual worker as a source of harm rather than on the workplace.

Such approaches to the management of safety reflect a reactive rather than proactive approach as proposed in Hudson’s HSE Culture Ladder (Hudson 2007). A reactive approach is allocated at step two on Hudson’s five step culture ladder, characterising organisations that are higher on the ladder as adopting a calculative, proactive and generative approach to

managing safety. Hudson (2007) also advocates for the adoption of Prochaska and DiClemente's Model of Change that incorporates four stages, ascending from precontemplative through to contemplative, preparation and action (Freeman & Dolan 2001). Using both the HSE Culture Ladder and the Model of Change leads to the characterisation of less proactive SMEs as being reactive to incidents and precontemplative, where the intention to change behaviour may not exist, potentially due to collective or individual risk conception and ignorance of the situation.

The world views regarding risk conception presented by some SMEs can be considered against a classification structure proposed by Jensen (2002), where risk is a social construct and its understanding is based on three positions: being the expert-based understanding, the legal understanding and the local understanding. The expert-based understanding relates to the use of quantitative and semi-quantitative mechanisms to determine risk. The legal understanding relates to risk as it is expressed in laws and standards, whilst the local understanding involves an application and engagement of risk-based decision making at an operational level, drawing on the experiences and perceptions of risk as it applies to a given situation (Jensen 2011, p. 211).

These positions are explained by Jensen (2002) in relation to the requirement to perform risk assessment. However, the classifications can be reflected on more generally where risk conception can comprise the position of one, two or all classifications: specifically, the consequent proportions of interest and relevance regarding each position is dependent on the stakeholder's ontology and intent to use risk management for a particular purpose. Using this classification as a guide to risk conception, SMEs are likely to utilise risk-based management practices at the level of local understanding. Operators in SMEs may not have the knowledge and resources to embrace risk-based practices as prescribed at the level of legal understanding nor be challenged or exposed to the expert-based understanding (Rodrigues, Arezes & Leão 2018). This classification system may assist in highlighting the barriers that SMEs face in adopting principle-based legislation.

If employers and workers in SMEs largely base their judgements of risk upon a local understanding of their work environment, then their management of hazards can be attributed to their intuitive insight and impression of specific risks, and risk perception based on their experience (Legg et al. 2009 p83). In this case, employers and workers may assume that a lack of accidents indicates that the health and safety measures in place are adequate. A study undertaken across 22 construction projects involving 120 construction workers (Xia et.al. 2017) found that workers base the ways in which they manage hazards on direct risk perception, rather than on 'perceived probability, perceived severity, perceived negative

utility' (Xia et.al. 2017, p 240) as might be used in the expert-based understanding and legal understanding described by Jensen (2002). This observation may present a case for further research into risk perception, risk conception and risk maturity practised by SMEs as it challenges more generic risk management maturity models proposed by Hudson (2007), Oliva (2015) and Kaassis and Badri (2018) who are at odds with the reactive, intuitive decision-making processes used by SMEs.

The preventive approach embraced within the design of current OHS legislation in many countries is then potentially at odds and 'misaligned with the character and context of small workplaces' regarding the ways in which SMEs operate (Eakin, Champoux & MacEachen 2010, p 32) and the ways in which OHS hazards and their consequent risks are intrinsically perceived and managed. Many SMEs operate intuitively, influenced by and responding to the immediate needs and constraints that are prioritised over strategic plans and objectives, exacerbating a 'constant state of self-adjustment' (Clusel et al. 2011). Planning processes that allow for the effective allocation of human, physical and financial resources may be relegated in favour of more immediate responses to perceived rewards. Such approaches can direct the efforts of managers operating the SME away from strategic approaches required to manage OHS, particularly in times of economic and financial uncertainty (Boustras, Hadjimanolis & Varianou-Mikellidou 2018).

Business owners and others within SMEs who base their judgements of OHS risk intuitively may not perceive the incentives associated with embracing risk-based legislation as a conduit to effective business management. Some SMEs do not identify efforts in safety management as profitable (Gervais et al. 2009, EU-OHSA 2017c), citing costs and time as impediments to addressing the systematic management of hazards. Research conducted in in the United Kingdom with large and small enterprises (Haslam, Haefeli & Haslam 2010) found that only twelve percent of SMEs considered the costs associated with an incident.

For some SMEs, the financial and operational benefits associated with the prevention of incidents are not immediately apparent (Champoux & Brun 2003; Deighan 2009, p152). The potential costs of accidents that can be measured in lost capacity, downtime, rescheduling, recruitment and medical and insurance costs (Gavious et al. 2009) are not obvious or considered, which in turn contributes to only a partial integration of OHS into business systems (Hasle 2013).

Due to their limited resources, SMEs can be challenged in their ability to recover from an incident and return to the operational environment that existed prior to the incident. The resources required to replace workers, fill orders (Gervais et al. 2009), cover associated

legal costs and increased workers compensation premiums (Targoutzidis et al. 2014) can contribute to the difficulties faced in recovering from an incident. However, it should be noted that the expense of implementing safety measures in SMEs is proportionately higher than in large enterprises (Hasle & Limborg 2006), where the recovery costs can be absorbed across larger departments and budgets.

Incentives for the implementation of OHS strategies have been considered for SMEs in various studies such as overall health and safety improvement measures (Gahan, Sievewright & Evans 2014), financial and managerial incentives (Cagno, Masi & Leao C 2016), and more specifically in providing training for workers in SMEs (Micheli & Cagno 2008). Much more research is required in this area to assist SMEs to link the association between proactive OHS risk management and a potential reduction in workplace injuries and disease.

Requirements for SMEs to firstly follow risk-based OHS legislation and secondly to seize opportunities to adopt risk-based OHSMS standards have been available across many jurisdictions including Australia (Gallagher, Underhill & Rimmer 2003), Europe (Boustras, Hadjimanolis & Varianou-Mikellidou 2018) and North America (Pao & Kleiner, 2001). The advancement of OHSMS standards for businesses will now be examined against their suitability for SMEs to establish and implement an OHSMS or adopt OHS improvement strategies through the use of such standards.

2.5 OHSMS frameworks and standards

The use of OHSMS to reduce occupational injury and illness in the workplace has grown substantially since the 1980's in Australia (Bottomley 1999; Makin & Winder 2009) and internationally (Barbeau et al. 2004; ILO 2011a; Toy 2019). Standards such as *BSI 8800:1996 Guide to occupational health and safety management systems* (BSI 1996) and other supporting 'Voluntary Guidelines' (OSHA 1989) gave rise to early research seeking to establish usable frameworks for OHSMS. An extensive review conducted by Redinger and Levine (1998) of major standards existing at the time sought to create a tool to be used in measuring the effectiveness of OHSMS. Named the Michigan OHSMS Assessment Instrument (MAI), the tool may also be used as a reference point for the elements comprising an OHSMS (Robson et al. 2007). From this research of 13 management systems, an OHSMS might comprise the following primary elements (Redinger & Levine 1998, p. 578):

- management commitment and resources
- employee participation

- occupational health and safety policy
- goals and objectives
- performance measures
- system planning and development
- OHSMS manual and procedures
- training system
- hazard control system
- preventive and corrective action system
- procurement and contracting
- communication system
- evaluation system
- continual improvement
- integration
- management review.

Redinger's approach was based on a voluntary, non-regulated system that may have suited the needs of some SMEs but was likely to have been overlooked in preference to the growth of regulated systems (Frick 2011, p 974). No other peer-reviewed studies of Redinger's approach are apparent (Wurzelbacher & Jin 2011). A similar proposal regarding what comprises an OHSMS was published in Australia by Bottomley (1999) in association with the National Occupational Health and Safety Commission, proposing a similar list of elements.

After this time, other specification standards such as *AS/NZS 4804:2001 Occupational health and safety management* systems and a revised British standard (BSI 2007) were published. Large organisations began to base their OHSMS on these specification standards (Gallagher, Underhill & Rimmer 2003; Robson et al.2007). A dearth of empirical research exists in relation to whether SMEs had begun using such standards from the time of their publication, although some SMEs have undertaken preventive OHS activities since the 1980's (Hasle & Limborg 2005, p. 7).

It is also noted with much interest that the newly published standard *AS/NZS ISO 45001:2018* for OHSMS (AS/NZS ISO 2018) may influence the landscape within which OHSMS are used within the workplace by SMEs. The following analysis of the utilisation by SMEs of particular standards for OHSMS development will focus on the time frame up to but not including the publication of *AS/NZS ISO 45001:2018*.

Standards developed by national or state authorities for the planning and implementation of OHSMS are fundamentally designed for large enterprises that are adequately resourced to

utilise them (Arocena & Nunez 2010) or for specific industries such as mining (Bennet and Foster 2007; DNRM 2008) that are also well resourced. For example, since its release *AS/NZS 4804:2001* has provided guidance with nineteen definitions, five chapters and forty combined clauses and sub clauses on planning, implementation and review principles that can be adopted by organisations for the establishment of an OHSMS. The recently released *AS/NZS ISO 45001:2018*, that specifies requirements and provides guidance for OHSMS also comprises similar volume and detail. Such standards require considerable knowledge and expertise to construe and use, and are not designed for a majority of SMEs (Frick 2011). This has been acknowledged by some authorities with the development of various specific OHSMS standards for SMEs.

2.5.1 OHS standards developed for SME's

Certain standards have been developed in an attempt to provide specific guidance for SMEs. The standard *HB 211:2001 Occupational health and safety management systems – A guide to AS4801 for small business* (Standards Australia 2001b, p. 2) introduces its intent as being for:

> …readers who have some sort of occupational health and safety management system (OHSMS) in place already but who wish to develop and improve it so they can claim conformance with AS 4801—2000, Occupational health and safety management systems—Specification and guidance for use.

The title of this standard targets small enterprises. However, its introduction is directed more so to suitably resourced and potentially larger sized organisations that are seeking to improve on their existing OHSMS and are able to implement audit strategies to measure conformance against the AS 4801 standard that sets auditable criteria for an OHSMS. The content within the standard does provide some useful elements and suggestions for the design of an OHSMS, but many SMEs will likely require suitable OHS expertise sourced from outside of the organisation.

Another standard, *ISO 31000: Risk management – A practical guide for SMEs* (ISO 2015) is designed for SMEs to 'compare their risk management practices with the internationally recognized benchmark and align their practices according to the international standard' (ISO 2015, p 9). This standard encourages SMEs to observe and adopt the language of risk management across many business areas, as promoted in the parent standard (ISO 2018). However, the suitability of including risk analysis tools such as fault tree analysis, event tree analysis and bowtie diagrams that are often used in high reliability industries and found in a separate risk analysis standard (ISO 2009) is questionable for a majority of SMEs.

This latter standard can be used in association with codes of practice, which are designed to provide practical guidance on the management of risk. Although these codes are not designed to function as a complete standard for the development of OHSMS, they are required to be used in various jurisdictions under work health and safety legislation to manage OHS risks (UK 2017; SWA 2017c). Codes of practice are used in developing policies, procedures and some practical ways of managing hazards, but their efficacy is compromised by design features that can limit their use (Gunningham & Bluff 2009), particularly for under resourced SMEs.

A lack of empirical research on the use of these standards by SMEs suggests a limited acceptance and usage of them within Australia in the case of *HB 211:2001 Occupational health and safety management systems – A guide to AS4801 for small business* and internationally for *ISO 31000: Risk management – A practical guide for SMEs.* However, some SMEs have been proactive in adopting OHS interventions and creating systems to manage OHS risk.

2.5.2 Resources for SMEs to support OHS interventions

Although SMEs do develop and implement OHS management strategies (Breslin et al. 2010), they may require assistance provided by external consultants to commence and create an OHS system (Brosseau et al. 2014; Autenrieth et al. 2015; Papworth 2015). Many SMEs are inadequately resourced to utilise standards and adopt interventions to improve OHS outcomes and may not utilise measurement tools to determine the success of interventions (Deighan 2009, p. 18). Questions have been raised in case study research (Pearse 2001), surveys (Barbeau et al. 2004; Arocena & Nunez 2010) and literature reviews (Barrett, Mayson & Bahn 2014) regarding the application and effectiveness of OHSMS by SMEs, where they are challenged by the need to develop systematic features as outlined in the standards and those prescribed in legislation (Diugwu 2011).These challenges are manifested in the inherent composition and operational framework of the SME where factors such as resource constraints, cyclic profit margins, a lack of formalised systems and a high reliance on verbal rather than documented communications can impact on their establishment and implementation (Legg et al. 2015; Schulte et al. 2018).

Some regulators and industry groups have recognised these limitations and responded by providing a range of supportive resources and programs to address the OHS needs of SMEs (APM 2003; QTA 2009; Hasle et al 2012; EU-OHSA 2017a; NIOSH 2018; SWA 2018b; Worksafe Victoria 2018) in order for SMEs to implement their own OHS intervention strategies. Guidance material pertaining to OHSMS development for SME’s exist within many work health and safety regulator websites across Australia (SWA 2017d) and

internationally (ILO 2011b; HSE 2014; EU-OSHA 2017a; OHSA 2017a; OHSA 2017b) where resources are supplied generically for various industries and specific business groups (Gunduz & Laitinen 2016) to assist with hazard identification and control.

In spite of this, potential limitations exist with these resources in their approach to risk management and to the adoption of systems approaches. Firstly, many of these resources are tailored to specific workplace hazards that may not apply to some SMEs, possibly leading to a lack of alignment between the tool and the hazards associated with a particular workplace (Hasle et al. 2012; Alavi & Oxley 2013). The ability to adapt the tool to the particular hazards and circumstances surrounding the operational structure of the organisation may be more challenging for those SMEs not adequately resourced to do so (Frick 2011).

Secondly, resources provided by regulators to encourage the adoption of systems approaches are largely generic in nature in order to accommodate industries and stakeholders likely to access the resource (European Commission 2013). SMEs seeking to develop elements of a safety system using such predesigned tools can experience a lack of orientation between the OHSMS and the SME's hazard profile that are reflected in the organisation's work activities (Gallagher, Underhill & Rimmer 2003). Such results are unlikely to reflect a systems approach by the SME and hence may not be effective at systematically addressing the management of hazards in the SME's workplace (Makin & Winder 2009).

Thirdly, many resources do not encourage customisation which incorporates the needs and internal context of the SME's to provide tangible solutions for an authentic OHSMS (Gallagher, Underhill and Rimmer 2003; Zanko & Dawson 2012). There is research that identifies success with specific strategies incorporating solutions 'conceived in relation to the owner's perspectives' (Legg et al. 2009) that involve the tailoring of strategies to the needs and characteristics of the organisation (European Commission 2013, p 17) in relation to the human interface, rather than the organisation moulding itself to the predetermined tool. Where this is successful, relevance and application of the strategy may contribute to acknowledgement and ownership of interventions by the SME. Such approaches are supported by empirical, interview-based research (Bottani, Monica & Vignali 2009; Lingard 2012) highlighting the need for an OHSMS to be adapted to the enterprise and be well integrated with other management functions.

A lack of explicit strategies to assist SMEs in developing an OHSMS that addresses their specific, site based OHS risks has not prevented SMEs from adopting alternative strategies

to assist with OHS interventions and the development of an OHSMS. The next section of this literature review examines influences affecting how SMEs use resources and guidance material to develop plans to manage OHS hazards.

2.6 Characteristics of OHS management used by SMEs

The identification of hazards, the management of consequent risks arising from them and the integration of those management practices into the OHSMS are integral and iterative components of systems used to manage OHS. When compared to large enterprises, SMEs are characterised by the adoption of less structured approaches (Pandey 2013; Legg et al. 2014) in the management of OHS risk. Some SMEs have developed an OHSMS and claimed its comprehensiveness, but research conducted through a literature review (Frick 2011) suggests only a few key features pertaining to risk management and employee consultation are found in such systems.

Some international studies suggest that the incorporation of OHS strategies and systems into SMEs are largely reactive (Ozmec et al. 2015) and informal (MacEachen et al. 2008; Legg et al. 2009) where systematic approaches to hazard identification and control are not routinely employed. Within Australia, data collected by the Australian Bureau of Statistics highlights a lack of business planning by some SMEs, with 35 per cent of businesses employing between 20 to 199 persons reporting the absence of a strategic plan and another 33 per cent reporting having a plan or policy that is not recorded (ABS 2018).

Although some studies highlight a lack of systematic approaches to the management of OHS by SMEs, some are using planning activities, processes and resources to manage hazards associated within their operations. These efforts are characterised by particular approaches incorporating strategies associated with OHS risk management, governance practices adopted by business owners, and systems of communication and training. These approaches will now be examined in turn.

The perception of risk is influenced by the social construct adopted by the SME (see Chapter 2, Section 2.4.6). Owners of SMEs may underestimate hazards and their consequent risks (Rodrigues, Arezes & Leão 2015) and this may be exacerbated where SME business owners attribute the management of OHS to individual employees (Holmes et al. 1999) or where workers perceive this as the case (Lingard & Holmes 2001). Risks may also be underestimated by the ways in which resources are invested into the management of hazards according to the perceived risk.

Empirical research conducted by Islam and Tedford (2012) of over two hundred SMEs in New Zealand had found that risks are mainly identified by the use of supplied forms from regulators and other sources. This narrow approach suggests that SMEs rely on a knowledge base of hazards obtained from a reduced compilation as prompted by the forms. These tools may not address some specific hazards created by an organisation and SMEs may not consider this factor when using generic tools.

Such limitations are recognised by Australia's government statutory agency Safe Work Australia. In a review of the effectiveness of safety interventions by regulators, the agency suggests that 'rather than a one size fits all approach, regulators may want to consider providing different kinds of advice and support for large and small businesses' (SWA 2013, p 21). However, a study undertaken in the United Kingdom reports positive results in the use of generic risk assessment approaches by proactive SMEs (O'Hara, Dickety & Weyman 2005), presenting a basis for further research into particular OHS risk management tools used by SMEs.

The recognition of hazards should occur across all of the SME's operations and be embedded in strategic planning, defined as a systematic process of determining a desired goal, and translating the goal into a broad set of steps and the sequence required to achieve the goal (Karel, Adam & Radomir 2013; Gandee 2014). However overall similarities found across SMEs characterise them as having less formal management systems and simpler methods of governance (MacEachen, Chambers & Mahood 2010; Legg et al. 2009). This may in part be influenced by many SME's having owner-managers (Hasle et al. 2011; Holmes & Gupta 2015) where they are responsible for handling the management of physical, financial and human resources and often contributing to most or all of the required capital for the business operation (Holmes & Gupta 2015).

The influence of the owner-manager can permeate many parts of the workplace culture and relations between staff in SMEs (Kvorning & Hasle 2013; Ozmec et al, 2015), where individual objectives and priorities may be reflected in the control of the operation. This is often characterised by informal management systems in SMEs (Bahn et al. 2013) where business owners access little support and assistance, have low levels of management expertise and maintain low levels of documentation (Legg et al. 2009). Some owner–managers of SMEs identify strongly with their skill sets or trade (Walters & Lamm 2003), rather than towards systematic management and strategic planning of the business that utilises a range of management skills. The management of a business requires the adoption of management skills that address work priorities, operational plans and the implementation of policies and procedures to meet legislative requirements.

Owner-managers of SMEs tend to employ family & friends (Lamm 2014), particularly in the early stages of development of the SME where trust is a concern (Legg et al. 2009; Devine 2012), thereby fostering greater personal relationships with employees than those that may be commonly found in larger enterprises. These close working relationships can be manifested in the adoption of normative approaches to risk, where standards and consensus on the management of hazards is sought informally amongst the workforce (Hasle et al.2011) without regard for the use of risk management processes prescribed in legislation.

Systems of communication and consultation are largely undertaken informally and verbally in SMEs (Walters & Lamm 2003; Legg et al. 2009; Shulte et al. 2018), leading to consultation that is often not recorded and the nature of which frequently comprises a specific technical base in the resolution of operational tasks (Legg et al. 2009). Consequently, SMEs have a higher reliance on implicit knowledge in the communication of work when compared to large enterprises (Gervais 2006; Pandey 2013; Pinder et.al 2016).

The use of implicit knowledge, when communicated to others, can increase the quality of relationships between employees and owner-managers in SMEs. This enhances the social capital within the organisation, where social networks that foster organisational effectiveness are established (Nelson et al. 2007). Conversely, networking with other SMEs and support networks external to the organisation is often limited (Swuste 2008, cited in Kelloway & Cooper 2011, p. 9), thereby reducing opportunities for access to information and benchmark business practices.

The conduits used in SMEs to promote flow of information are also used for informal training in OHS matters, a preferred option to formal training for SMEs (Croucher et al. 2013; Gibb et al. 2016, p77) due to costs associated with formal training and the potential to lose employees acquiring additional qualifications. An increased investment in training and development is forecast for the future needs of the workforce (BCEC 2018), but the nature of precarious employment casts uncertainty of how these are to be met by SMEs or employees in order to meet industry needs.

One other factor requiring consideration by SMEs for training in OHS matters is the potential transfer of the knowledge and skills acquired from the training into applicable contexts in the workplace (Namian et al. 2016), where the presence of a functioning OHS risk management system is required. In the absence of an OHSMS that incorporates principles of OHS risk management, trained employees may not be able to effectively apply principles learned within the training.

The management approaches used by SMEs that are examined in this section across the areas of OHS risk management, governance practices, communication and training have been used in some measure by SMEs for some time (Champoux & Brun 2003; Barbeau et al. 2004). These approaches should be retained by SMEs, but on their own may be insufficient to methodically integrate OHS practices into the business and be relevant to the internal context within which the SME operates. These issues will be examined in the next section (2.6.1).

2.6.1 Potential approaches for OHSMS for SMEs

Research on OHSMS undertaken by Makin (2009, p 332) identified ten core elements seen as most important for an OHSMS:

- training
- baseline risk assessments
- incident management
- communication
- accountability
- consultation
- measurement
- measurable goals
- emergency preparedness
- hazardous substances.

These elements are underpinned within *AS/NZS ISO 45001:2018 Occupational health and safety management systems-Requirements with guidance for use* and the British standard *OHSAS 18001:2007 Occupational Health and Safety Management* but are couched in more elaborate terminology and prescriptive clauses, challenging SMEs not adequately resourced to utilise such standards.

A simpler framework that may suit SMEs seeking to establish an OHSMS may be found in research undertaken by Gallagher (2000, p238) evaluating the performance of different OHSMS. The following basic purposes are proposed by Gallagher for OHS interventions but may also translate into appropriate elements for a simple OHSMS for SMEs:

- systematic hazard identification and management
- establishing basic system infrastructure
- risk management
- compliance with legal requirements

- cultural change-behavioural change and/or employee participation mechanisms
- response to health and safety issues arising.

Such a classification of elements may be a more useful starting point for SMEs, where the terminology and framework may be simpler to relate to when aligned against the business. This approach shares common elements of OHS risk management, governance practices, communication and training with those of Redinger & Levine (1998) and Makin (2009) identified earlier in this chapter.

A useful explanation for what defines an OHSMS that supports a suitable approach for SMEs is found in Makin (2009, p.104).

> OHSMS structures simply provide guidelines on essential criteria for the safety program content, whilst the systematic approach found within the OHSMS allows information to be collected and communicated so that critical processes are controlled to ensure safe operations.

If SMEs have been seeking something simple to operationalise, then it may be a matter of deciding what constitutes relevant criteria for their particular OHSMS framework, and determining how the relevant information is to be collected and disseminated across the other business systems such as procurement and human resource management.

2.6.2 Integration of OHSMS with other systems used by SMEs

Recent changes to the intent and design of OHSMS standards shows promise for the application of a contextualised and relevant approaches for SMEs. The standard *AS/NZS ISO 45001:2018* for OHSMS (AS/NZS ISO 2018) incorporates the recognition of an OHSMS as a stand-alone management system or part of a larger management system that interacts with other systems to achieve OHS outcomes, thereby suggesting the potential to integrate OHS into other systems. Prior frameworks for the design of OHSMS have adopted approaches for the design of OHSMS without sufficient consideration for these factors.

A ‘strategies for action’ concept proposed by Legg et al. (2015, p. 193) incorporates key drivers to initiate and help sustain improvements in OHS outcomes for SMEs. The strategies identify the need for systems support, requiring the provision of ‘concrete/specific solutions that are integrated into business strategies’ and existing systems (Legg et al. 2015 p 192). Frick (2011) has examined the motives for the adoption of management systems, proposing that interventions be integrated into existing management systems and accompanied by management commitment and input from the workforce.

Business operations share functional relationships with each other, since ‘an organization is basically a giant network of interconnected nodes’ (Islam & Tedford 2012, p 11). Therefore,

an integrated management approach is required across these and other areas of the SME's business; for example in contractor management and purchasing of equipment to effectively identify and manage OHS hazards. The standard is not 'prescriptive about the design of an OH&S management system' (AS/NZS ISO 2018, p.1), and so encourages organisations to seek and establish frameworks that they are able to operationalise.

A review of literature on OHS prevention activities in small enterprises by Hasle and Limborg (2006, p. 9) has suggested that 'the most successful methods seem to be action-oriented, combining health and safety with other management goals, and based on trust and dialogue'. Research undertaken by Gallagher, Underhill and Rimmer (2003, p 77) also proposes that an OHSMS must be integrated with other systems in order to avoid its marginalisation, be supported by management commitment, be developed with involvement of the workforce and customised to the needs of the organisation. Such approaches are founded on a sociological framework requiring consideration for how OHS is perceived and practised within the organisation and are dependent on robust and iterative undertakings that draw on and interconnect related management activities.

The sociological influences present within organisations that contribute to the development of OHS interventions and integrated management systems have attracted the interest of some researchers. Zanko and Dawson (2012) have identified a requirement for further research targeting sociological approaches to OHS interventions. In a broad review of OHS management in organisations, the authors assess 'contributions of psychology, sociology, industrial relations and management studies' (Zanko & Dawson 2012, p. 328), proposing that an emphasis on policy and practice in OHS management systems research has drawn attention away from the greater examination of internal OHS management practices. The authors argue that it is these practices which contain the foundations for how OHS is conceived and practiced.

The collective knowledge on the evaluation on OHS interventions has 'taken place within disciplinary silos that result in a failure to learn from or apply knowledge gained elsewhere' (Walters & Wadsworth 2016, p. 107), and is often found in various domains and disciplines that are not connected through the literature. What is required is further research on OHS interventions in organisations that examines 'individuals in work settings, the social relationships that exist at various levels, the workplace and business environment, regulatory practices and daily operating procedures, as well as the tasks and activities that occur within context and over time' (Zanko & Dawson 2012, p. 332) in ways that can harness transdisciplinary knowledge.

One way in which sociological influences can be investigated is by ensuring that criteria relating to organisational context is designed within the intervention or research. The inclusion of mechanisms to capture and examine organisational context may assist to answer questions that seek to know ‘how is OHS conceived and understood in organizations’ and ‘how OHS activities are perceived and evaluated from different perspectives’ (Zanko & Dawson 2012, p. 340).

2.7 OHS interventions and internal organisational context

The internal organisational context of a business operates within a community of practice, where technologies and systems are used in interactions between individuals and groups, presenting the potential for learning (French et al. 2009). This context may incorporate consideration of social drivers, contractual arrangements, governance structures, management systems in use and various interdependent nodes used in the operation of the business (ISO 2018, p6). When planning OHS interventions, features of the SME in regard to its own internal context, being the operational structure, work activities and human interface is gaining importance in research.

Some studies (Torp & Moen 2006; Hasle et al. 2012; Cunningham & Sinclair 2014; Nowrouzi et al. 2016; Schwatka et al. 2018) propose that OHS interventions need to consider the nature of the SME, its particular needs, social structures and underpinning interdependencies and connections. Research conducted in Italy by Masi and Cagno (2015), comprising interviews with over 50 safety officers in SMEs supports the need for specific internal context factors to be built into the design phase of an OHS intervention.

One study has proposed a model for the design of intervention programs in SMEs (Hasle et al. 2012, p 187), based on context design features that consider the following factors;

- limited use of owner-manager time
- the use of methods that avoid direct or indirect criticism of the owner-manager
- support through trusted personal contacts and trusted others
- integration of the work environment into other parts of the operation’s management
- new practices built on existing approaches.

Such factors can be useful contributors to the design and establishment of intervention tools and data collection when conducting research, thereby facilitating the potential integration of the intervention or research into business practices to provide relevance and ownership.

These findings highlight the need for OHS interventions to address context, participatory processes, integration and relevance to the SME, and provide some contribution to the research variables and contextual factors used to frame the research questions in this research (see Figure 1.1). The remainder of this literature review links the adoption of the internal organisational context with the methodology used in this research to determine whether a hazard profile mapped to the SME's business contexts assists in recording the SME's hazards.

2.8 Internal organisational contexts used for hazard identification in SMEs

Emerging methodologies for hazard identification have sought to capture non-linear ways in which hazards occur (see Chapter 1, Section 1.4.2). The recognition of influences generated by the organisational context and associated sociotechnical factors challenge a simplistic linear strategy used to determine where impacts associated with hazards and potential incidents may occur (Carayon et al. 2015). Various levels of complexity and interconnectivity influence the ways in which hazards are created and manifest themselves within an organisation (Waterson et al. 2015; Aven & Ylonen 2018), requiring consideration for the internal organisational context and how it may affect the manifestation, continuing presence and escalation of various hazards.

Research undertaken in cross-disciplinary hazard identification proposes that new approaches to hazard identification should attempt to capture hazards using methods that incorporate 'interconnectivity, dependency and complexity (that) result in cross-disciplinary relationships and unidentified hazards' (Parchment 2013, p.335). Such approaches would seek to avoid a focus predominantly based on known hazards and consequences drawn from databases harbouring cause and effect relationships (Parchment 2013, p 48).

A methodology seeking to adopt interconnected factors and diversity associated with work processes has been employed in case study research by Makin (2009). This incorporated a hazard profile of the enterprise using the Software, Hardware, Environment and Liveware (SHEL) model followed by an OHSMS framework suited to the SME, aligning hazards with a predetermined framework base on a 'Safe Place, Safe Person, Safe Systems model' (Makin 2009). The SHEL model is a conceptual framework initially designed in 1972 (Chiou & Chen, 2010) for application in human factors frameworks and later used widely within air traffic control contexts incorporating a human factors approach (Latorella & Prabhu 2000). The adaptation of the SHEL model as the framework for the input of hazards provides some congruence between workplace hazards and a structure for recording them.

However, requiring the enterprise to mould and adapt itself to the SHEL model would limit the opportunity for the SME to participate in the design of the hazard profile 'conceived in relation to the owner's perspectives' (Legg et al. 2009), and potentially have limited opportunity for integration of the outcomes into other parts of the operation's management due to its generic structure. Additionally, the adoption of preconceived strategies may not allow for research participants to embrace an initiative of their own design and afford them the opportunity to 'tell it as they see it' (Denzin 1978, cited in Patton 2002, p. 21).

The aim of this research has sought to validate whether the foundation of a hazard profile can be designed around the SME's operations, according to its own beliefs and constructs (Legg et al. 2009). Those constructs can be considered within the context of consultation and engagement with employees and also within the internal structures and operations characterised by the SME.

Methods employed for hazard identification and the creation of hazard profiles can be underpinned by extensive consultation and the provision of opportunities for key stakeholders within the SME to participate in the development of hazard profiles. Some jurisdictions prescribe legislative requirements entitling employees to take part in consultation regarding the identification of hazards (SWA 2017c; EU-OHSA 2018). This process provides opportunities for employees to offer knowledge about hazards not previously known or recorded through consultation and participation.

Employee input is paramount to a hazard profiling activity, and utilises tacit knowledge which Nonaka (1994) categorised as one type of knowledge creation in organisations, along with explicit knowledge. The knowledge that is easily identified, for example in procedures or verbal conversations and shared commonly in the workplace is termed explicit knowledge and is an important element required for the creation of a hazard profile. However, equally as important is the tacit knowledge that is stored within the minds of employees and is used when required or decided on by each individual. It is this tacit knowledge that can be extremely valuable in drawing out information regarding work known potentially to only a few individuals. Tacit knowledge should be of particular importance for SMEs that rely on individual employees to use tacit knowledge in the conduct of their work (Floyde et al. 2013) and should be recorded in order to potentially contribute to knowledge management systems used in the organisation.

Knowledge management has been explained as a practice used within organisations that involves 'knowledge creation, which is followed by knowledge interpretation, knowledge dissemination and use, and knowledge retention and refinement' (De Jarrett 1996, cited in

McAdam & Reid 2001, p 231). Knowledge management is an essential stratagem for SMEs, where adopting particular knowledge management practices that employ knowledge creation, knowledge storage and knowledge transfer (Cerchione & Esposito 2017) can be used for the collection of tacit knowledge. Systems used by the SME may include the use of traditional tools such as internal electronic networks, or emerging knowledge storage systems such as cloud storage. The use of knowledge management systems by SMEs can provide a competitive advantage where investments are made in innovation and differentiation is sought from competitors in the field (Bagnoli & Verdato 2014, p 615).

The adoption of knowledge management practices requires the facilitation of access to the organisation's internal context where operational planning and its accompanying systems along with the human interface reflected in governance practices and human resource management practices (AS/NZS ISO 2018) can be considered. The seeking of internal structures and operations used by SMEs in association with the pursuit of tacit knowledge that is then channelled into an appropriate knowledge management system may provide a holistic approach to identifying hazards in order to create a hazard profile.

2.9 Organisation of business contexts for hazard profiling

The technique of hazard profiling has been employed in various contexts. Hazard profiles have been used within the domain of emergency planning, represented as an emergency planning database for concrete frame construction (Lendlease 2018), an emergency planning database in schools (Salmon et al. 2017) and in generic texts promoting hazard profiles for emergency and disaster management exercises (Schwab, Sandler & Brower 2017). Elsewhere, researchers have sought to convey various graphic representations for context specific hazards of noise and dusts in manufacturing firms (Reinhold & Tint 2009). Such approaches can be useful to depict specific hazards, but may contribute to a silo approach to knowledge on hazards and associated risks (Parchment 2013, p. 2; Standards Australia 2013, p 16) and do not systematically capture hazards across the range and breadth of all operations of an organisation.

In other studies, an adaptation of the SHEL model used by Makin (2009) for establishing hazard profiles required the business to be mapped into the approach. Such a construct may not seem relevant or logical to a business if it is not aligned to its internal context (Cunningham, Sinclair & Schulte 2014). Other hazard exposure profiles have been proposed based on occupations and tasks (Jørgensen, Duijm & Troen 2010), but such approaches have the potential to omit hazard sources arising from sociotechnical factors including work environment design and the allocation of human resources (Carayon et al. 2015).

This research has adopted an alternative approach to hazard profiling. At the design stage, an organisation's OHSMS may include consideration for its 'activities, products and services' (Standards Australia 2001a; AS/NZS ISO 2018). This classification may be seen as the primary business contexts used to construct the hazard profile. The adoption of such a classification may be used as an initial scoping structure for a hazard profile that is relevant to the SME (Bogna, Dell & Raineri 2018, p 8), the contents of which may then be sought for alignment with the OHSMS. A classification using the SME's activities, products and services provides opportunities to consider the internal context of the SME which can include the internal structures and associated operations, knowledge management practices and human transactions that occur through various interfaces.

The utilisation of this classification structure for a hazard profile requires a framework that can act as a foundation to integrate the internal context and potentially capture the sociotechnical factors contributing to the hazards within the SME when planning and constructing the profile. A framework may facilitate the capturing of hazards arising from or influenced by the internal organisational context and other external contexts impacting on the SME.

2.10 A conceptual framework for hazard profiling

The adoption of a classification structure for the construction of a hazard profile requires the support of various factors in order to apply the internal context to the identification of hazards found across the SME's activities, products and services. A conceptual model developed by Bogna, Dell and Raineri (2018, p. 10) proposes several considerations to assist in achieving this. The model comprises a series of contextual themes, being the internal and external influences, prerequisites for the establishment and implementation of research design strategies and consideration for the internal perceptions and underpinning interdependencies and connections within the SME (see Figure 2.2).

The model provides a synthesis of contextual factors and can be used to support the development of a hazard profile using the classification of activities, products and services and guide 'an evolutionary sequence in building OHS interventions and as contributory frameworks to the development of an OHSMS' (Bogna, Dell & Raineri 2018, p 8). The model proposes the context of the organisation as a starting point for the design of OHS research or intervention strategies, providing an iterative foundational framework for the extraction and cataloguing of potentially critical factors relating to the SME's internal context before and during the creation of the hazard profile. Consideration for the age, structure of the business and the ways in which it operates is likely to lead to a more relevant application of design for the SME (Cunningham, Sinclair & Schulte 2014).

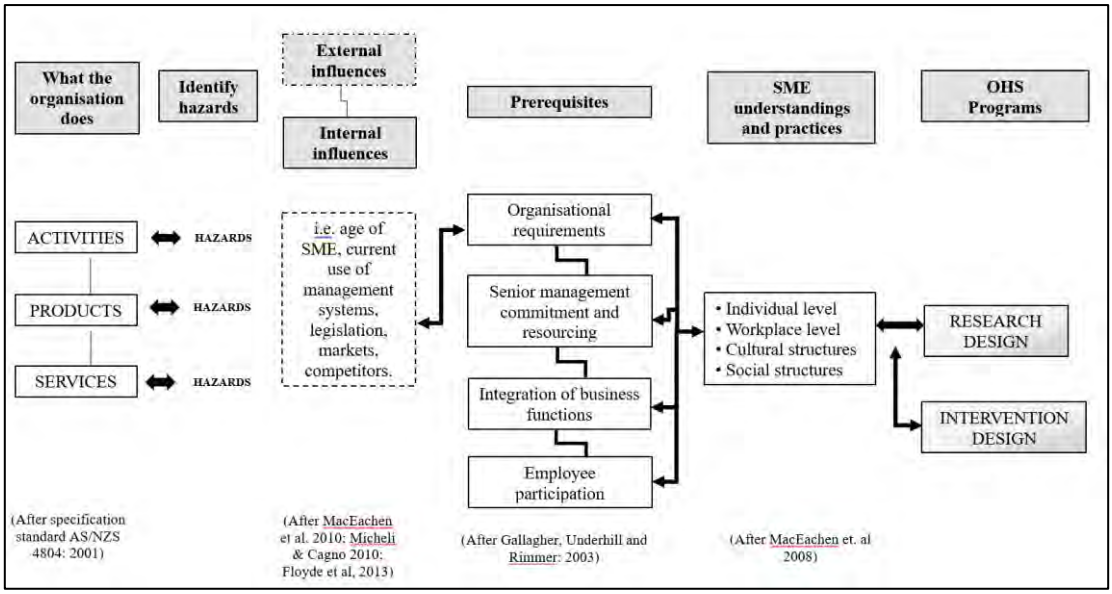


Figure 2.2: Establishing the internal context in SME's: a conceptual framework for the design of OHS programs

Source: Bogna, Dell & Raineri (2018, p. 10)

The conceptual framework presented in Figure 2.2 was used in this research project to address the internal context, participatory processes, integration of business systems and knowledge management practices that are relevant to the SMEs studied, and supports the requirement ‘to tailor support programmes to the specific needs and context of small enterprises’ (Hasle et al. 2012, p182). This framework was guided by a methodical approach to its implementation in this research project and can be represented within an epistemological model.

2.11 A research model based on internal context and an epistemological model

Various models for OHS intervention programs have been proposed by a number or researchers (Goldenhar et al. 2001; LaMontagne 2004; Hasle et al. 2012). Common features shared within these models include the determination of some context regarding the target group, the development of theories and selection methods to be used, an implementation phase and the dissemination of results.

An ‘epistemological model of literature reviews’ as shown in Figure 2.3, proposed by Schryen, Wagner & Benlian (2015, p 9) shares these features but also incorporates a base centred on tacit knowledge (see Chapter 2, Section 2.8) and stimulates a need for the development of a research agenda. Founded on combining literature arising from literature reviews with literature on epistemology, the model theorises on how domain knowledge from

particular fields of study is combined and contrasted with domain metaknowledge arising from the analytical evaluation of existing knowledge.

Although the model targets its application in literature reviews, it does have relevance in other research approaches inclusive of this research project, where the outcome of a literature review seeks the identification of research gaps and the adoption of new perspectives that require theory testing within a research agenda (see Figure 2.2). Therefore, it is applicable to other types of field-based research as conducted in this study.

The model depicted in Figure 2.3 proposes an epistemological model of knowledge synthesis and knowledge conversion and can be compared and contrasted with Figure 2.2 regarding the use of internal context to guide the design of research and interventions. A synthesis of epistemological views regarding the establishment of the internal context is a new perspective that is theorised and adopted to explore a research gap, drawing on an abstraction of knowledge and codified through the data collection methods that rely on harvesting tacit knowledge and explicit knowledge from participating SMEs (see Chapter 3, Section 3.6).

The creation of a hazard profile, based on the classification of the SME's hazards according to its activities, products and services was theorised as to whether a hazard profile can be created based on this classification and whether the profile facilitates alignment to the OHSMS to assist in managing OHS risks.

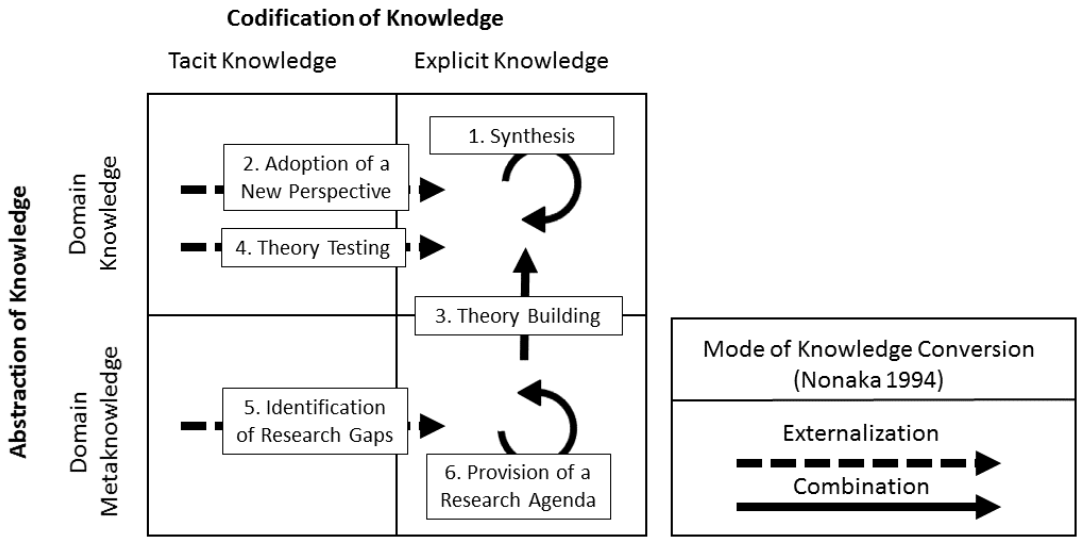


Figure 2.3: Model proposing knowledge synthesis and knowledge conversion arising from Literature Reviews

Source: Schryen, Wagner & Benlian (2015, Figure 2).

This theory was tested through two research questions (see Figure 1.1) according to the research agenda as prescribed in the methodology of this dissertation, with data able to be drawn from the tacit knowledge and explicit knowledge offered by the research participants in SMEs. Findings were then discussed, and proposals made in regard to the contribution to knowledge conversion (Nonaka 1994, cited in Schryen, Wagner & Benlian 2015, p 6).

2.12 Literature review summary

This literature review has identified the nature and operational context of SMEs in the current business climate within which they operate in many industrialised societies. Influences brought about by economic, technological and political forces have advanced the onset of globalisation, impacting on social and economic structures in many countries (Thornley, Jeffreys & Appay 2010) and contribute to the challenges SMEs face in managing OHS hazards. These challenges are manifested in their access to limited resources and the increasing impact of precarious employment, along with developments in risk-based OHS legislation that has not favoured the environment and internal context within which some SMEs operate.

Assistance provided to SMEs by regulators and other interest groups in many parts of the world have had limited success due to underlying factors associated with relevance, internal context and limited resourcing that is characterised in many SMEs. New lines of inquiry have proposed the need to integrate OHSMS with other management systems, and to ensure that research and intervention strategies incorporate consideration of the SME's own internal context that includes the SME's operational practices, social networks and associated social capital.

This literature review has identified a research gap regarding a lack of attention to the internal context of the SME when planning OHS research and intervention strategies. A new perspective proposes the development of a hazard profile utilising activities, products and services as an initial classification from which to organise a hazard profile. This classification has been incorporated into a conceptual framework that captures elements relating to the internal context. The research agenda has sought to identify and catalogue potentially critical factors relating to the SME's internal context before and during the creation of the hazard profile, thereby gaining methodological insights into the internal context in SMEs and its influence on the creation of a hazard profile.

3 Methodology

This chapter outlines the methodological approach used in the conduct of this research project. The methodology is representative of a point in time where the researcher had formulated particular world views in relation to the research questions that were substantially influenced by the epistemology surrounding the subject matter. The methodology of the study was not entirely static, as the researcher's academic maturity evolved in response to interactions with supervisors, various stakeholders within SMEs and a body of literature that continues to grow.

The aim of this research was to validate that a hazard profiling approach, tailored to the desired business frameworks of an SME, will assist in the development of an OHSMS. Three key elements were central to the research and are aligned to the data collection phases within the methodology (see Chapter 3, Section 3.6).

1. The first element required the creation of a hazard profile by the SME, incorporating its hazards within the classification framework of activities, products and services

2. The second element involved the defining of an OHSMS in a way that was logical and usable for the SME

3. The final element considered the integration of hazard profiles into an OHSMS framework relevant for the SME.

It was apparent to the researcher that this qualitative inquiry fell within a broad classification of social research, the goal of which is described by Neuman (2014, p. 104) as 'to develop an understanding of social life and discover how people construct meaning in natural settings'. In contrast, quantitative research 'involves the generation of data in quantitative form' (Kothari 2004, p. 5) and did not align to a social research approach since it is used for 'testing objective theories by examining the relationship among variables' (Creswell 2014, p. 4) and the consequent assimilation and analysis of numerical data.

Social research is a collection and connection of methods used to identify, synthesise and produce knowledge. Elements of the research required the establishment of opportunities for the collection of data through transactions and interactions between research participants in their own work environment where knowledge, objectivity, subjectivity and the search for clarity might be experienced in a dynamic setting. Guba and Lincoln (1994, p. 107) propose that research findings arising within the social sciences, which usually involve people, are

created through interactions between the researcher and the phenomenon being the people and is a plausible inquiry process.

The research methodology required consideration of how these elements should be incorporated into the research project. Research methodology can be defined as a determination of the rationale and logic used in the planning of research in order to explore the research problem (Kothari 2004, p8), and is the approach that underpins the research. This was addressed by firstly defining a research approach, and secondly a research design.

A qualitative based inquiry was selected as the most appropriate approach for the research project. Qualitative research is used where the research requires a study of people's lives within their real world and requires the capture of their perspectives and associated contexts. Qualitative based inquiry involves the gathering of data from various perspectives and from within a research participant's own experience (Wu, Aroian & Deatrick 2016).

This research incorporated phenomenological inquiry that sought to explore how research participants make sense of their experiences and communicate those experiences to others for shared meaning. A key component of phenomenological research is the description of a phenomenon as described by the research participant's subjective experiences (Creswell 2014; Scotland 2012) and the synthesis of those experiences by those who have experienced the phenomenon.

The researcher was able to become involved in the phenomenological inquiry, observing and recording experiences, beliefs and reactions to how the research participants experienced and interpreted the methodological presentation of the research objectives. It was envisaged that such a qualitative approach necessitated the researcher to experience the phenomenon too, leading to the requirement for particular research methods to capture available data and, according to Patton (2002, p.106) capture 'essences to the shared experience' where particular themes, for example the acquisition of new business approaches may become a defining feature of the phenomenological study.

The researcher firstly attempted to grasp a sense of system and structure for qualitative inquiry, and found an extensive array of epistemologies, methodologies and demarcated affiliations that were challenging to arrange, categorise and label. This approach was cast aside, with the researcher deciding to adopt an approach proposed by Schwandt (2007), that positions oneself somewhere within a typology and interface relevant to the research through an adopted and moulded systematic classification.

The overall research approach used in this study is summarised in Figure 3.1 and is used in this chapter to illustrate how the research was undertaken. The approach operates iteratively and incorporates key terminologies and activities that will be progressively addressed in this chapter.

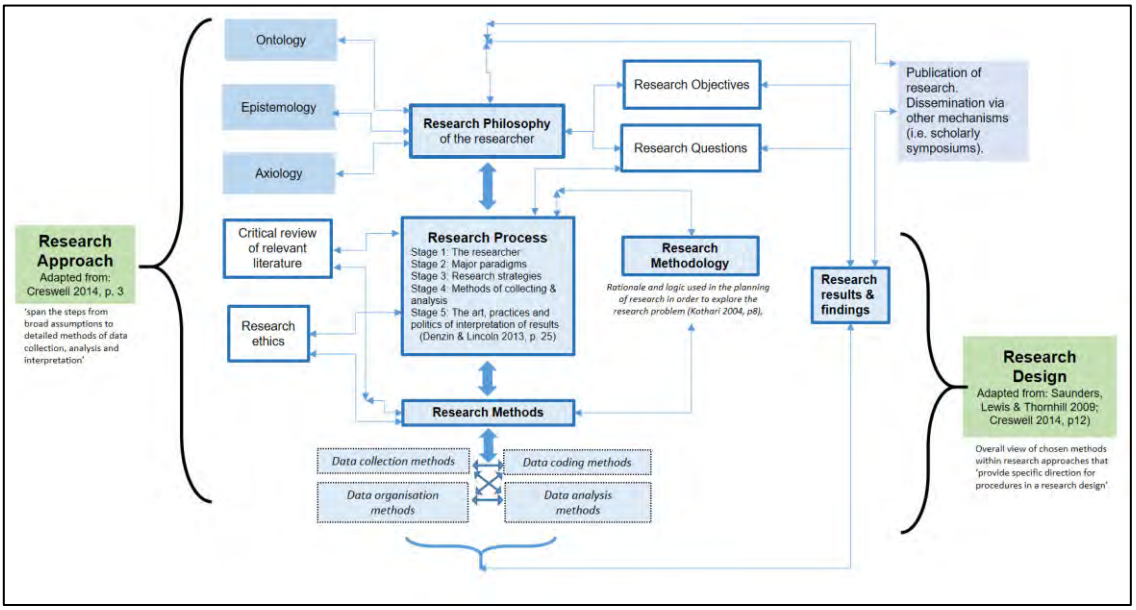


Figure 3.1: Summary of Research Approach and Design
Source: Adapted from Kothari (2004), Mayer (2015), Venkatesh, Brown & Sullivan (2016) and Kivunja & Kuyini (2017).

3.1 Research Philosophy

This research commenced with a world view of the researcher through the adoption of a research philosophy. According to Saunders, Lewis and Thornhill (2009, p. 109), a research philosophy comprises two major components that contribute to the researcher's philosophical standpoint: ontology and epistemology. The particular worldviews held by the researcher in regard to this research project initially comprised an ontology of what was known about SMEs in relation to the research questions. This ontology was framed and shaped by the epistemology surrounding the valid knowledge accepted in the field of study regarding SME's and their management of OHS hazards.

The researcher's philosophical position was guided by these factors and led to the next stage in the research process (Guba 1990, p. 18) where the methodological question regarding how the inquiry should go about seeking further knowledge in this area was asked. This question sought to define and establish a foundation and justification to be used in the planning of the research in order to explore the research objectives and research questions.

The methodological question has been codified in the epistemological model of knowledge synthesis and knowledge conversion (see Figure 2.3), where epistemological knowledge has identified gaps in the literature. This research project was designed to explore these gaps using a research agenda as detailed in this chapter.

A set of elements associated with research, described and posed as fundamental questions by Lincoln and Guba (2013, p. 37) proposes that ontological, epistemological and methodological questions underpin research inquiry, along with a fourth question regarding axiology. This fourth element is concerned with judgements and values made during the course of a research project and includes factors such as the determination of appropriate ethical decisions and substantiating judgements made during the design of data collection tools.

Lincoln & Guba (2013, p. 41) explain the application of axiology to a research project as follows:

> In this shared and co-created reality, the values of the inquirer, the various value systems of research participants, the values which inhere *[sic]* in the context all must be uncovered and made transparent. It is also the case that, ultimately the values of stakeholders in the research—those who are not participants but for whom the research itself is important, or informs some part of their work or their lives—will come into play.

Axiological positions taken by the researcher have assisted to establish appropriate ethical decisions regarding the research and positions taken by the researcher during phases of the project. Axiology has been addressed within this methodology in sections regarding the design of data collection tools and their implementation, potential researcher bias and the application of ethics (see Chapter 3, Sections 3.11 and 3.12).

The foundation that incorporated the researcher's ontological, epistemological and axiological position prior to the conduct of the data collection required the adoption of a research methodology congruent with the research objectives and research questions the inquiry had set to answer. A critical review of the literature in the field informed and influenced the research methodology by requiring the researcher to determine particular gaps in the literature that could be addressed through the design of the research objectives and research questions. Methodologies used by other researchers in the field also informed the researcher about limitations experienced within their own research, and potential opportunities for further exploration.

The research methodology is given credence and supported by the research methods (Kothari 2004, p8), being the iterative techniques used to conduct the research and

comprises the data collection methods used, data coding methods, data organisation methods and data analysis methods required to address the methodology and associated research questions (see Figure 3.1). The research methods can only be finalised after the research philosophy and research process is established,

The research methodology outlined in this chapter reflects a culmination of the research methods selected as the most appropriate to address and answer the research questions and support the epistemological perspectives and conceptual framework synthesised in the literature review for the design of OHS programs (see Figure 2.2). This chapter will now review the research aims in order to link key characteristics of qualitative inquiry associated with the research with the methodology, comprising the selected research approach and research design.

3.2 Research Approach

According to Creswell (2014, p. 3), a research approach is a plan and the adopted procedures that 'span the steps from broad assumptions to detailed methods of data collection, analysis and interpretation'. A qualitative research approach is one used for 'exploring and understanding the meaning individuals or groups ascribe to a social or human problem' (Creswell 2014, p.4). It requires the use of interpretive strategies to establish who the research participants are, the settings to be used and how the data is to be collected and analysed. Interpretive strategies are also required to ascribe meanings and conclusions from the data through the lens of the researcher. This approach aligned with the research objectives and research questions prescribed within this project.

A large portion of the data gathered from this project comprised the recorded observations and understandings of research participants. However, additional data gathered from this research included technological features embedded within the business information systems used by SMEs. The term 'information systems' operates as a subset of the practice of knowledge management (see Chapter 2, Section 2.8), where knowledge is created, interpreted and disseminated (De Jarrett 1996, cited in McAdam & Reid 2001, p 231) in formats used within business practices. Information sources such as spreadsheets, tools used to track and manage corrective actions and the detailing of hazard profiles through photographic captures comprised part of the SME's information systems that was collected as research data. This required consideration for the incorporation of information systems (IS), used by SMEs as an input into this project.

Research conducted by Boell and Cecez-Kecmanovic (2015, p. 4961) propose that IS comprise views of technology, social systems that have embedded information technology,

the emergence of socio-technical views and processing activities to capture, store, manipulate and display information. The integration of this information and associated approaches aligned with perspectives and associated contexts that research participants would be providing to apply meaning to social and business contexts through the use of IS. A qualitative inquiry aligned to such an approach.

The research objectives sought to gain an insight into the meaning that people within an SME attach to hazards, their identification and alignment to a database and the consequent application of a hazard profile to a selected OHSMS framework. The research also required insights into and use of information systems (IS) used within each participating SME.

The overall research approach aimed to answer the research questions by determining the starting point and end point each SME had in terms of the current knowledge base and systems supporting hazard profiling and its links to the OHSMS, by utilising the collaborative approaches designed within the data collection methods. The end point was represented by the completion of the data collection and analysis, in validating whether hazard profiling had improved business approaches for the development of the SME's OHSMS.

3.3 Research Design

Research design provides an overall view of the chosen methods and their justification (Saunders, Lewis & Thornhill 2009, p. 43) within the adopted research approach. It includes the conceptual structure built into the design (Kothari 2004, p. 14) and can 'provide specific direction for procedures' (Creswell 2014, p. 12) in the design of the research. The linkages established in Figure 3.1 reflect that the determination of research objectives and research questions informed the research design, thereby providing indicators about the material the researcher was aiming to explore, contributing to the consideration for an appropriate conceptual structure (Kothari 2004), defined here as the research process.

3.4 The Research Process

In order to plan the qualitative research design in consideration for its stages, a research process was used in this research to underpin the research design. A research process proposed by Denzin and Lincoln (2013, p. 25) is defined and depicted across five phases, being 'the researcher; major paradigms; research strategies; methods of collecting and analysing empirical materials; and the art, practices and politics of interpretation'. Within this study, these phases have been recognised as synonymous with stages, and will be referred to as stages in order to avoid potential confusion with terminology used in a later section of this chapter regarding data collection.

3.4.1 Research Process – Stage 1: The researcher

The researcher is seen as central to qualitative research and is placed within this first stage of the research process (Denzin & Lincoln 2013, p. 25) as the initiator for establishing the context of the research. Creswell (2014) proposes that the researcher, as owner and designer of a qualitative inquiry should be cognisant of their personal biography (see Chapter 1, Section 1.1), since this is incorporated within the evolving ontology and epistemology of the researcher, so consideration for how it may influence the study should be given.

As a central figure in this research, that the researcher could influence the direction of the research using research methods and their implementation. The axiological positions taken by the researcher were identified as having the potential for shared and co-created realities arising from the research, where selected social contexts established between the researcher and research participants could produce outcomes that are subject to altered meaning, rather than to the detailing and characterisation of it. This is referred to as the supply of interpretation and voice by Snow & Morrill (1993, p. 8), where there is potential for the researcher to not reflect accurate representation of the voices of research participants and provide selective, rather than objective interpretations of the analysed research data.

In order to mitigate such influences, Finlay (2002) proposes that researchers can identify their own subjective influences associated with their research by using reflexivity and in the process consider how the sense making of the collected data can maintain its authenticity. The use of reflexive analysis by a researcher required ‘continual evaluation of subjective responses, intersubjective dynamics, and the research process itself’ (Finlay 2002, p. 532). According to Finlay, reflexive analysis involves an examination of how the researcher constructs their own interpretation of research constructs and experiences, and how those interpretations are made with the objective of maintaining the integrity and authenticity of the research. A reflexive approach can be applied across the constituent parts of self-reflexivity, reflexivity about research participants and reflexivity regarding the recipients of the research findings (Patton 2002, p. 495).

Reflexive interpretations in relation to the methodology, the researcher’s own constructs and potential biases in the design of research instruments, have been outlined in this chapter. Elements of reflexivity relating to the research participants are addressed in Chapter Four, relating to the analytical framework and chapter five in relation to the research results and discussion. The application of a reflexive approach assisted in identifying strengths and limitations to different stages of this research, allowing space for reflection to understand the social world of those being studied.

3.4.2 Research Process – Stage 2: Major paradigms and interpretive perspectives

The selection of a major paradigm or combination of paradigms allows the researcher to use a conceptual lens to examine and construct the research approach and research design, which in turn informs the research methods to be used and how the data is to be collected. The adoption of a research paradigm also facilitates the eliciting of inferences associated with the relevant paradigm from the analysed data to address the research objectives and answer the research questions.

A paradigm is defined by Guba and Lincoln (1994, p. 105) as 'the basic belief system or world view that guides the investigator, not only in the choices of method but in ontologically and epistemologically fundamental ways'. At a fundamental level, belief systems and world views have been posited by Lincoln and Guba (2013, p. 37) as comprising four elements: epistemology, ontology, methodology and axiology (see Chapter 3, Section 3.1). Each of these four elements are able to inform the researcher of the particular philosophical dimensions that should be used to guide the research approach and research design.

These elements require the researcher to find their intersection with broader organising frameworks, termed research philosophies (Saunders, Lewis & Thornhill 2009, p. 119) or inquiry paradigms (Guba & Lincoln 1994, p. 109) that reflect theoretical underpinnings incorporating general assumptions, key issues and models of inquiry. Within this research project, these will be termed research paradigms.

Within the field of social research, Lincoln, Lynham and Guba (2011) propose that research paradigms include positivism, postpositivism, critical theory and constructivism, termed 'social constructivism' by Creswell (2014). There is research that has synthesised various research paradigms, where postpositivism is also associated with critical realism and constructivism with interpretivism (Wahyuni 2012, p. 70). These research paradigms have no conclusive way in which to be classified (Patton 2002, p. 79), and are essentially a human construction subject to acceptance or repudiation as they are not based on 'incontestable logic or indisputable evidence' (Guba & Lincoln 1990, p. 108). Different paradigms provide different perspectives and assumptions of knowledge and reality, which in turn underpin a research approach and research design.

A research project requires a foundation that can articulate and support the researcher's approach and be constructively aligned to particular paradigms which in turn inform the research design and research methods. The paradigms and associated perspectives underpinning this foundation will now be examined.

Two research paradigms were selected for this research, being constructivism and critical realism. These paradigms were identified as the most appropriate due to their theoretical underpinnings and alignment to the research objectives and research questions, in guiding the research approach and research design of this project.

The use of both paradigms for qualitative inquiry is indirectly but succinctly summarised by Corson (1997, p. 169) as:

> To adequately interpret the structural influences that affect people's lives, the first object of research is to discover what is in people's minds about the world of human affairs. Social reality is interpreted by discovering what people report its reality to be for them … Later stages involve explaining the operation of structural influences, and using that knowledge to promote emancipatory change of some kind as a morally binding response.

Qualitative inquiry must first adopt an approach that will assist in determining the worldviews of the participants, after which further inquiries can be made with regards to the structures triggering or contributing to those world views. The researcher had determined that a constructivist approach, used on its own might furnish limited findings regarding the research questions. The paradigm would assist in discovering research participants' beliefs about a hazard profile and in identifying and managing OHS risks. However, the structures underpinning the adoption and use of a hazard profile within an OHSMS were recognised as an important precursor to its use and required further methodical analysis. The second paradigm of critical realism became a logical and necessary approach to exploring the causality of what might be found using a constructivist approach.

These paradigms will now be addressed separately and then summarised against their respective ontology, epistemology, methodology and axiology in association with the identification junctions between each paradigm (see Table 3.1). The outcome of this comparison provided a means from which the research process and research methods could be aligned to both paradigms, thereby strengthening the research methodology.

3.4.2.1 Constructivism

Within the field of qualitative inquiry, the paradigm of constructivism, sometimes combined with interpretivism (Creswell 2014) views knowledge as socially constructed as a result of interactions between people and the environment within which the views are formed (Orlikowski & Baroudi 1991; Creswell 2014). In this context, constructivism, a term in this research that is used synonymously with social constructivism, seeks to explain how people construct particular subjective meanings and perspectives within social settings and relies on the views of research participants that lead the researcher to identify patterns in the 'complexity of views rather than narrow meanings in a few categories or ideas' (Creswell 2014, p. 8).

The constructivist paradigm, when aligned to the fundamental questions regarding ontology, epistemology and methodology that underpin research inquiry (Lincoln & Guba 2013, p37), assumes a 'relativist ontology, …a subjectivist epistemology … and a naturalistic set of methodological procedures' (Denzin & Lincoln 2013, p. 27). Each of these can be applied to the research as follows.

Constructivism adopts a relativist ontology by seeking the validation of multiple realities within the beliefs of research participants. Multiple realities are constructed by people, and the effects of those constructs and new beliefs may be affected by changing world views arising from them (Patton 2002). Within this research, participants were provided with opportunities to express their world views in regard to hazard profiling and its association with OHSMS, as reflected in the participatory processes and operational contexts incorporated into the research methods (see Figure 1.1). The potential for changing world views was able to be captured in each of the data collection methods (see Chapter 3, Section 3.7).

A constructivist paradigm draws on a subjective epistemology (Denzin & Lincoln 2013, p. 27). This involves the researcher engaging in sense making of the collected data through reflection and analysis, which is informed by interactions with those being researched. There is the understanding that the researcher will construct knowledge as a result of their personal experiences within the natural settings being investigated. Within this research project, this was facilitated by the researcher firstly visiting each of the physical locations within the workplace and secondly by providing a conducive environment and opportunities where the research participants could develop understandings based on their world view.

Constructivism adopts a 'naturalistic … set of methodological approaches' (Denzin & Lincoln 2013, p. 27). This requires the researcher to engage research participants using research tools that are aligned to the natural ways in which people usually communicate; for example, through the use of activities that incorporate dialogue in reflective approaches. This research was conducted in the natural world, being the work environment of the SME and adopted a naturalistic approach through making observations on task-based activities, the conduct of interviews and the facilitation of focus groups (See Chapter 3, Section 3.6).

A constructivist paradigm draws on a relativist ontology and naturalistic methodology to place the research participants central to their world, being their work environment. A central tenet of the research was to draw on the knowledge and experiences of persons within SMEs by engaging them in activities within their familiar work environment. The placement of individuals within their own work settings during the research provided opportunities for

the researcher to be immersed in the contexts unique to the particular social and work environments within the SMEs used in this research, from which a subjective epistemology informed by actual work practices and real-world settings could be contained and rationalised.

A constructivist paradigm was one of two selected research paradigms for this research project. The paradigm's positioning within the Research Process (see Stage 2 of the Research Process in Figure 3.1) locates it between the research methodology and research methods within the research design. This design triggered the requirement for the researcher to consider how the employment of the data collection methods of observation, interviews and focus groups could provide opportunities for the research participants to construct additional or new meanings to their worldview through interaction with others in their environment (see Chapter 3, Section 3.6).

The research design facilitated the process of interaction among research participants within SMEs by providing opportunities for a 'literal creation or construction of the inquiry process' (Schwandt 1998, p. 243) that could lead participants to their own construction of a reality that might be useful for them. This could be characterised as a flexible process, being dependent on how concepts, models and ideas would be formed, transmitted, stored and exchanged within social contexts. Such an approach combined 'elements of a narrative analysis with the processual perspective' (Zanko & Dawson 2012, p. 339), focussing on the study of processes as a way of gaining further understanding of OHS practices within organisations.

The accumulation of data gathered from processual perspectives provided a body of evidence for analysis of how research participants make sense of the phenomenology and its application to their own perspectives and application of hazard profiling to OHS management. The researcher accepted Mertens' proposition (1998, p. 161) that the 'ontological assumption associated with interpretative/constructivism that multiple realities exist that are time and context dependent … [encourage researchers to] choose to carry out study using qualitative methods so that they can gain an understanding of the constructs held by people in that context'.

A reflexive analysis (see Chapter 3, Section 3.4.1) required the interpretation of those constructs and experiences associated with the phenomena of hazard profiling and the associated use of the conceptual model (Figure 2.2). The researcher considered the merit of a constructivist approach in this context and sought to look beyond the boundaries offered by the constructivist paradigm in order to explore particular initiators or mechanisms that

could influence the research participants' construction of reality, thereby leading to particular observable outcomes called events within a critical realism framework.

According to Masi et al. (2019, p. 53), current intervention research models for SMEs do not adequately address the interaction between mechanisms that give rise to events and the context and associated triggers within which they arise. Such potential influences in this research were identified as residing within the research questions, where activities such as hazard profile mapping and the seeking of alignment to an OHSMS through the application of information systems used by the SME were practically oriented activities that could act as a trigger for a particular construction of reality that ought to be explored.

Grover et al. (2008, p 45) propose that research on information systems, as incorporated within this research project (see Chapter 3, Section 3.2), should consider the following:

> IS [Information Systems] scholars can also search for new positions epistemologically or ontologically in relation to the phenomena they are studying. What was earlier seen as a concrete and hard fact can be, instead, observed as symbolic, negotiated, and malleable. Finally, scholars can play with multiple theoretical narratives instead of just following one causal story. What was earlier recognized as a causal form and functional explanation can, in contrast, be formulated in a narrative that connects chains of indeterminate events and complex interactions.

The paradigm of critical realism was identified as one that could accommodate further investigation while not being in conflict with the project's research questions, nor undermine the research methodology and research methods.

Critical realism 'accommodates immediate (i.e. proximal) causal mechanisms coexisting alongside mechanisms at other levels of analysis that operate more distally' (Hodgkinson & Rousseau 2009, p 540). Research techniques using a social constructivist perspective can feasibly be used in conjunction with a research approach that incorporates critical realism (Morton 2006, p5) providing that the ontologies and epistemologies of each are explained (see Table 3.1). Therefore, the incorporation of the two paradigms could contribute to a richer narrative. A key feature of critical realism is the seeking of mechanisms that can add to the narrative collected from the utilisation of a constructivist approach.

3.4.2.2 Critical realism

Critical realism has emerged from critical research philosophy, which proposes that the reality underpinning social constructs is influenced by people, organisations and other societal influences and that the reality is subject to change (Orlikowski & Baroudi 1991). The research paradigm of critical realism is most commonly associated with the work of ontological philosopher Roy Bhaskar, as a general philosophy termed transcendental realism and combined with a philosophy of the social sciences Bhaskar called critical

naturalism (Bhaskar 1998). The two philosophies have been extended by others using the title critical realism (Harre 2009; Syed, Mingers & Murray 2009; Roberts 2014; Walker 2014). Critical realism is explained by Bhaskar (2010, p2) as being founded on the following principle:

> We will only be able to understand—and so change—the social world if we identify the structures at work that generate those events or discourses. Such structures are irreducible to the patterns of events and discourses alike. These structures are not spontaneously apparent in the observable pattern of events; they can only be identified through the practical and theoretical work of the social sciences.

According to Bhaskar, to 'understand the social structures and mechanisms at work in the social world … the idea of the transformational model of social activity is … that while we don't create society, we do reproduce or transform it' (Integral Leadership Review 2013). Critical realism recognises that subjective knowledge can contribute to research (Peters et al. 2013), as obtained by constructivist approaches but it also seeks 'more detailed causal explanations of a given set of phenomena or events in terms of both the actors' interpretations and the structures and mechanisms that interact to produce the outcomes in question' (Wynn & Williams 2012, p 788).

The paradigm of critical realism is underpinned by some defined principles, although it is not a uniform movement in social inquiry, since different perspectives may be found in philosophical approaches or social phenomena (Danermark et al. 2001; Pawson et al. 2005). At a fundamental level, its methodological foundation focuses on the interplay of structure and mechanisms that are then used as linkages to events (Sayer 1992; Bygstad & Munkvold 2011; Wynn & Williams 2012; Mingers & Standing 2017). Critical realism focuses on examining and explaining causality by identifying the structures and the causal mechanisms that underpin and generate events. This fundamental level has been identified as relevant and applicable to the research questions associated with this project. Each principle will now be addressed.

Structure

Within the context of qualitative inquiry, structure is defined by Sayer (1992, p. 92) as 'sets of internally related objects or practices'. Structures may be physical or social in nature and for this research project are largely aligned to the social interactions within the organisation, being the SME. Critical realism also recognises structure as it relates to sociotechnical environments (Wynn & Williams 2012, p. 791). Therefore, systems of human relations within the SME, where the social structures included employees, workgroups, and the organisation itself can define the structure. Within this research, the structure was identified as the particular relations between persons in the SME in regard to their position of governance

within the organisation, determined in part by their position title and location within an organisational hierarchy, and the particular governance activities they engaged in within the workplace. The structure was also inclusive of management systems and business strategies, since these were related to the facilitation and mobilisation of governance and accompanying social structures. Social structures relating to other matters such as friendship were not included within the scope of this research project.

Mechanism

A mechanism is central to a critical realist methodology (Bhaskar 1998). It is conceptualised as either a causal power or tendency (Sayer 1992), and may include 'dispositions, capacities and potentials to do certain things, but not others' (Fleetwood 2004, p. 46) and reside independently of the events that are generated from them. A mechanism contains properties that have the potential to act in certain ways to influence or affect an outcome or event. Mechanisms may be identified within this research project as the tendencies and actions adopted to undertake or refrain from certain activities, collaborative activities used within the data collection phase (see Chapter 3, Section 3.7), classification systems adopted by the SME as part of its initial hazard profiling activity and the use of particular tools for visualisation of the phenomenon (see Chapter 3, Section 3.8).

Conditions

The means by which mechanisms operate are associated with the conditions which give rise to them (Harre 2009, p. 218). Conditions operating within a critical realism framework are summarised by Wynn and Williams (2012, p. 794) as comprising contingent conditions that encourage the evolution of the event (enabling conditions), conditions that trigger or reinforce the event (stimulus conditions), and other conditions that remove impediments to the event occurring (releasing conditions). Such a framework assists in determining the nature of the conditions and their impact as a trigger in influencing the event.

Event

An event can be defined as an occurrence or action arising from a mechanism, or several mechanisms (Winn & Williams 2012, p. 792) and associated conditions that possess causal powers or tendencies to contribute to the event (Mingers & Standing 2017, p. 172). Bygstad and Munkvold (2011) propose that events may be observed empirically, and structures can support or limit events.

As events are observed, two principles associated with critical realism termed retrodiction and retroduction (Wynn & Williams 2012; Mingers & Standing 2017) can be used to look backwards and examine iteratively what has emerged via the identification of causal

mechanisms and underlying structures. The process of retrodiction seeks the identification and use of previously identified mechanisms that explain events within a new set of circumstances. Retroduction refers to the identification of new mechanisms. Emergence relates to the properties of a particular structure that emerge from interactions between the other components within the structure (Wynn & Williams 2012, p. 792) and in the case of social research seeks to find associations between the properties and influences of various persons through their association (Easton 2009).

The test here is to establish whether the mechanism is present, whether it is observable empirically and if the generative mechanisms were not present, would the event transpire? An underlying factor in adopting a realist approach is to ‘unpack the mechanism’ for how something might work within a defined environment (Pawson et al. 2005, p. 21). A continual interplay is required between the examination of events and potential causal mechanisms and structures that can be explained, in order to validate the foundation for these associations to occur.

The three principles of structures, mechanisms and events comprise the fundamental pillars of critical realism and operate iteratively. Figure 3.2 highlights the visual interplay of each principle, where events are preceded by mechanisms that may influence an event, and these in turn are impacted by a structure. This elementary model is likely to depict many scenarios and variations and has been used in a synthesis of the two paradigms for this research (see Figure 3.3).

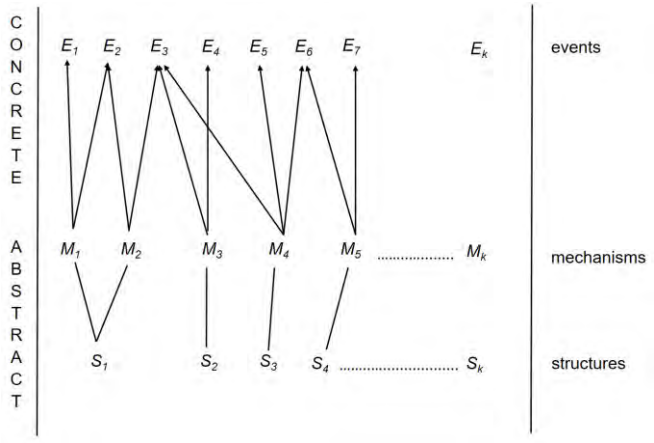


Figure 3.2: Sample associations between structures, mechanism and events
Source: Sayer (1992, p117)

3.4.2.3 Links between constructivism and critical realism

This research sought to explain the phenomenon of hazard profiling and its potential to be mapped to an SME’s business contexts, to record the SME’s hazards and determine

whether this process facilitates alignment to the OHSMS, and so assist in managing OHS risks. The use of a constructivist approach incorporated social practices used to engage research participants, and were addressed through task-based activities, interviews and focus groups (see Chapter 3, Section 3.6). The research methods assisted in drawing on tacit knowledge from research participants to elicit how hazard identification can be applied in the construction of a hazard profile, and the seeking of linkages between a hazard profile and the SME's OHSMS.

Data collection methods were conducted in sociotechnical contexts within the physical work environment of each SME. The researcher sought to understand the views and perspectives of individuals within their own environment, and comparisons made to determine whether data gathered from within different SMEs provided similar patterns that validated the research questions. The boundaries of constructivism would seek to identify themes and concepts drawn from the research questions gathered through discourses that, when formulated and synthesised, may be used to support the research questions in the affirmative. The accumulation and sorting of this construction of reality was limited to determining the individual tacit knowledge provided by research participants and the observed social interactions within the established research activities, accompanied by various observations in relation to the physical establishment of a hazard profile.

Due to the relativist ontology and subjectivist epistemology associated with this paradigm (see Table 3.1), the interpretation of meaning associated with the data could not be examined further using a constructivist paradigm alone. The conceptual framework of constructivism and its methodological framework provided limited opportunities to conceptualise social interactions and their contribution to causality. In this context, the paradigm of critical realism provided an expanded framework that could be used to merge relativist and realist ontologies to further examine the social phenomena being explored.

The paradigm of critical realism also requires the language of the research participants to be understood but offers a methodology for the generation of explanations of how the meanings are developed and maintained. This is achieved by detailing the material conditions, being the structures and causal mechanisms, operating under specific conditions that influence and constrain meanings that contribute to events. The events are then able to be linked to a causal process and associated phenomenon. This is shown at a conceptual level in Figure 3.3

Table 3.1: Comparison of research paradigms and implications for this research project

RESEARCH PARADIGMS: COMPARISONS AND IMPLICATIONS FOR THIS RESEARCH PROJECT				
Fundamental questions /elements *Lincoln and Guba (2013, p37)*	**Research Paradigms**		**Junctions and divergences**	**Implications for this research**
	Constructivism	***Critical Realism***		
Ontology	The situations studied have multiple realities. A relativist ontology based on the exploration of conceptual schemes owned by individual research participants. Reality is socially constructed. (Zhang et al.2011; Denzin & Lincoln 2013) Social reality relies on language.	A realist ontology. An objective reality that is independent of individual's perception of reality (Syed, Mingers & Murray 2009; Wynn & Williams 2012). The 'real stratification of being is separate from our knowledge of being'. Seeks mechanisms that generate phenomena through the actual events that occur and the empirical. (Peters et.al. 2013, p 338). (Bhaskar 1998)	**Junction** Acceptance of the theory dependent nature of research. Critical realism does accept that individual subjectivity contributes to defining reality. (Fleetwood, 2005) **Divergence** *Constructivist* Social structures and associated practices are constructed by individuals and are not recognised as having causal powers. *Critical realist* Social structures and associated practices have causal powers. (Peters et al. 2013)	Adopting a critical realism paradigm allows for further exploration of the identified ontologies of individual research participants, using structures and mechanism to explain the recorded events, supporting a realist ontology.
Epistemology	Subjectivist epistemology. The researcher interacts with research participants and interprets and co-creates their own meaning of the data. (Denzin & Lincoln 2013) The researcher and participants work together to generate knowledge. Meanings are linked to dialogue and social interactions. (Peters et al. 2013)	A wide-ranging, interpretivist epistemology. Relationships, ideas and knowledge structures that contribute to causal mechanisms, events and experiences that generate particular tendencies (Peters et al. 2013, p343). Social reality comprises language and social structure. The determination of knowledge claims are dependent on	**Junction** Language and social structure is sought. Multiple explanations accepted. **Divergence** *Constructivist:* Knowledge is generated from the research participants. There may be no truth beyond the social constructs of the research participants. *Critical realist*:	'A natural and social reality should be understood as an open stratified system of objects with causal powers' (Morton 2006, p2) Knowledge can be generated both from social interactions and from the search for structures and mechanisms that contribute to and allow that knowledge to be observed in an event.

		specifying elements (mechanisms) that exist so that the events and experiences of others can be validated. (Wynn & Williams 2012)	Knowledge is generated through an exploratory process that identifies structures and mechanisms that cause events and contribute to the phenomena.	
Methodology	Data is gathered through natural discourses (observations, interviews, focus groups) where the researcher is an observer and recorder. (Denzin & Lincoln 2013) Themes and concepts are identified and formulated.	Pluralist approach, where a variety of research methods can be used (Syed, Mingers & Murray 2009), including a naturalistic methodology. Identify physical and social structures and associated relationships Identify and elucidate on causal mechanisms and tendencies within various structures and mechanisms that interact with events. (Wynn & Williams 2012, p796)	**Junction** Allows action research (activity based research structured around involvement of research participants) **Divergence** *Constructivist:* Explanation via seeking of discourse associations essential. Causality not addressed. *Critical realist:* Explanatory via uncovering causal mechanisms	During the data collection process, the researcher can contextualise features of the objective world in addition to constructs from the social world that contribute to or link causation to events. A realist approach to the analysis assists in explaining why particular events occur.
Axiology	The researcher allows for an interpretation of the world as research participants see it. The researcher is an actor, not information processor. (Peters et al. 2013) Reflexive analysis required.	Researcher is objective. Social theory arising from research can provide a critique that leads to the proposition for change and action. (Syed, Mingers & Murray 2009) Reflexive analysis required.	**Junction** Accepts accounts collected via social discourse. **Divergence** *Constructivist:* Explanation based on socially constructed reality. *Critical realist:* Explanation seeks causal mechanism as a basis for judgements. (Fleetwood 2005)	The interpretation of events must rely on substantiating judgements made in regard to observed phenomena from discourse and observations, and its interpretation through analysis that seeks causal regularities.

Source: Created by the author and adapted from sources as cited.

Table 3.1 compares and contrasts the tensions between constructivism and critical realism, their associations and the differences between the two research paradigms. It also outlines the proposed implications for this research by utilising both paradigms within the research process. Similarities and differences exist across the fundamental elements of ontology, epistemology, methodology and axiology. When aligning these to each paradigm, it is evident that research data gathered by using a constructivist approach has limitations when seeking underlying causal factors and mechanisms. These are not addressed within the paradigm's framework, and are more aligned to a realist ontology, although 'ontologies are neither mutually exclusive, nor wholly encompassing' (Peters et al. 2013, p. 337).

The use of a critical realist paradigm coupled with the adoption of a constructivist paradigm required the connecting of various social interactions and outcomes observed from within a constructivist paradigm with chains of events and associated causal mechanisms and underpinning structures framed within a critical realist paradigm. This provided an opportunity to add a firmer foundation to what the paradigm of constructivism offers, thereby contributing additional layers within a theoretical framework that can better answer the research questions.

Little guidance exists in the application of analysis methods using a critical realist approach (Hoddy 2019) and methodological design (Fletcher 2017). However, Sayer's representation of a sequential process (see Figure 3.2) for the application of the paradigm offered a logical and practical approach. A theoretical framework that captures the two paradigms has been created and represented in Figure 3.3. The conceptual model presents Sayer's depiction of associations between structures, mechanism and events (see Figure 3.2) and provides an overlay of how the constructivist paradigm used in this research project aligned to the paradigm of critical realism. This conceptual model reflects a detailing of the major paradigms within this research process (see Stage 2 within Figure 3.1).

The ordering of the foundation principles of a critical realism paradigm, being the interplay of structure, mechanisms and events is presented in Figure 3.3. The activation of these is contingent on the initiation of causal powers or tendencies (Wynn & Williams 2012, p. 792), which in turn depend upon the conditions within which they operate to inform causal explanations for an identified event. Events may or may not occur as a result of activation of causal powers and conditions leading to an event. Retroduction is used as a mode of inference during this iterative process to establish causal links.

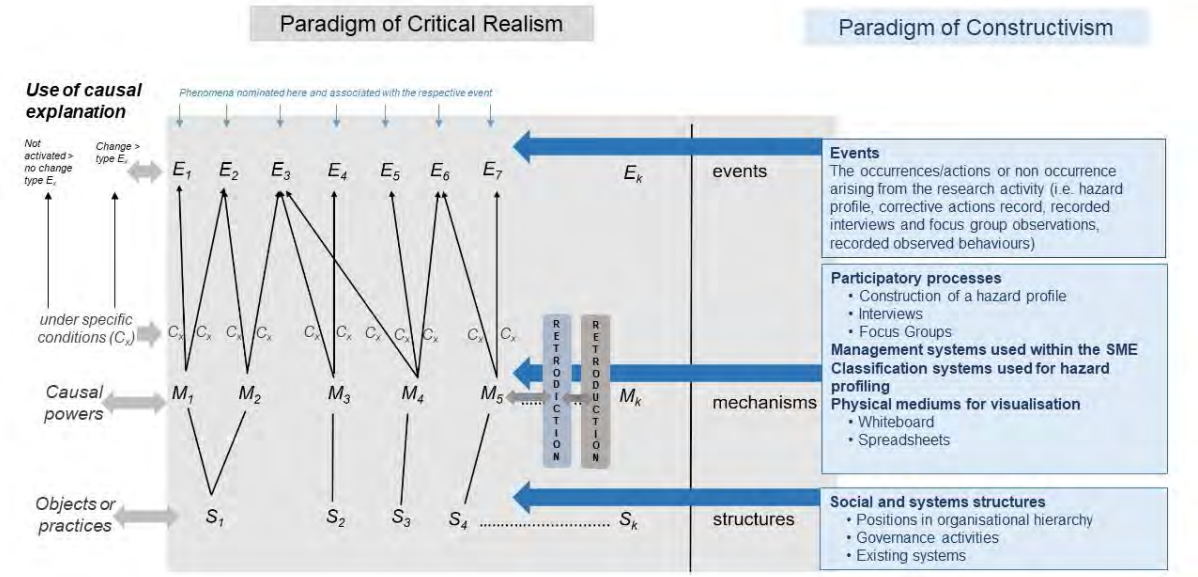


Figure 3.3: Paradigms Model for this research: Linkages between Critical Realism and Constructivism

Source: Adapted from Sayer (1992, p 109 and p 117)

The search for underlying structures and mechanisms within this research comprised the stratified layers of management in organisations and the accompanying socially constructed relationships. This offered a foundation from which to seek the causal mechanisms leading to observed events arising in each SME during the data collection phase of this research. This approach offered ways to enhance the rigour of the inquiry and the potential establishment of clearer links between the knowledge and meanings generated from the observed dialogue and social interactions gathered using a constructivist approach. Events that could be identified using a constructivist paradigm would otherwise not have had the opportunity to be linked to causal mechanisms and structures, leaving identified themes gathered from social constructs as the final foundation of the research findings.

Within the paradigm of critical realism, the identification of causal mechanisms was a key contributor to the seeking of meaning from the collected data undertaken within this research project. The identification of causal mechanisms would seek to explain ‘the basic conditions for the existence of the phenomenon studied’ (Danermark et al. 2001, p 1) and contribute to sense making (Pawson et al. 2005), rather than reflecting only on the meaning as expressed by the research participants when adopting a constructivist paradigm. The underlying causal mechanisms (Danermark et al. 2001, p. 5; Roberts 2014; Mingers & Standing 2017) could

provide indicators of the triggers within the structures. The mechanisms produced the empirical events that were observed and recorded using a constructivist approach.

The identification of mechanisms that link the structure of the research to the events, being the recorded events that unfold during the research, allowed for additional potential layers of data and its analysis to be utilised in the research. Danermark et al (2001, p. 5) propose that 'the point of departure in critical realism is that the world is structured, differentiated, stratified and changing' and so capturing the mechanisms that produce events allowed for the identification of causal powers. This is a main contrast with constructivism, which does not seek stratification and the recognition that various social structures may have causal powers (Peters et al. 2013).

By combining these two paradigms, greater insight could potentially be provided within the research findings while using a naturalistic methodological approach suited to both paradigms. An interpretivist epistemology aligned to critical realism can assist in generating particular tendencies through the analysis of causal powers, which in turn provides clearer links between the research participants' meanings obtained from a socially constructed ontology and particular events. The validation of these events was sought to contribute to the implementation of information system strategies associated with hazard profiling and its use to facilitate alignment to the OHSMS framework.

3.4.3 Research Process – Stage 3: Research strategies

A research strategy is explained by Denzin and Lincoln (2013, p. 29) as 'a bundle of skills, assumptions, and practices that researchers employ as they move from their paradigm to the empirical world'. This section explains the research strategies within the context of the chosen research design for this project. It consists of an overview of the selected strategy chosen for social inquiry and its linkage to the two research paradigms of constructivism and critical realism. Details regarding the empirical implementation of this project are provided in detail in Chapter 3, Sections 3.6 to 3.8.

This research adopted a phenomenological approach to the inquiry. Phenomenology is concerned with exploring and understanding the lived experiences of persons being studied, to seek patterns and associated meanings 'about a phenomenon as described by participants' (Creswell 2014, p. 14) connected with their subjective experiences. Phenomenological inquiry requires the researcher to be involved in the experiences of those being studied; for example, through the conduct of observations and interviews (Patton 2002, p. 106) in order to capture the essence of the occurrences and discourse used by the

research participants. A case study strategy was used to frame the phenomenological approach.

3.4.3.1 A case study strategy of inquiry

Case study research is a strategy of inquiry used in social science research, and according to Yin (1993, p. xi) is an appropriate strategy when researchers require broadly defined topics, when coverage of contextual conditions and the phenomena are not clear, and when there is a reliance on different sources of evidence. Each of these three factors were relevant to the justification for a case study design for this project.

Firstly, the research questions required the researcher to cover the broad topics of hazard profiling, OHSMS and SMEs within an adopted organisational context for each SME used in the research. The inquiry into the internal context of the SME when planning the creation of a hazard profile using activities, products and services as an initial classification presented a broadly defined topic that addressed an organisation's internal context and its linkages and influences in the use of information systems, being the OHSMS.

Secondly, direct linkages between the phenomena of hazard profiling, the organisational context and OHSMS arising from the research questions were not identified in any empirical literature. Coverage of the contextual conditions and the phenomena of hazard profiling as summarised in Figure 1.1 inquired into the relationships between the contextual factors and research variables through the research questions.

Thirdly, one single data collection method would not offer sufficient validity to answer the research questions. Sources of evidence for the project comprised data drawn from recorded observations of research participants engaged in a hazard profiling activity, interviews, focus groups, photographic captures and electronic spreadsheets representing the hazard profiles that were created. A case study design supported this social research inquiry method. The collection of different sources of evidence required the practice of triangulation to be used when examining the data collected from various sources.

3.4.3.2 Triangulation of data

Triangulation is described by Golafshani (2003, p. 603) as a 'strategy (test) for improving the validity and reliability of research or evaluation of findings' and can be used to examine research findings from more than one data collection method (McNeill & Chapman 2005, p. 23). The objective of using triangulation is primarily to test for the consistency in the results obtained from the research (Patton 2002; Golafshani 2003) and to avoid potential weaknesses associated with more traditional approaches for SME research employing a single data collection method (Lamm 2014, p. 175). The comparing and contrasting of data

obtained from the use of different data collection methods using reflexive analysis (see Chapter 3, Section 3.5.1) assisted in gaining a comprehensive insight into the phenomena being researched and provided opportunities to strengthen the consistency of identified associations arising from the collected data.

One type of triangulation identified by Patton (2002, p. 559) is triangulation of data sources, where different data collection methods such as interviews and observations are compared and checked for consistency. Within the context of the research, the triangulation of data sources was used to test the uniformity and regularity of the results obtained through the data collection methods of observation, interviews and focus groups (see Chapter 3, Section 3.6). The findings from one data collection method were organised according to themes arising from the research questions (see Chapter 4, Section 4.1) and compared to those gathered from other methods, while maintaining the research questions under investigation, thereby contributing to the consistency of the data in its alignment to the identified themes with the inquiry.

3.4.3.3 Research strategies and links to major paradigms

A case study design is supported by previous qualitative case study research (Barbeau et al. 2004; Makin 2009; Arocena & Nunez 2010; Cunningham & Sinclair 2014) that focused on the examination of OHSMS in SMEs. Empirical studies seeking to establish efforts to reach SMEs through OHS initiatives and interventions have utilised multiple case studies, incorporating the data collection methods of surveys and interviews. The paradigm of constructivism most closely aligns to these studies, as each respective study required interaction between the researcher and the research participants, after which themes and concepts were identified and analysed.

The theoretical paradigm of constructivism was captured within a case study design for this inquiry, where the research employed a phenomenological inquiry and analysis of business practices within SMEs. By inquiring into the worldviews of the research participants through the detailed analysis of hazard profiling while using various research methods, ‘multiple realities constructed by people and the implications of those constructions’ (Patton 2002, p. 96) could be observed, recorded and triangulated against other data collected from the participants using different data collection methods.

The literature review within this research suggests that tacit knowledge is likely to be of importance for SMEs (see Chapter 2, Section 2.8). There is a reliance within SMEs on informally recorded systems of work that depend on individual employees to perform work functions unlikely to be recorded within the SME’s information system. The seeking of

discourses provided by research participants would facilitate an insight into the internal structures and operations used within the SME and the relevant information systems that contribute to hazard identification and the potential creation of a hazard profile.

This required the researcher to adopt a constructivist paradigm to draw on interactions between research participants and their work environment, where the formed views that describe particular beliefs and perspectives were obtained. At this point, a case study using a constructivist paradigm could only seek to identify themes and concepts through natural discourses and research activities designed to create a hazard profile and compare its utility within the SME's OHSMS. However, a critical outcome of these research activities were the occurrences or actions that could emerge and be defined in some way. These could then be used as a feeder into the critical realism component of the paradigms model, commencing with an event.

The occurrences or actions arising from the research activities, for example the creation of a hazard profile in a spreadsheet, were able to be allocated as events within the framework offered by the paradigm of critical realism. The researcher was then further able to seek what caused the events to occur by using such data within the confines of the case study to examine the internal structures and mechanisms that produced the events utilising the paradigms model for this research (see Figure 3.3).

Case studies using a critical realism paradigm are supported by Wynn and Williams (2012, p. 788) in the field of information systems research (see Chapter 3, Section 3.2). Easton (2009, p. 123) proposes that 'a critical realist case approach is particularly well suited to relatively clearly bounded, but complex phenomena such as organisations' providing that the boundaries relating to the phenomena are clearly defined. This study was bounded by the three data collection methods of observations, interviews and the conduct of focus groups across four case study groups, being the four SMEs.

Adopting a critical realist approach to this case study research sought to identify the distinct events associated with the phenomenon of hazard profiling and its association with the management of hazards within the SME's OHSMS, and asked what caused those occurrences or non-occurrences. Each case study could be examined using the paradigm's model for this research (see Figure 3.3) to assist in determining 'the key entities involved, their powers, liabilities, necessary and contingent relationships … (to identify) one or more mechanism that can be regarded as having caused the events' (Easton 2009, p. 128).

The collected data was able to firstly be analysed for themes and concepts through the triangulation of data sources. This data comprised the richness of detail derived from observations, interviews and focus group discussions that sought to establish meanings, perspectives and world views and establish the consistency in the results through triangulation of the data collection sources and each SME. This provided opportunities for one level of analysis related to data accumulated from the implementation of a constructivist paradigm. However, a further level of analysis was possible where the events arising from the observations, interviews and focus groups were introduced to the critical realism paradigm model (see Figure 3.3).

Events can be generated through one or more mechanisms that possess causal powers or tendencies to contribute to the event (Winn & Williams 2012, p. 792). For example, the creation of a spreadsheet by one SME to represent the hazard profile was labelled an event, since it was an occurrence and an action arising from various mechanisms. The mechanisms in this case were the collaborative activities utilised in its development, the management systems associated with where the spreadsheet would be utilised, and the use of tools to record and illustrate the hazard profile. Hence, a causal explanation was possible regarding what can be established to create a spreadsheet representing a hazard profile.

The case study for each SME was used as an opportunity for a deeper analysis in the seeking of structures, causal powers and associated conditions contributing to the events. The two paradigms of constructivism and critical realism share epistemological junctions where language and social structure are accepted, as are multiple explanations regarding what is discovered. The adoption of a case study design facilitated the initiation of research activities that were designed to seek the production of at least one event, being the hazard profile.

The use of a constructivist approach contributed to the collection of information supporting the factors in its creation and occurrences of other events, making a contribution to one reality and providing a judgemental focus. An explanatory focus was undertaken with the occurrence of events arising from those same case studies within the critical realism portion of the paradigms model. This facilitated the examination of potential factors contributing to those events, therefore offering an additional reality that supported the research questions.

3.4.4 Research Process – Stage 4: Methods of data collection and analysis

The fourth phase of the research process requires the determination of appropriate data collection methods. As discussed in part earlier within this Chapter, these comprised the methods of observation, interviews and focus groups (see Section 3.4.2.1). The justification

for the selection of these and their intended use will be discussed in Section 3.6 of this chapter.

3.4.5 Research Process – Stage 5: The art, practices and politics of interpretation

The fifth phase of the research process considers how the results are to be constructed and interpreted within a systematic framework (Denzin & Lincoln 2013, p. 30) and consists of the researcher firstly creating field notes from collected data, followed by a classification of the data and its alignment to interpretations based on research centric concepts and language. An explanatory script is then created and aligned to the research approach and design, and finally the research is published.

As this stage of the research process is progressed, Denzin and Lincoln (2013, p. 30) propose that within qualitative research the classification and analysis of data and its interpretation reveals ‘no single interpretive truth’ and the ‘interpretive practice of making sense of one’s findings is both artistic and political’. The sense making analysis undertaken by the researcher requires the interpretation and theorising of data (Schwandt 2007, p. 6) that ultimately leads to the drawing of inferences and conclusions, and the justification of what has been interpreted. An interpretive truth that may sit alongside other similar truths claimed in other research.

The artistic value of what the researcher finds lies in the unique research approach and research design adopted for the study. The political revelations refer primarily to the ‘multiple interpretive communities’ (Denzin & Lincoln 2013, p. 30) within active but disparate research interest groups, found among researchers with an interest in the phenomenology associated with particular research and those researchers with an interest in the methodological approaches adopted for a study.

This stage is addressed through the data collection process for this project in the remaining sections of this chapter, where the strategies associated with the data collection methods are discussed (see Chapter 3, Sections 3.6 to 3.8), and in chapters that follow. The classification of collected data, its analysis within the constructivist and critical realist research paradigms and the interpretive practices employed in the analysis and discussion relating to the results are addressed in Chapters Four and Five of this study. The next section of this chapter begins with a description of the strategies employed to engage SMEs in this research, followed by an explanation of each data collection method and how it was used in the research.

3.5 Gaining access to the SMEs for this research

A multiple case study approach was used for this research. Several SMEs were sought to participate in the research, allowing for a more 'convincing and accurate case study' (Yin 1994, cited in Houghton et al. 2013, p. 12). The use of multiple case study groups allowed for comparisons and a broader range of perspectives to be gained from data sources obtained from each SME. A reproduction of similar findings across different SMEs had the potential to demonstrate consistency in the phenomena being researched, where associations arising from the collected data could validate findings relating to the application of hazard profiles as a useful mechanism in the construct of an OHSMS.

3.5.1 Methods used to approach SMEs

A total of four SMEs were used for the research, within the city of Mackay in the state of Queensland, Australia where the main output of revenue generated by the economy occurs within the mining, manufacturing and construction sectors (MRC 2018). Potential participating organisations were identified as those having between ten to fifty employees, and operating across any industry group, as classified under industry sectors used by the Australian Bureau of Statistics (ABS 2013); for example, metal product manufacturing and road freight transport. The researcher considered that a cross section of SMEs from different sectors may better support the reliability and validity of the findings by reducing bias that would focus on any one industry sector.

Mackay's estimated resident population is 114, 969 (ABS 2018), suggesting a considerable number of businesses would be operating in the city and immediate environs that could be approached for this study. In 2018, Mackay recorded 1,033 registered businesses having between 5-19 employees and another 249 registered business employing between 20-199 employees (QGSO 2018). The boundaries of the established employee range for this study (10-50 employees) fell within these two classifications, suggesting a significant number of SMEs operating within the city and region that could be approached for this study.

An invitation to participate in the research was kindly facilitated by the Mackay regional office of WorkCover Queensland (Queensland Government 2016), the regulator for safety and compensation services which also provides a Small Business Program with advisors located within regional offices. The government department's database was used to identify three hundred and fifteen potential SMEs in the region, while also incorporating an industry network within the region (MAIN 2017).

The invitation was sent by email, accompanied by an invitation letter and information brief (see Appendices 1 and 2) regarding the aim and objectives of the research, the type of

research being conducted, possible impacts of the research on business operations, required time investment and involvement in the research.

Based on the volume of invitations distributed, the researcher was anticipating being oversubscribed with SMEs interested in participating in this research. The first four respondents would be those selected for participation, providing they could be identified as SMEs having between ten to fifty employees. However, only four SMEs had responded to the invitation within a week of its transmission, with no others responding to the invitation after that time. It is not clear why the relatively low response rate was experienced. It may be attributed to findings similar to those of Nelson et al. (2007), where within Australian SMEs, a paltry ten per cent are interested in pursuing growth strategies, although this figure is not clear in regard to its representation for any specific business growth strategy or those associated solely with OHS.

3.5.2 Initial engagement with participating SMEs

An appointment was made to conduct a preliminary information session with SMEs accepting the offer. The researcher visited each SME in person prior to the conduct of the research activities to discuss details of the project and review information contained within the invitation letter, information brief and consent form (see Appendix 1, 2 and 3). The engagement of a key person to liaise with in establishing the context for the research, recruitment of research participants and a schedule for visits was critical to the implementation of the data collection phase. The representative for the SME in each case was the person allocated OHS management responsibilities within the organisation and one of the research participants. In each case, this person became the key informant (Patton 2002, p 320; McNeill & Chapman 2005, p 110), being the person who facilitated access to the workplace and to other research participants. Each key informant played a crucial role in the successful scheduling of visits, attendance of research participants to each research activity and the provision of physical resources such as a suitable room and whiteboard to undertake the research activities.

The visit was essential to enable the researcher to become familiar with the context of the SME, the work site and to gain an understanding of the operations. Value was gained in establishing a connection with at least one research participant. Within this preparatory stage, it was also paramount to gain trust and rapport that would facilitate engagement in each phase of the data collection (see Chapter 3, Section 3.6).

It has been suggested that researchers should consider the scope of a small business across OHS related studies, where ‘attention to the nominal size dimension … of people and

financial resources… should be supplemented by consideration of the age and structure of the business' (Cunningham, Sinclair & Schulte 2014, p. 156). This was an important consideration for the researcher to seek out during the preliminary information session with each SME. An initial determination of the business context assisted in the cataloguing of potentially critical factors relating to the SME's internal context that may impact on how the profile might be constructed in each SME and its creation against an alignment to the elements comprising the internal context of the conceptual framework for the research design (see Figure 2.2).

After an acceptance to engage in the research was received by the researcher through a confirmatory email, the steps undertaken to gain entry were adopted as follows for each SME.

1. Confirm a suitable date and time to conduct a preliminary visit with the contact person
2. Confirm the research participants to be involved, comprising managers and line supervisors on the initial visit to each workplace
3. Review the invitation letter, information brief and consent form and discuss the ethics surrounding the research. Advise the representative of the SME that the signing of the consent form would occur at the initial briefing to be conducted in the first session, being the commencement of phase one of the data collection (see Chapter 3, Section 3.7)
4. Record information regarding a site description (industry sector, number of employees, intended research participants and core business) and observe business functions (see Table 3.2)
5. Schedule proposed visits aligned to phases one, two and three of the data collection (see Chapter 3, Section 3.7.1).

Characteristics associated with each business are summarised in Table 3.2, where the organisational structures associated with the research participants were recorded in conjunction with the size of the organisation, its core business and years in operation. Other details pertaining to the existence of the SME; for example, the Australian Business Number (ABN) were recorded for future reference but have not been provided in the table for the purpose of confidentiality.

At the conclusion of the preliminary information session with each SME, a schedule of proposed visits was established, where the three phases of data collection would be

undertaken. The rationale for each type of data collection and details regarding the conduct of each phase is explained in the next section of this chapter.

Table 3.2: Characteristics of SMEs participating in the research

Characteristics of SME's participating in the research			
SME Identifier: **SME 'A'**	Date: 31/01/2018	SME Identifier: **SME 'B'**	Date: 26/04/2018
Research Participants Identifier: Position in organisation		Research Participants Identifier: Position in organisation	
O	Director. Manufacturing manager.	J (1)	Director
D (1)	Safety coordinator. Quality coordinator.	B	Production manager
D (2)	Workshop manager	J (2)	Workshop supervisor
M	Onsite manager	E	OHS & Quality manager
Employees (number)	38	Employees (number)	48
ABN	Available (retained for confidentiality)	ABN	Available (retained for confidentiality)
Years in operation	Founded 2011 (7 years)	Years in operation	Founded 2006 (12 years)
Core business	Maintenance, construction, fabrication and engineering services (Metal Manufacturing)	Core business	Maintenance and construction, supplying mechanical and structural (fabrication) services
Website	Available (retained for confidentiality)	Website	Available (retained for confidentiality)
SME Identifier: **SME 'C'**	Date: 20/03/2018	SME Identifier: **SME 'D'**	Date: 15/08/2018
Research Participants Identifier: Position in organisation		Research Participants Identifier: Position in organisation	
W	Director	D	Director (Chief Executive Officer)
M	Director	N	Safety, Quality and Environmental Coordinator
D	Operations manager	M (1)	Manager – Site Services
T	Workshop manager	M (2)	Operations manager
Employees (number)	40	Employees (number)	36
ABN	Available (retained for confidentiality)	ABN	Available (retained for confidentiality)
Years in operation	Founded 2012 (6 years)	Years in operation	Founded 1988 (30 years)
Core business	Road Haulage (Road Freight Transport)	Core business	Engineering Plastics, Rubbers, Polyurethane, Grouts and Epoxy's.
Website	n/a. Facebook: Available (retained for confidentiality)	Website	Available (retained for confidentiality)

Source: Author, 2019.

3.6 Data Collection methods

Within the research methods component of Figure 3.1 Summary of Research Approach and Design, data collection is depicted as a key activity that is preceded by the research process, the research methodology the research questions and research objectives, and ultimately the philosophy of the researcher.

This research was influenced by the researcher's ontology that sought a line of inquiry to explore the phenomenon of hazard profiling and establish if SMEs can use such a profile to facilitate strategies to manage hazards within the OHSMS. This required the researcher to select data collection methods that could incorporate the lived experiences of research participants; that is to collect data on how they make sense of their experiences and communicate them to others for shared meaning. This required data collection methods that were suited to a constructivist approach and could also offer insights into how those meanings and events arise when analysing them within the research paradigm of critical realism.

The research objectives sought to map and align the hazard profile to the SME's business contexts, acknowledging the creation of a hazard database, and validating whether a hazard profile could be aligned to the OHSMS framework by the SME. This required the selection of data collection methods that would allow the researcher to become involved in the phenomenological inquiry, in order to observe, participate and record the experiences of the research participants.

The first data collection method of observation of workplace practices was used to engage research participants in the planning and construction of a business tool, being the hazard profile. A task-based research activity was used to construct the hazard profile. The research participants were actively engaged in its development and the researcher was able to systematically select, watch and record behaviour based on actions, events, environmental influences and reflections (Spradley 1980). This was followed by the research participants' analysis and application of those tools to the OHSMS used by the SME, which was also observed by the researcher.

Following this, interviews were conducted with each individual research participant to record their own worldviews regarding the research activity and designing of a hazard profile. The interview questions focussed on both the phenomenology that was experienced and the accompanying interactions with the other research participants and sought to capture the views and perspectives of each research participant's experiences.

The final data collection method used was the conduct of a focus group, where collective and potentially changing world views arising from the construction of a hazard profile and its ability to facilitate the management of hazards within the OHSMS was sought. Participants were provided with opportunities to express their world views regarding hazard profiling and its association with OHSMS in a participatory process and draw on operational contexts that could be confirmed or contested to by others in the group. This assisted is finding points of difference with world views in regard to the phenomenology and validating patterns of data obtained from other data sources through triangulation.

Each data collection method will now be discussed in some detail and linked to the schedule reflecting the time frames for this undertaking. The data collection schedule is presented prior to a detailed explanation of each data collection method (see Table 3.3) in order to provide context for the sequencing and conduct of a schedule that was undertaken in each SME. Specific details on how the research activities were established with the research participants is explained later in this chapter (see Section 3.7).

The selection of each data collection method follows from the previous one across the sequenced phases, in terms of its applicability to the research questions and its complexity regarding how the research participants became involved within the research activities. This sequential process is summarised in Table 3.3

3.6.1 Phase 1 - Observations

Observations conducted within research focus on the direct, firsthand experiences of social interactions occurring in fieldwork (Wilkinson & Birmingham 2003, p. 116). The use of observations as a data collection method provide the opportunity to capture ‘rich descriptions of the social world’ (Denzin & Lincoln 2013, p. 19). Data obtained from observations can be used as a ‘check against participants’ subjective reporting of what they believe and do …[and] is useful for gaining an understanding of the physical, social, cultural and economic contexts in which the participants live’ (Mack et.al. 2005, p.12). Data obtained through observation can provide a rich source of information that can be triangulated against information collected from other data collection methods for validity and consistency, as was used in this study through interviews and focus groups.

According to Schwandt (2007, p 211), observations conducted in research are typified by events experienced by research participants within an identifiable context. Social interactions are viewed as fluid and dynamic. Therefore, the detailing of observations should be systematically recorded in some way and the researcher refrains from imposing theoretical analysis at an early stage in the study.

Table 3.3: Data collection methods and schedule

Research question	Case Study strategy	Data Collection Method	Research Phase (8 weeks per SME)	Data types	Data Collection Context
		Conduct of preliminary information session with each SME (1 to 2 weeks prior to commencement of phase 1).			
1. Does a hazard profile mapped to an SME's business contexts identify and record the SME's hazards?	Construct of a hazard profile and mapping to the business in each SME (x 4 SMEs). Hazard profiling is initiated for each SME, after which business contexts and mapping are undertaken by research participants.	Initial baseline questions (see section 3.7) posed collectively to all research participants to determine baseline knowledge of concepts regarding hazards and use of OHSMS. **Observation** Events to be recorded, based on frequency of visits, duration of visits and sample of research participants.	Phase 1 (two to four visits x 2 hours each) ***Weeks 1-3***	Annotations - visual and auditory observations (written). Visual cataloguing of profile (i.e. whiteboard). Photographic/digital recordings Annotations - responses to verbal questions.	SME premises (meeting rooms, work areas for operations). Observation criteria sheet used. Controlled environment at SME premises from prepared question bank.
2. Does hazard profiling facilitate alignment to an OHSMS structure suited to the SMEs characteristics, and will this assist in managing OHS risks?	Determination of potential alignment/integration between hazard profile and OHSMS structure relevant for the SME.	**Observation** Events to be recorded, based on frequency of visits, duration of visits and sample of research participants.	Phase 1 ***Week 4***	Annotations - visual cataloguing (whiteboard) and auditory observations (written) Photographic/digital recordings.	SME premises (offices, meeting rooms). Observation criteria sheet used.
		Interview Questions posed to each research participant regarding concepts, design and usefulness of hazard profiles, alignment of hazard profile to OHSMS structure, and assistance in management of OHS risks.	Phase 2 (one visit to interview each research participant – 30 minutes per interview) ***Week 5 - 6***	Annotations - responses to verbal questions. Digital recordings.	Controlled environment at SME premises from prepared question bank (i.e. office, quiet area away from distractions).
		Focus group Question bank used to trigger 'stimuli'. Content to include hazard profiling usefulness, mapping to business contexts, alignment of hazard profiles to OHSMS, suitability of process to SME's business.	Phase 3 (one visit – 60-minute session) ***Week 7-8***	Annotations. Digital recordings.	Controlled environment at SME premises (offices, meeting rooms). Question bank posed to research group participants.
A Preliminary Results Report was provided to each SME at the conclusion of the data analysis, offering a preliminary summary based on the evidence collected and analysed for the SME during each of the three phases of research. The intent of the Preliminary Results Report was to provide some feedback and immediacy to the needs of the SME shortly after the conclusion of the data collection phase (one month).					

Source: Author, 2019.

Events were required to be constructed by research participants within the first phase of data collection, in order to address the research questions and provide an environment where research participants could be observed within the paradigm of critical realism. One principal event was the development of a hazard profile, where research participants within each SME were tasked with the creation of one as a key activity. It was interesting to note that none of the participating SMEs had previously developed or used a hazard profile.

The researcher sought to observe the occurrences or actions that could emerge from the research activity of creating a hazard profile. These observations would then provide data for analysis within the constructivist paradigm by seeking themes, concepts and actions obtained through natural discourses. In addition, the seeking of events, structures and mechanisms associated with the observations was also required to contribute to the analysis using the paradigm of critical realism.

In addressing each research question, research participants were required to firstly determine whether a hazard profile can be mapped to the SME's business contexts and be capable of identifying and recording the SME's hazards. Secondly, a response was sought from research participants regarding whether a hazard profile facilitates alignment to the SME's OHSMS framework and its characteristics, and if it assists in managing OHS risks.

For this to occur, several valid social interactions required the researcher to observe those being researched and 'see the world from their standpoint' (McNeill & Chapman 2005, p.19) as the profile was constructed and then compared to the existing OHSMS. The objectives of this research relied on the visual and auditory collection of data by the researcher within the workplace of each SME. The data collection method of observation has been used within several research studies targeting OHSMS interventions in SMEs (Cunningham & Sinclair 2014, Brosseau et al. 2014, Ozmec et al, 2015), supporting the validity of the method for this research.

Criteria was developed for observations, based on verbal exchanges, observed practices that the research participants engaged in and observed connections between 'actions, interactions and behaviours' (Berg & Lune 2012, p. 230). These were supported by elements and accompanying criteria that utilised an observational methodology initially developed by Spradley (1980), incorporating people's actions and reactions, the physical research environment and the conceptual goals identified and targeted by the research participants (Fox 1998; Wilkinson & Birmingham 2003).

A synthesis of this criteria was created within the research instrument titled ‘Observation Schedule’ (see Appendix 4 Research instrument: observation schedule). The observation schedule incorporated four main components; the contextual details for each SME, a set of instructions for its use and two tables relating to the research questions, being the establishment of the hazard profile and secondly its alignment to the OHSMS. Each site visit to the SME was recorded separately for the two tables.

The conduct of observations provided opportunities to witness and gather tacit knowledge that may not have been readily available or provided incidentally through other methods. Several visits to each SME provided increased opportunities to develop facilitative relationships, thereby affording opportunities for greater volumes of data to be collected.

At this stage, the researcher identified the importance to not repress consideration for analytical thought as the data collection commenced. The emergent nature of the provision of data through observation was important to necessitate the recording of analytical insights in order to capture the analysis as it unfolded, rather than relying only on the analysis of the data when reviewed at a later time, where the transience of some analytical thoughts may be lost. This was addressed through the process of memoing when collecting the data (see Chapter 3, Section 3.7.5).

Limitations of observations included the possibility for the researcher to affect the behaviour of the research participants who may act in atypical ways during the research activities. Reflective strategies such as visual capture (see Chapter 3, Sections 3.7.1 and 3.8) helped to address such limitations.

3.6.2 Phase 2 - Interviews

The data collection method of interviews has been used in research studies regarding OHSMS programs (Barbeau et al 2004; Walker & Tait 2004), and to triangulate against other methods including questionnaires and observation when researching OHSMS in organisations (Makin 2009). Interviews are used in research to find information that either cannot be observed or when a secondary confirmation via a questioning process to validate and compare what has been observed is required. Direct observations cannot necessarily divulge beliefs, meanings or behaviours, and so the researcher needs to seek other methods to help determine what is unfolding (Patton 2002, p. 341).

The conduct of interviews was selected as the second data collection method in order to capture the evolving perspectives of the research participants in an environment that facilitates the elucidation of their world views and experiences within the research activity.

The use of interviews allowed the researcher to ‘enter into the other persons’ perspective… with the assumption that the perspective of others is meaningful, knowable, and able to be made explicit’ (Patton 2002, p. 341). Perspectives previously observed, for example during the research activity comprising the creation of the hazard profile could be confirmed using targeted interview questions.

The conduct of interviews would provide data for analysis within the constructivist paradigm by seeking responses in relation to the perspectives, knowledge and potential changes to worldviews obtained from each interviewee. In addition, the interview process had the potential to disclose events, structures and mechanisms associated with using the paradigm of critical realism that may not have been previously observed by the researcher during phase one of the research.

Interview types can be classified according to whether they are fact finding, an elicitation of a lived experience or an interactional encounter (Schwandt 2007, p. 164). A combination of the lived experience and an interactional encounter aligns to the constructivist research paradigm used within this study. The approach adopted for the conduct of interviews in this research sought responses reflecting world views in relation to the studied phenomena. This required the design of research questions to draw on how particular meanings were constructed over time during the research project and asked the interviewee to reflect on the content of the phenomenology itself.

Research questions incorporated a standardised suite relating to the research objectives incorporating the following elements:

i. the phenomenology of hazard profiling (concept, design, usefulness to the business, assistance in managing OHS hazards)
ii. knowledge on the OHSMS and its use
iii. the validation of links between hazard profiling and the OHSMS and the hazard profile’s usefulness in managing OHS risks
iv. the use of visual mapping (see Chapter 3, Section 3.8) in the creation of the profile
v. reflective learning arising from the research activity.

Questions were framed to encourage research participants to consider the development of knowledge and application of the phenomena during the research period in phase one, and the relevance and usefulness of the phenomena itself.

Interviews were conducted by the researcher after the completion of the phase one observations (see Table 3.3), where a further visit to the SME was conducted to interview each research participant separately. The research instrument titled 'Interview Questions – Reflections on Hazard Profile and links to OHSMS' (see Appendix 5) comprised a preliminary interview guide for the researcher and directions to be provided to each interviewee. The interview events were designed and conducted as a 'standardized open-ended interview' (Patton 2002, p. 349) where the questions and sequence were predetermined and posed in an open-ended format to elicit comprehensive responses and enable the organisation and analysis of data into key themes and categories (see Chapter 4, Section 4.2).

Many questions were framed in an open manner, allowing the elicitation of ideas within the framework of a general theme. It was anticipated that concepts and methodologies underpinning the creation of the hazard profiles and alignment to the OHSMS had been utilised within the research activities, reflected on and evolved during this time so that each research participant could offer assimilated experiences and perspectives regarding the phenomenology.

Interviews were conducted individually in order to avoid the potential influence of other research participants, and to avoid individuals refraining from providing a response due to a potential sense of unease in a group setting. The interviews were conducted with each participant over the course of approximately thirty minutes. Responses were recorded and read back to the participant in order to verify the accuracy of all recorded responses.

It was anticipated that responses provided by interviewees may be influenced by the variables of time and group dynamics, since the interviews were conducted after the initial hazard profiling phase. Respondents may reflect differently to questions posed in the interview compared to the recorded observations made by the researcher in the initial group-based activities undertaken in phase one. This variable was addressed by the utilisation of a standard set of interview questions, and an attempt to schedule the interviews within a week of the completion of the phase one observations (see Table 3.3), while details of what had transpired in phase one could be a recent recollection for each interviewee.

One other variable requiring consideration during the interview was that each interviewee was a unique informant with the potential to provide different breadth and depth to the interview questions. This was addressed by the use of probes within the research instrument; for example, the prompt to ask for further explanation in regard to a particular question. The researcher also sought visual cues from each interviewee; for example,

gestures that could reflect confusion or uncertainty with the question. In such cases, the question was rephrased and contextualised for the research participant in order to provide greater clarity and the change noted accordingly within the research instrument.

Following the completion of phase two of the data collection, the final phase required the researcher to convene research participants within each SME for one focus group session. The objective of this activity was to generate additional data that may be available after the creation of the hazard profile and resulting observations and interviews.

3.6.3 Phase 3 - Focus Groups

A focus group is a data collection method in which the researcher and participants meet as a group to discuss a specific research topic (Mack et.al. 2005) and is essentially conducted as an interview (Patton 2002, p. 385). As a data collection method, a focus group has several advantages over individual interviews. Firstly, it offers the economising of data gathered from several participants at the same time. Secondly, it provides a platform for the exchange of views between research participants and can confirm, elaborate or illustrate disagreement on certain views. This final point can assist in the checking for consistency or variability among the participants' responses.

Focus groups were not found to have been used in other similar studies with SMEs, although Makin (2009, p. 195) proposed that focus groups may be useful in future research when exploring barriers to the use of OHS strategies. The researcher identified this as a useful method, where the collection of data would assist in the summation and synthesis of the total data collected from each SME using all three data collection methods.

A set of strategies for the design of this method is proposed by Cyr (2016, p. 251), where the researcher should 'state the main purpose of the focus group, …identify the primary unit of analysis exploited …and list the questions used to collect data in the focus group'. In addressing these strategies, the purpose of convening a focus group was to collect additional information about the range of opinions and accompanying social constructs from the research participants that had developed during the research activities.

According to Cyr (2016, p. 231), three units of analysis generate data from focus groups: the 'individual, the group and the interaction'. The specific units of analysis relevant to this research were associated with the interactions occurring within the groups of research participants, which aligned to the constructivist research paradigm. Additionally, data obtained from group interactions could be drawn on to explore the structures and mechanisms leading to events within the research paradigm of critical realism.

A question bank consisting of open and closed questions posed to each focus group at each SME was used to draw on the following elements related to the research objectives:

- usefulness of hazard profiling as a tool
- hazard profile mapping to business contexts
- identification and recording of hazards
- hazard profile alignment to an OHSMS structure
- suitability of whole process to the SME's business.

The research instrument titled 'Focus Groups' (see Appendix 6) was used as a guide for the researcher, along with accompanying directions and ground rules (Berg & Lune 2012) provided to the focus group participants prior to the commencement of the activity. The researcher took on the role of moderator for the activity, introducing the topic and each question, but allowing the group discussion to take its natural course. The moderator's guide (see Appendix 6) incorporated an introduction, establishment of guidelines for the session, itemisation of questions and guidance on dealing sensitive issues and consideration for equitable opportunities for input from all participants.

The conduct of each focus group session firstly revisited the scope of the research and research objectives. A standardised set of questions were designed to incorporate the research objectives and baseline questions undertaken in phase 1 (see Chapter 3, Section 3.7), and a series of open-ended questions included to synthesise the process and experiences of the participants. Responses were recorded with the name of each respective participant allocated against the recording for future reference and analysis.

Data collected from the focus groups was used to triangulate results obtained from the other data collection methods of interviews and observations to determine alignment, correlations, comparable patterns and the value and usefulness of hazard profiling as perceived by research participants within each SME. Triangulation provided a mechanism for validating the components by 'converging several sources of data or perspectives from participants' (Creswell 2014, p.201).

Studies have found that a tailored, outcomes focussed approach incorporating 'trust, participation and dialogue' (Legg, Olsen, Laird & Hasle 2015, p. 192) are the most successful strategies for OHSMS interventions in SMEs. The data collection methods of observation, interviews and focus groups provided the capacity to facilitate discussion, consultation and disclosure between participants and the researcher in a collaborative

environment where those elements could be experienced as the relationship between the researcher and the participants developed.

The rationale underpinning each of the data collection methods and incorporated linkages to the selected research paradigms used in this study has been explained in this section. The implementation of the data collection phases will now be discussed and is organised according to the sequential implementation of the research activities within each SME.

3.7 Schedule and conduct of data collection

The research required several worksite visits to each SME, where different data collection methods were employed at different stages in the data collection schedule (see Table 3.3). The data collection phases undertaken within each SME spanned a period of approximately eight weeks for each SME, allowing time to establish and conduct the research activities over a total of four to six visits. This provided continuity with the project and the opportunity for the researcher to connect with the research participants on a regular basis, so building trust and rapport to facilitate engagement.

Some SMEs have insufficient knowledge of what is required for the identification of hazards and the establishment of an OHSMS (Legg et al.2009; Makin 2009; Hasle et al. 2012; Masi & Cagno 2015). This was identified as a variable of primary importance that required control in order to standardise the inputs associated with knowledge and process surrounding the subject matter of hazard profiling and OHSMS. Therefore, the researcher was required to facilitate, lead and control all sessions and activities in relation to data collection, according to schedule outlined in Table 3.3.

3.7.1 Conduct of an introductory session with the SME

At the commencement of the research activity, participants were introduced to the phenomenology of the study. This involved determining the level of knowledge and prior experience research participants had with:

- the concept of a hazard profile
- how a hazard profiling may be initiated
- deciding on how the context of the business can be incorporated in the profile
- ensuring that known and anticipated hazards can be incorporated within the profile
- an understanding of OHSMS and how hazards might be addressed within the system.

Once the SME had accepted the offer to engage in the research through a confirmatory email, and actions were completed in relation to gaining entry (see Chapter 3, Section 3.5.2), the data collection phase was commenced with the provision of an initial briefing as summarised below (see Appendix 7).

1. The first session was scheduled, and a meeting convened with the research participants in each SME.
2. The researcher introduced the scope of the research, the research objectives and schedule of visits aligned to Phases 1, 2 and 3.
3. The researcher provided copies of the invitation letter, information brief and consent form (see Appendix 1, 2 and 3) and discussed the ethics surrounding the research, as summarised in the consent form. Research participants were asked to read each form, sign and return the consent form to the researcher. Risks associated with engagement and ethics are addressed in detail in section 3.12.
4. A knowledge baseline was established for each SME in order to determine the general collective knowledge base of the research participants and the SME's use of an OHSMS. A suite of questions was posed verbally. A collective response was sought in order to gain an overall reflection of how hazard identification and OHS management were employed in the SME at the commencement of the study, and to also not alienate or discourage individual participants from the study if they were not able to answer the questions of their own accord. Recorded responses would be revisited at the conclusion of phase 3 of the schedule, and a comparison made in regard to any particular changes that had occurred with the phenomenology, as understood through the lived experiences of the research participants. The baseline questions were framed as follows:
    i. what is your understanding of hazards?
    ii. what do you see as your needs in regard to the hazards in your business and how to manage them?
    iii. what is your understanding of a hazard profile?
    iv. what do you understand an OHSMS to be?
    v. what do you perceive as the state of your OHSMS?

Following the initial briefing, research participants were ready to commence the planned research activity in phase one (see Table 3.3). The initiation of the research activity, being the construction of a hazard profile was introduced in a consistent manner as described below for each SME, in order to ensure a uniform approach with each case study group.

3.7.2 Commencement of the research activity: construction of a hazard profile

The construction of a hazard profile required the revising of initial responses to the baseline questions provided by the research participants, in order to determine the type of facilitation that might be required to ensure key concepts relating to the phenomenology were understood and able to be used in the construct of the hazard profile. At the commencement of phase one of the project, the researcher clarified the basis of a hazard profile in broad terms for each case study group. The clarification was based on the explanation offered in Chapter 1 (see Section 1.4.5) where a hazard profile can reflect OHS hazards present or having the potential to be present within the SME, and that the hazards are classified in a grouping and framework that is relevant for the SME.

At this stage, the researcher also reflected on the elements that can comprise the internal context of the SME (see Figure 2.2) to ensure that the particular understandings in regard to the introduced phenomenology, as determined by the baseline responses could be verbally contextualised for the research participants, along with consideration for how the business functions. An initial classification framework was provided for the research activity, consisting of activities, products and services (see Chapter 1, Section 1.4.5 and Chapter 2, Section 2.10).

The researcher was aware of the potential bias in using this particular framework. Research participants were advised that the classification framework was a starting point, and that they were free to modify it or adopt another classification system. However, each SME across each of the four case study groups decided to retain the use of the framework comprising activities, products and services for the duration of the research project.

The creation of the profile required a medium for its recording and communication to the research participants. One readily usable tool, being the use of a whiteboard was suggested at the commencement of the research activity as the design of the hazard profile was commenced. To avoid potential bias, the use of this medium was explained by the researcher to the research participants as being an initial tool, not a mandatory requirement and that it could be replaced by another medium during the research activity. However, each SME across each of the four case study groups decided to continue using the whiteboard as the initial tool of choice to record the hazard profile. An explanation on the use of visual mapping associated with the use of a whiteboard has been provided later in this chapter (see Section 3.8).

In each case study group, research participants commenced the establishment of the profile, largely through brainstorming and the exchange of ideas regarding how the business was

operated and where hazards are created. The researcher used the relevant research instrument, being the observation schedule to record observations and annotate particular discourses and behaviours. At the end of each session, the researcher used a digital photographic capture of the whiteboard to record what had been produced and was able to make consequent comparisons with further developments in the creation of the hazard profile by repeating this process with each visit until the final session conducted in phase three.

Return visits in phase one required the research participants to continue constructing the hazard profile and the determination of potential alignment/integration between it and the structure of its OHSMS. Set blocks of time for researcher visits in phase one were established, comprising a maximum of two-hour blocks for each visit during normal business hours. Each SME required between three to five visits by the researcher during phase one, with SMEs' either adding to the profile between visits, or neglecting it until the researcher had returned for the next visit. Standardising the time spent with each SME to a two-hour block intended to reduce bias (Denscombe 2008, p. 217) between different SMEs in terms of time investment and lessened the potential imposition on research participants being drawn away from the operation of the business for extended periods during normal business hours.

3.7.3 Conduct of interviews

At a point when the research participants had communicated that the initial draft of the profile was complete, the second phase of the project regarding the conduct of interviews commenced. A series of appointments was established for the interviews, some of which were completed within one visit for all participants, while other SMEs required return visits due to the availability of some but not all research participants. Interviews were conducted in a manner consistent with the research instrument designed to administer the interview questions (see Appendix 5).

Interviews were conducted in a quiet location such as offices or the board room, away from distractions and proximity to other research participants. The suite of instructions as provided in the research instrument for interviews was read to each interviewee. In several cases, further open-ended questions were required to elicit responses that addressed prescribed questions. The researcher encouraged all participants to continue reviewing the hazard profile during phase two, and to make additions on the whiteboard in an easily recognisable code; for example a different colour and dated notation, so that any progress or modifications to the profile were easily identified.

3.7.4 Conduct of focus groups

The final phase required the convening and conduct of the focus group to collectively participate in a focus group that synthesised the phenomena. The requirement to convene all research participants challenged the scheduling arrangements for this activity. However, it was critical that all participants be present in order to have the opportunity for equal and sustained contribution to the project. Each focus group session was conducted in the SME's main meeting room or boardroom and followed the suite of directions and guiding questions itemised within the research instrument.

The final section of the research instrument used in this phase (see Appendix 6) revisited the baseline questions. These were posed to the research participants after the conclusion of the focus group session so as to avoid interference with the finalisation of the focus group questions. Responses to the baseline questions were analysed and compared to the initial responses collected at the commencement of phase 1 when they were first administered.

Within approximately one month of completing the data collection for each SME, a Preliminary Results Report was provided to the SME (see Appendix 8 for a sample), outlining an initial summary of the research conducted and some general indicators arising from the collected data. The intent of the report was to provide some commentary to assist the SME in confirming preliminary findings and providing a platform for further actions arising from the hazard profile, should they wish to develop it further. The report also provided an expression of gratitude for their time.

By using the selected data collection methods, the research questions could be addressed within the constructivist research paradigm by drawing on the observations, interview responses and discourse arising from the focus group. The collected data reflected how the research participants constructed particular meanings and perspectives from the research activities and associated phenomenology as follows:

- observation, allowing for a recording of insights into the meaning research participants will attach to hazards, their identification and alignment to the hazard profile and a selected OHSMS framework
- interviews, allowing for the potential to confirm or contradict data collected through observations in relation to an individual participant's meaning that is attached to hazards, their identification and alignment to the hazard profile and a selected OHSMS framework
- focus groups, providing an opportunity for a synthesis among research participants in relation to the phenomena of shared interest, being whether hazard profiling

facilitates alignment to an OHSMS structure suited to the SMEs characteristics, and whether this assists in managing OHS risks.

The data collection methods also facilitated the triangulation of data and the research design strengthened by planning methods where the ‘instruments could contain directly analogous variables’ (Yin 2006, p. 44). In this way, there were opportunities for overlap between the methods, leading to a strengthened mix between them.

The data collection methods also facilitated the identification of particular events using the research paradigm of critical realism. Events such as the creation of a visually depicted hazard profile required the researcher to seek the structures and mechanisms that allowed the event to occur, thereby providing insights into what had facilitated the creation of the profile that could be communicated to other scholars and interest groups for future exploration.

3.7.5 The use of memoing when collecting data

As the data collection tools were designed, it was anticipated that there would be a need for the researcher to engage in memoing, both during and after the data collection phase. Memoing is described as when ‘researchers take note of personal, conceptual, or theoretical ideas or reflections that come to mind as they collect and analyze the data‘ (Van den Hoonaard & Van den Hoonaard 2012, p.2).

This was addressed within the research instruments by including a section titled ‘Comments/observations made by researcher‘, thereby facilitating the recording of particular observations gathered about the data at the point in time when it was first collected. Memoing was found to be a useful strategy in assisting with the interpretation of data both immediately after a data collection activity and later in the analysis in order to relate the recorded notes to fundamental themes underpinning the research questions. For example, the renaming of a category within the hazard profile by one organisation reflected a significant departure from the initial hazard profile framework and provided insights that were helpful with the analysis of data.

The final part of this chapter will address three fundamental components built into the research design that were crucial to the implementation of the research methods. These involved the use of visual mapping as a tool, an explanation of how research bias was addressed throughout the research design and actions taken to address ethics associated with this research.

3.8 Visual mapping as a tool

The use of verbal discussion was prominent in the research activities during all phases of the data collection. However, this was only one feature used to capture, record and convey the discourse and engagement provided by the research participants. Other considerations were also required to reflect concepts and associations as they were identified, discussed and utilised by the participants to form an additional part of their learning experience and communication strategies.

Some research on learning, and in particular perceptual learning promotes approaches that require the application of multisensory visual and auditory mediums (Shams & Seitz 2008) in order to grasp concepts. In a study on the use of visualisation in qualitative research, Alsughayer (2017, p. 22) proposes that visualisation 'drives the researcher to think about, organize, and draw connections between elements from the context of their data collection' and consequently 'see their data, observe patterns, detect salient themes, and visually compare data points across different metrics'. Such insights should not be confined to the researcher, as they also apply to the research participants who are presented with and contribute to the visualisation of concepts as part of a research activity.

Visual mapping can be used to draw information from research participants that provides 'rich, raw, timely, collaborative data that is invaluable when attempting to develop new operational models for organisations' (Bahn & Weatherill 2011, p. 432). Advantages of visual mapping arise from the ability of images to encourage and promote communication and facilitate discussion through the lived experience of the participants as the 'images overcome the alphabet's limitations' (Andrade, Urquhart & Arthanari 2015, p. 648).

The use of visual methods can elicit information from research participants and hence facilitate discussion that enhances data gathering (Pain 2012) in ways that are not easily achieved by the collection of written statements and their reiteration through a spoken medium. Meyer (1991, p. 232) proposes that the progression of data collected from research participants can be developed by the participants in a graphic context, thereby perhaps reducing researcher bias where the discourse might otherwise be recorded in a text-based format by the researcher and not be readily viewed by research participants.

Research participants within each SME expressed an inclination for the use of a participatory visual method to commence the hazard profiling activity. The design of the hazard profile was initiated visually, on a whiteboard by each case study group. This was the mode of preference for each group of participants as the research progressed from the first session to the next, although the researcher had advised that it could be replaced by another

tool during the research activity. The whiteboard was also supplemented with the use of a spreadsheet by two of the SMEs to assist in communicating some of the developments in the creation of the hazard profile to other research participants. However, use of the whiteboard was retained by each SME during the research activities.

The use of the whiteboard can be described as a form of visual mapping, where frameworks and associated entries were linked to other physical parts of the workplace, its work processes such as the fabrication of products or the broader business systems such as human resource management. The symbolizing of various work processes within a visual map facilitated the linking of connections between concrete activities representing the work undertaken in the SME and coded concepts relating to identified hazards and how they are managed utilising various business systems. Research participants inserted these features in the profile independently of any input or suggestion from the researcher.

Indeed the 'enrichment of data and an approach to participants that is affirming and empowering are intricately connected in the attainment of relationship-focused outcomes such as empowerment and change' (Pain, 2012, p 314). Within this research, the data could be readily accessed, reflected on and used by the research participants of their own volition at a time of their choosing, since the data was readily available on the whiteboard in the workplace.

The use of visual mediums involving the use of a whiteboard and spreadsheet to promote the cognition and use of information was a prime tool that assisted in presenting associations between different concepts within the research. In a study of common data displays used in research, a model found to be commonly used for data displays by researchers are matrixes (Verdinelli & Scagnolli 2013; Henderson & Segal 2013). The visual mapping was used as a matrix, incorporating features of a hazard profile for each SME and its consequent mapping in the form of a visual comparison into an OHSMS structure (see Appendix 11), thereby addressing the two research questions.

3.9 Research Bias

Research bias is suggested by Schwandt (2007, p. 20) as existing in two forms. Firstly, there is potential for a researcher to rely on the accounts of certain research participants in favour of others. Within this research project, the potential for this commenced during the initial contact made with key informants within each SME. The engagement of a key person to liaise with in establishing the context for the research, recruitment of research participants and a schedule for visits was critical to the implementation of the data collection phase. Within each SME, this person became the key informant for the research project.

Opinions and perspectives communicated by informants during the preparation phase of the research prior to the data collection were not recorded as part of the research data. The researcher advised each informant of the research instruments to be used within the study, and that these formal tools would be used to record research data at the commencement of the data collection sessions as organised within the schedule established with the SME.

The emergence of key informants also presented opportunities for bias by the informants arousing aversions and ill feeling among other research participants (Patton 2002, p. 320), identified within this research through the requirement to allocate additional time to separate discussions with the informant that related to the logistics of each visit. The researcher sought to maintain visibility in the relationship during all research activities by revising discussions held with the informant with the entire group of participants at the commencement of each session.

The provision of abundant narratives by some key informants or other research participants were also identified as potentially contributing to feelings of aversion among some research participants. This was avoided during the data collection phase by using a reflexive approach through maintaining equitable opportunities for engagement. A tally system was used to record responses and engaged interactions provided by each research participant during phase one (observations) and phase three (focus groups). These were reviewed during and prior to the end of each session. Participants recording a lower tally were offered further opportunities to engage through the provision of open-ended questioning and review of material discussed, aligned to the research instrument and directed to them.

A second potential for bias can exist in the individual preferences and dispositions employed by the researcher in terms of not adopting a neutral, objective approach (Schwandt 2007, p. 20) leading to subjective attention to particular information, events and behaviours. The seeking of information or observations may lead to the inability to record and interpret a neutral account of social discourses and observable actions. There is also potential here for the researcher to use data to endorse a position taken prior to the commencement of data collection. Hence the research design process may be biased or there is a tendency by the researcher to forecast or seek what is anticipated (Morse 2015, p. 1215) within the data collection and to adopt prejudiced notions or judgements.

The potential for preferential researcher bias arising from the research was addressed by adopting a robust research design (See Figure 3.1) that linked the research questions with the research strategies and research methods. Research instruments were designed to maximize respondent engagement by using simple terminology relating to workplace

practices rather than the phenomenological concepts associated with the research questions. The use of baseline questions (See Chapter 3, Section 3.7.1) assisted in determining the knowledge base of the research participants and assisted in minimising task difficulty so that respondents were more likely to engage with the research activities.

The adoption of a reflexive analysis during the design of the data collection tools was employed by ensuring each data collection method and accompanying instrument could be aligned to one or both research questions. Responses recorded from research participants was firstly mapped to the relevant portion of the research instrument, and secondly considered in terms of its application against the research questions, in which case additional memoing was made in regard to the discourse or observation.

3.10 Ethics associated with the research

Ethics in qualitative inquiry can be explained as the 'justification of human actions' (Schwandt 2007, p. 89), and is based on determining whether the research to be undertaken may impose harm on research participants and other stakeholders, and also to determine the potential for achieving positive outcomes.

The application of ethics in a research project can be applied more broadly, where a range of ethical principles should guide the research. These are identified by McNeill and Chapman (2005, p. 12) as comprising informed consent, provision of transparent objectives and methodology associated with the research, maintenance of privacy and anonymity, protection of research participants from harm and the maintenance of legal standards. These principles have been applied to this research within the framework for ethical conduct in human research (NHMRC 2015) and ethical approval granted by the Central Queensland University Human Research Ethics Committee (HREC).

The researcher was involved in a sustained and continuing experience with the research participants in each SME, where attendance at their workplace spanned a few hours each week for a continuing number of weeks. This raised some ethical issues for consideration related to the strategic design of the practical inquiry sessions, the framing of the sessions where the research project and hazard profiling was introduced and the professional background of the researcher, all of which had the potential to affect the shape of interpretations of the study in its design and execution.

The researcher was required to undertake an evaluation of the ethical risks associated with the project, across risk categories including governance, research integrity and engagement risk. Risks were identified and mitigated through the creation of various research instruments

(see Appendices 1-8). Research instruments pertaining to an invitation letter, information briefing, informed consent and data collection all required submission to the Central Queensland University HREC (see Appendix 6).

The application of an ethical approach to the research was also considered through the process of reflexive analysis. A continual evaluation of self-reflexivity, actions and reactions experienced by research participants and the research findings required the researcher to examine and respond to the research constructs and participant experiences. Those reflections and interpretations were made with the objective of maintaining the integrity and authenticity of the research.

Adherence to the research schedule (Table 3.3) and the dissemination and implementation of each research instrument enabled the researcher to ensure ethical principles associated with privacy, anonymity and the maintenance and implementation of transparent objectives and the planned methodology were employed throughout the research.

3.11 Summary

This chapter has outlined the research approach and research design used to conduct this research project. A research process (see Figure 3.1) has been used to explain the stages that the researcher has chosen to adopt to collect and analyse the data. A qualitative based, phenomenological inquiry was used to explore how research participants acknowledge the concept of a hazard profiles and make sense of the phenomenon to construct one that is contextualised for their SME. The design and implementation of the data collection tools used is explained as part of the overall research approach and research design. The following chapter extends those portions of the research approach and research design regarding the analysis of data, and explains the stages, methods and presentation of the analysis within an analytical framework.

4 Development of an analytical framework

This chapter uses an analytical framework (see Figure 4.1) to explain the stages, methods and presentation of the analysis that was adopted from the data gathered within this research project. This framework is used to illustrate how the data was organised to elicit meaning, and how analysis and conclusions reflecting the use of both constructivist and critical realist research paradigms were drawn from the data.

The analysis of qualitative data is explained by Jorgensen (1989, p. 3) as:

> … a breaking up, separating, or disassembling of research materials into pieces, parts, elements, or units. With facts broken down into manageable pieces, the researcher sorts and sifts them, searching for types, classes, sequences, processes, patterns, or wholes. The aim of this process is to assemble or reconstruct the data in [*sic*] meaningful or comprehensible fashion.

The researcher saw the need to adopt such an approach and illustrate the analysis in ways that would reflect the use of a systematic and valid analysis, and one that could be aligned to the research questions and methodology associated with this research.

4.1 An analytical framework

The researcher acknowledged that 'conceptual frameworks and research questions are the best defence against overload' (Miles, Huberman & Saldana 2014, p. 73). Therefore, the data collection and analysis required a selective, transparent process to be adopted in order to filter what was relevant and important to the research questions, rather than the researcher being overwhelmed with collected data without a plan detailing how to organise and dissect it for analysis. A conceptual framework, called an analytical framework in this research was able to provide disclosure of the qualitative analysis process (Attride-Sterling 2001) to illustrate how the textual data and sense making was undertaken by the researcher and to provide credibility to the analytical process (Bengtsson 2016).

Based on the work of Huberman and Miles (1998), Attride-Sterling (2001) and Bengtsson (2016), an analytical framework was developed to illustrate the stages and process of analysis and how this linked to the presentation of the data and results. The analytical objective underpinning the framework sought to adopt a systematic approach that would help organise and elicit significant meaning from the collected data and obtain realistic conclusions relevant to the research questions.

The analytical framework (see Figure 4.1) incorporates three key components depicting how the analysis associated with the research was conducted. These components are named as

the stages of analysis, the methods of analysis and presentation of the analysis. Firstly, the stages of analysis demonstrate the overall sequential process of analysis that was undertaken as the data was collected, organised, compared and reassembled. The analysis was also validated reflexively against a suite of criteria drawn from other research, in order to strengthen the integrity and objectivity of the inferences made (see Chapter 4, Section 4.5).

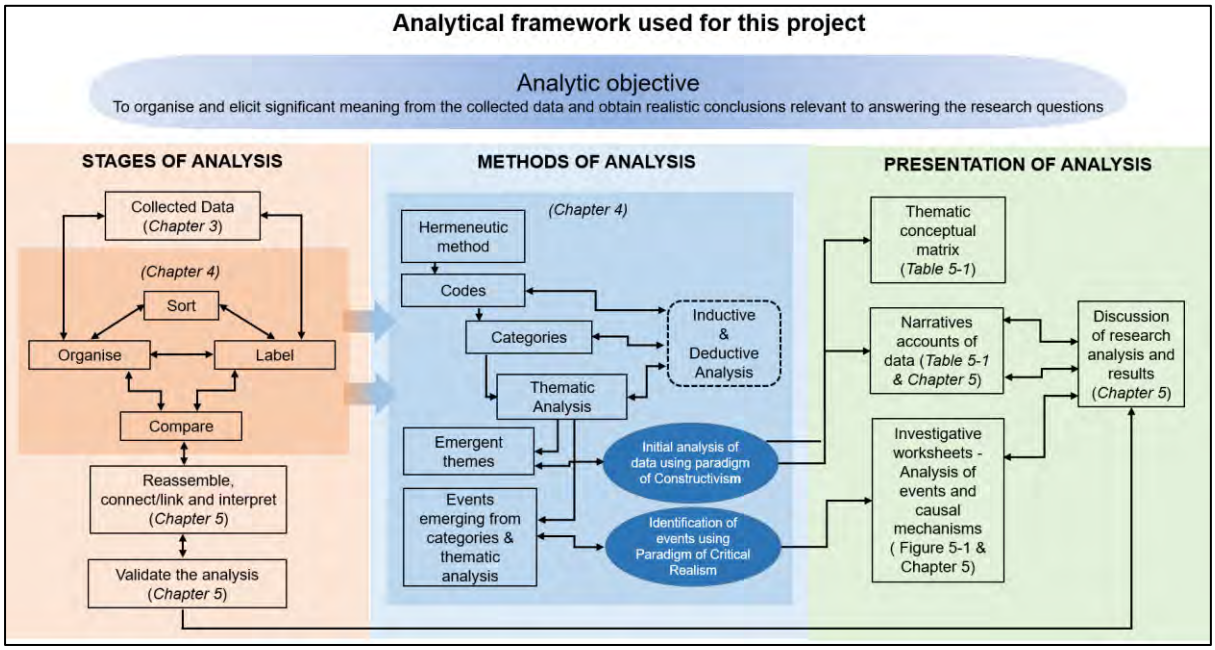


Figure 4.1: Analytical framework
Source: Adapted from Huberman & Miles (1998), Attride-Sterling (2001) and Bengtsson (2016).

The second component of the analytical framework presents a summary of the particular methods of analysis used to code, categorise and draw themes from the data within a constructivist paradigm. The data was also searched for the identification of *events* (see Chapter 3, Section 3.4.2.2) that were then analysed to determine causal mechanisms within a critical realist paradigm (see Chapter 4, Section 4.3.4).

The third component of the analytical framework itemises the presentation of the research analysis and results in several different forms. These comprise a Thematic Conceptual Analysis, narrative accounts and an Investigative Worksheet. A Thematic Conceptual Matrix (see Figure 4.1) was developed to collate, summarise and perform an initial analysis of the collected data. Narrative accounts drawn from the research instruments were also used as a mode for the presentation of the analysis, where they were listed in the Thematic Conceptual Matrix and used as supporting accounts to the results discussed in Chapter 5. An

Investigative Worksheet (see Figure 4.1) was used to provide a causal analysis of each event identified within the critical realist paradigm in order to determine its triggers. Collectively, the research analysis and results are discussed in the Chapter 5.

The methods of analysis shown in Figure 4.1 incorporated two research paradigm models in the analysis, being the constructivist model and critical realist model illustrated in the methodology chapter of this thesis (see Figure 3.3). Analysis of the data was firstly undertaken within the constructivist paradigm, reflected in the methods of analysis component of the analytical framework (Figure 4.1), framed using codes, categories and thematic analysis to cluster, organise and analyse the data. Several emergent themes were identified as outcomes of the analysis and used in a constructivist-based discussion of the analysed data and findings in Chapter 5.

Once this portion of the analysis was conducted, events as defined within a critical realist paradigm (see Chapter 3, Section 3.4.2.2) that emerged from the categories and thematic analysis were analysed within a critical realist framework using a tool titled ‘Investigative Worksheets’ (see Figure 4.2) in order to identify the structures, causal mechanisms and conditions that led to events arising from the research activities.

This chapter will now focus on the methods of analysis and explain how they were organised to draw meaning and conclusions from the data, through a process of data reduction (see section 4.3 of this chapter). A presentation and discussion regarding the research results and their analysis is addressed in Chapter 5.

4.2 Methods of analysis

The methods of analysis (see Figure 4.1) required the adoption of a systematic sequence of actions that would facilitate the organisation of data into a meaningful, scaffolded classification within which an analysis could be conducted. A simplified approach to such classifications is proposed by Dey (1993, p. 53), comprising the organisation of data that then undergoes the process of describing, classifying and connecting which leads to an account of the findings, all operating within an iterative spiral. Further investigation by the researcher established a limited breadth of literature on particular methodologies associated with qualitative analysis (Sandelowski & Barroso 2003; Vaismoradi, Turunen & Bondas 2013), triggering the need to construct a more substantial analytical framework to address the analytical objective (see Figure 4.1) and adoption of the research methodology described in Chapter 3.

The researcher sought to develop a transparent sequence within the design of an analytical framework that could incorporate a constructivist paradigm representing an in-depth insight of the phenomena, followed by the adoption of a critical realist paradigm that would provide 'transformative moves away from the data' (Sandelowski & Barroso 2003, p. 908) to interpretive explanations. To achieve this, the data was firstly organised around the research questions, then coded, categorised and themes drawn from it. Events were then drawn from the themes and analysed within a critical realist paradigm in a transformation towards an in-depth, interpretive explanation of the phenomenon. A synthesis of this approach is illustrated in Figure 4.1 and was applied using the analytical tool Thematic Conceptual Matrix (see Table 4.1). This matrix was separated across four worksheets, with each worksheet used for a separate suite of data derived from the data collection methods.

Matrixes are commonly used to assist in depicting how particular concepts and issues are related within various types of data (Goodrick and Rogers 2015) and are considered a substantial tool to illustrate themes and narratives that involve a significant level of complexity (Henderson et al. p. 56). The Thematic Conceptual Matrix was used to establish linkages between collected data and the phenomenology (see second column of Table 4.1), connecting the observations and narratives to themes that represent broader concepts aligned to the phenomenology.

The matrix was used as a framework to arrange and analyse phenomenology associated with the research questions. It was applied within a constructivist research paradigm while adopting the analytical elements of codes, categories, themes, significant statements and significant observations. The collated views and perspectives of the individual research participants, recorded across the three data collection methods, was analysed within the framework and a fourth worksheet used for the analysis of graphical recordings, being the hazard profiles recorded by research participants on a whiteboard or spreadsheet. The significant observations shown within the matrix were drawn from the researcher's own recorded observations and memoing within phase one of the data collection (see Chapter 3, Section 3.6.1) and supplemented by the graphical recordings. The layout of codes, consequent categories, themes, significant observations and nominated events are shown in the Thematic Conceptual Matrix (see Table 5.1) and explained further in section 4.3.2 of this chapter.

Individual components featured in the design of the Thematic Conceptual Matrix (Table 5.1) and their alignment to the Analytical framework (Figure 4.1) were utilised within a hermeneutic framework that focussed on coding, categorisation and theme building to make sense of the qualitative data. These components and their positioning within a hermeneutic

framework and the Thematic Conceptual Matrix will now be discussed as individual elements within this chapter.

4.3 Hermeneutic method of analysis

A hermeneutic method of analysis was selected for this project. A hermeneutic method is described by Goodrick and Rogers (2015) as an iterative process that seeks to identify and draw meanings and themes from data through a process of data reduction (Attride-Stirling 2001), using coding and categorisation of those meanings that are immediately visible and others that latently appear during the course of the analysis.

A hermeneutic method was particularly suited to this research, where data collected within a constructivist paradigm was immediately visible; for example, through interview transcripts, observation records and visual capture of hazard profiles created by the research participants. The appearance of previously latent categories and themes revealed events emerging from the data that could then be explored for causality within the framework of critical realism (see Figure 3.3), thereby adding a complementary and extended layer of analysis. The analysis of events sought to find the underlying triggers and causality that led to particular events that were discussed within the constructivist discourse.

A body of qualitative data derived from diverse sources required analysis and a framework for interpretation and assessment in the search for similarities, differences and themes. Hermeneutic methods involve a thematic analysis (Goodrick & Rogers 2015. p. 576) that requires a deductive approach, derived from a theoretical or conceptual framework and an inductive approach, which draws on empirical data collection and analysis (Creswell 2014, p. 186; Miles, Huberman & Saldana 2014, p 81). A deductive approach was firstly adopted to address phenomelogical foundations originating within the research questions, followed by an inductive approach that examined the empirical nature of the data found within the observations, interviews, focus groups and graphical recordings. This approach is exemplified in the Thematic Conceptual Matrix (see Table 4.1), which illustrates the design of each table within the matrix prior to the entry of research data.

Research data was classified and analysed within this matrix. Design of the matrix facilitated the employment of an iterative analysis, where notations and assessment associated with the data could be easily located, referenced to the research question and phenomenology and considered against the coding classifications, categories and emergent themes. A separate table was utilised for each data collection method (see Table 5.1), allowing a comparative triangulation of data between each table to identify common patterns across the data.

The use of memoing (see Chapter 3, Section 3.7.5) became a useful tool during the analysis. Notations made within the research instruments (see column 'Comments/Observations made by researcher to self' in Appendix 4, 5 and 6) were also used to analyse the recorded observations, interview responses and focus group discussions. Interactions recorded as internal notations by the researcher during each data collection event represented a record that also required consideration within the analytical methods, as they became part of the data record.

One feature of the matrix was a design that incorporated coded summaries of analysis for each phenomenological concept (i.e. not evident, partially evident and evident), collected or observed against each research participant in each SME. This provided a two-dimensional summary analysis of phenomenon against the collected evidence from which further analysis could be undertaken and easily examined through reflexive iteration.

Thematic analysis, a common type of analysis used with hermeneutic methods (Goodrick & Rogers 2015, p. 576) was employed as a component of the analysis. The emergence of themes was sought from the identification of relationships and connections of data in the codes and categories, and the formulation of propositions that support a theme. The researcher was required to move iteratively between the data sources, the coding of data, its classification into categories and resultant themes, and could do so due to the singular layout and design of the matrix. Thematic analysis is discussed further in Chapter 4, Section 4.3.3.

The determination of events arising from the utilisation of a constructivist paradigm (see Figure 5.1) was analysed using a critical realist approach to seek factors that could be linked with the causality of those events. The utilisation of a critical realist analysis as illustrated conceptually within the Paradigms Model (see Figure 3.3) extended the use of a hermeneutic method. This required the adoption of an iterative, retroductive process to review the data, its coding and categorisation in order to seek out the latent factors within the data that gave rise to particular events.

Retroduction (see Chapter 3, Section 3.4.2.2) is also a feature used within hermeneutic methods (Goodrick & Rogers 2015. p. 577) and was employed in both the constructivist framework and critical realism framework. Retroduction assisted in finding associations between the influences of various persons and their actions, in conjunction with the structures and mechanisms identified within each SME that contributed to the causality of events.

The use of an hermeneutic method of analysis required the establishment of an initial organisational framework from which the coding, categorisation and thematic analysis could be undertaken. To achieve this, the initial classification for assessment was made according to the research questions and associated phenomenology. This feature is found within the first portion of the Thematic Conceptual Matrix (see Table 4.1) and is discussed in the next section.

4.3.1 Organising data analysis around the research questions and phenomenology

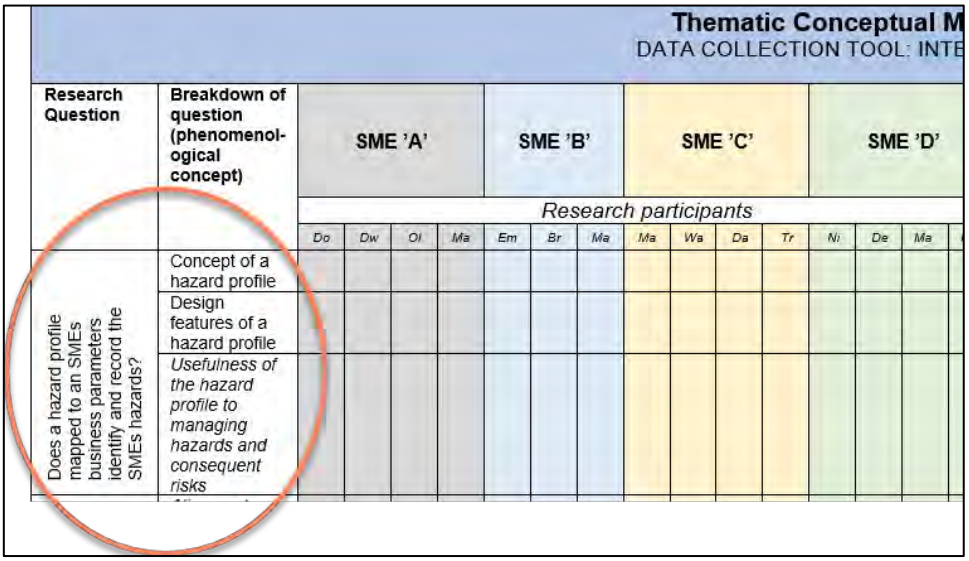
The phenomenology underpinning the research questions was drawn from the literature review (see Chapter 2) and was a key first step in determining what would comprise the coding structure within the analytical framework. The phenomenology associated with the two research questions (see Section 1.3) comprised the following conceptual phrases drawn from within the research variables and contextual factors (see Figure 1.1):

- the concept of a hazard profile
- potential design features of a hazard profile
- usefulness of the hazard profile for managing hazards and consequent risks
- alignment between the hazard profile and the SME's business contexts
- knowledge on the OHSMS and its use
- links between hazard profiling and the OHSMS
- visual mapping as a tool used in the creation of the profile
- reflective learning arising from the research activity.

Each item was assigned as a phenomenological concept. The process of incorporating this phenomena into the Thematic Conceptual Matrix began by stating the research question and then aligning each phenoenological concept to the relevant research question. This allowed the allocation of each individual phenomenon to its own position for analysis and the display of its source from within the research question. A sample of this is provided within the section highlighted in Table 4.1.

Once the initial phenomenological concepts were established, two coding frameworks were designed: one named a 'Code list' (see Table 4.2) and the other named 'Evidence coding' (see Table 4.5). The legends to both coding frameworks are provided within the Thematic Conceptual Matrix, providing a reference point that assisted the researcher to analyse and evaluate individual entries made in the matrix. Principles and practices underlying these coding schemes are discussed in the next section.

Table 4.1: Thematic conceptual matrix: Sample of alignment between phenomenological concepts and research questions



Thematic Conceptual M
DATA COLLECTION TOOL: INTE

Research Question	Breakdown of question (phenomenol-ogical concept)	SME 'A'				SME 'B'			SME 'C'				SME 'D'			
		Research participants														
		Do	Dw	Ol	Ma	Em	Br	Ma	Ma	Wa	Da	Tr	Ni	De	Ma	
Does a hazard profile mapped to an SMEs business parameters identify and record the SMEs hazards?	Concept of a hazard profile															
	Design features of a hazard profile															
	Usefulness of the hazard profile to managing hazards and consequent risks															

Source: Author, 2019.

4.3.2 Developing a coding scheme

A code is defined by Goodrick and Rogers (2015, p. 564) as 'a descriptive word or phrase that is intended to describe a fragment of data'. The coding of the data within this project assisted in the building of logical units of meaning that were aligned to the research phenomenology and contributed to an account of the analysis. Codes were developed and used to identify similar pieces of data that could be clustered, in order to establish initial patterns and reduce the overall volume of data to be analysed. This required the allocation of codes to the preliminary dissection of textual data, recorded observations and graphic hazard profiles.

Two approaches to coding were employed. Firstly, a coding list was developed and applied to the data for initial identification and further classification of the data. The code list was used to align parts of the data with a coding structure for further analysis, beginning with its use in the research instruments (see Table 4.3) and then within the Thematic Conceptual Matrix. The coding structure used within the Thematic Conceptual Matrix is summarised in Table 4.2, and its application can be viewed within the completed collation of data (see Table 5.1 Thematic Conceptual Matrix - Data collection obtained from research instruments). Secondly, an application titled by the researcher as 'evidence coding' (see Table 4.5) was used to provide a graduated evaluation of the data against the individual phenomenological concepts. These two approaches to coding are discussed in the following two sections.

4.3.2.1 Developing a code list for further analysis

The coding of qualitative data typically requires the use of both an inductive and deductive approach (Patton 2002; Bengtsson 2016). An assignable list of codes was developed using a deductive approach, and some additional codes drawn from the data using an inductive approach were included in a code list within the Thematic Conceptual Matrix (Table 5.1). A list of codes, as used within the matrix is provided in Table 4.2.

Table 4.2: Coding Structure - List of Codes, Categories, Themes and Events assigned to the Thematic Conceptual Matrix

CODING STRUCTURE - LIST OF CODES, CATEGORIES, THEMES AND EVENTS				
CODE LIST		**CATEGORIES**	**THEMES**	**EVENTS**
Deductive codes		Hazard profile Activities, Products, Services. People. Alternative categories for HP design Hazard identification and control Hazard-Risk association Element of OHSMS Systems knowledge dominated by key informant OHSMS Integration of safety Mapping of hazard profile to OHSMS Communication Collaboration Whiteboard Spreadsheet Obtaining implicit/unstated knowledge Breadth of hazards Alternative categories for HP design Availability of OHSMS Hazard profile alignment to the SME's business Allocation of tasks - development of profile Familiarity with OHSMS	*Hazard profile design* *Visual depiction* *Leadership by key informants* *Hazard identification* *Hazard control* *Integration of safety into the business* *Systems knowledge* *Categorisation* *Management systems use* *Inclusion of risk is a distractor* *Operational controls* *Tacit and explicit knowledge* *Strategic planning* *Interactive teamwork*	E 1 - HP. Creation on whiteboard. (SME A, B, C & D) E 2 - HP. Creation on spreadsheet. (SME B & D) E 3 - Link HP to legislation (SME 'A') E 4 - Use of HP to rectify hazards using a systems tool > Corrective actions register (SME 'B') E 5 - Spreadsheet discontinued during group design of HP (SME 'A') E 6 - New hazards iden ified - fatigue, fitness for work, vehicle journeys, communication by and limited experience of supervisors (SME 'A ' & 'B') E 7 - New main category (redesign of profile) to activities, services and people (SME 'B') E 8 - Entry of additional columns (SOP, Manual, Procedures, Doc) in spreadsheet to assist with mapping (SME 'B') E 9 - Linked procedures to hazard profile (SME 'B') E 10 - Planning of hazard communication me hods (SME 'A') E 11 - Toolbox talks introduced, regarding hazards and their management SME 'A') E 12 - OHSMS made available and used for HP (SME 'B') E 13 - OHSMS not used to create hazard profile (SME 'A', 'C' & 'D') E 14 - Additions made to hazard profile independently of researcher and research activities (SME 'B', 'C' & 'D')
HPC	Hazard profile concept			
HPDF	Hazard profile design features			
HPUS	Usefulness of hazard profile			
HPBC	Alignment of hazard profile to SME business contexts			
SMSKN	Knowledge of OHSMS			
SMSUSE	Use of OHSMS			
HPSMSLNK	Links between hazard profiling and the OHSMS			
VM4HP	Visual mapping as a tool for creating hazard profiles			
RL	Reflective learning arising from the research activity			
Inductive codes				
CA	Collaborative approach			
CS	Communication strategies			
NS	New strategies for development of hazard profile and links to OHSMS			
TK	Tacit knowledge			

Source: Author, 2019.

Firstly, an inductive approach was used to allocate codes against the collected data, a sample of which is supplied in Table 4.3. The codes were used to identify features within the data that could be classified at their most basic meaning and phenomena directly associated with the research questions was highlighted in yellow (see Table 4.3) for ease of identification during the analysis.

Table 4.3: Sample of coding list used within a research instrument

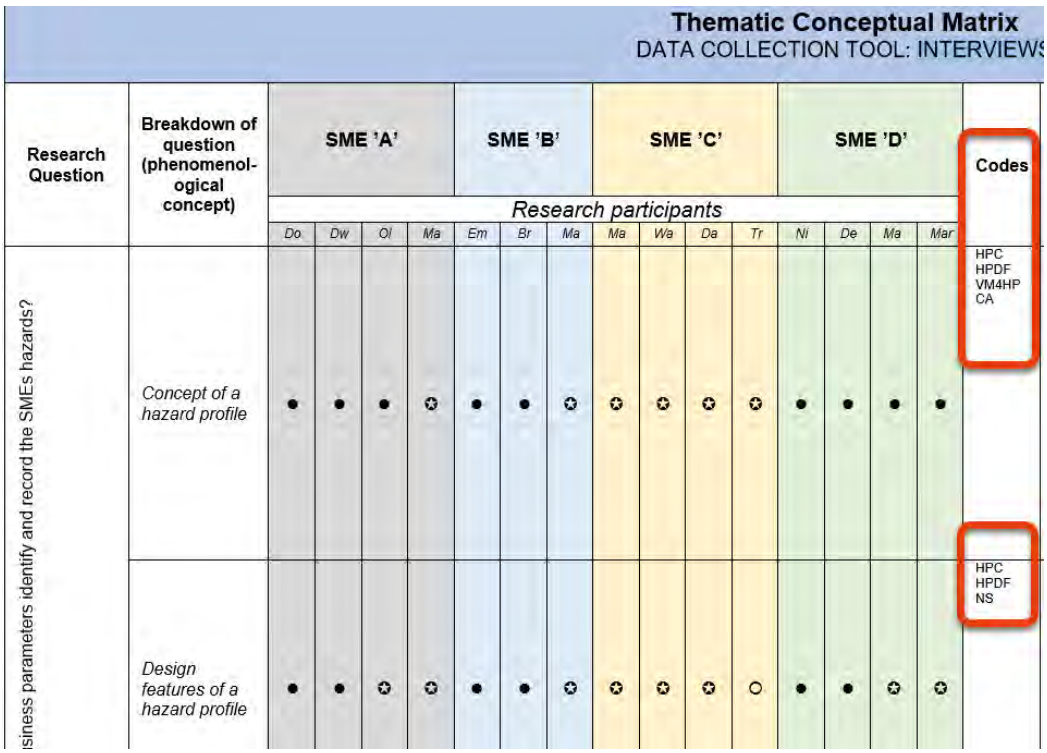
Please describe your thoughts on the hazard profiling exercises you had participated in. For example *(introduce each separately)* - The idea of a hazard profile itself, what it is and how it looks.	It was a good way to understand it and explain it to the others. **HPDF**	*Strategy provided opportunity to share with others*
- The use of visual mapping. What are your thoughts on using that as a way of creating the profile?	Yes it was good because it's visual. People see the piece of paper but it's hard to see. A lot of people are visual people. **VM4HP**	*Was able to communicate whiteboard entries with others*
- What are your thoughts on using a group approach to develop the profile? - What are your thoughts on the suitability of group participants for that task (based on who was in the group)?	Everybody has a different **HPUS** perspective on things. We hadn't covered all of the things we should have. They can see what's missing because they deal with it every day. **HPUS**	*Other ways needed to identify hazards* *Tacit knowledge*

Source: Author, 2019.

An inductive approach to coding followed, where additional codes were considered against data linked to the phenomenology. Codes were derived directly from the text associated with the data. The researcher had noted with much interest the need to nominate additional codes to those derived directly from the phenomenology. This indicated that an inductive approach was warranted as the research activities themselves had triggered additional factors such as collaborative approaches related to hazard profiling that were not factored into the research questions but arose within the collected data.

The code list facilitated a readily locatable reference point where one or more codes could be allocated to each phenomenological concept within the matrix (see Table 4.4) and against the collected data within the research instrument itself (see Table 4.3). Each code was allocated an acronym for ease of reference and facilitated a more expedient checking of data sources during the analysis as certain observations and recorded discourse required revisiting in order to confirm meanings and interpretation.

Table 4.4: Sample of initial coding used in the Thematic Conceptual Matrix



Thematic Conceptual Matrix
DATA COLLECTION TOOL: INTERVIEWS

Research Question	Breakdown of question (phenomenol-ogical concept)	SME 'A'				SME 'B'			SME 'C'				SME 'D'				Codes
		Research participants															
		Do	*Dw*	*Ol*	*Ma*	*Em*	*Br*	*Ma*	*Ma*	*Wa*	*Da*	*Tr*	*Ni*	*De*	*Ma*	*Mar*	
siness parameters identify and record the SMEs hazards?	*Concept of a hazard profile*	●	●	●	✪	●	●	✪	✪	✪	✪	✪	●	●	●	●	HPC HPDF VM4HP CA
	Design features of a hazard profile	●	●	✪	✪	●	●	✪	✪	✪	✪	○	●	●	✪	✪	HPC HPDF NS

Source: Author, 2019.

The data was collected as written accounts and transcriptions of significant observations, narrative accounts and also in the reflection of graphic hazard profiles that each SME constructed, making it possible to draw some interpretation of the results from a variety of sources and mediums. Features within the data used to align to a code included single words, quotations, observations and graphical features, being the entries made within a hazard profile. The coding assisted in establishing linkages to patterns and characteristics associated with the phenomenology, so further analysis could be undertaken with a contracted set of data.

4.3.2.2 Creation and use of evidence coding

One other type of coding undertaken at the commencement of the analysis involved the allocation of a graduated evaluation of the data against each of the phenomenological concepts. Used with each worksheet within the Thematic Conceptual Matrix, evidence coding was established to evaluate and display an initial determination of the level of congruence between the phenomenology and the data gathered from observations, verbal dialogue and graphical representations of the hazard profiles. This was compared against each research participant in each SME, providing a platform for further reflexive analysis.

The legend located within the matrix used symbols adapted from Henderson and Segal (2013, p. 66), displaying ‘not evident’, ‘partially evident’ and ‘evident’. This provided a simple coding structure accompanied by coding descriptors that could be identified for further analysis (see Table 4.5). The design of the matrix offered the potential for collectively evaluating the level of correspondence and connection with the phenomena when analysing data associated with observations and graphical recordings, and from each research participant when analysing data obtained from the interviews and focus group discussions. This approach provided an initial indication of the interest, acknowledgement and understanding of the phenomena relative to the data collection method used.

The use of evidence coding within the Thematic Conceptual Matrix is shown as an extract in Table 4.5, where phenomena were itemised against the relevant research question, and an evaluation recorded using the coding located within the evidence coding legend. The legend contains symbols that visually indicate the frequency of evidence for each phenomenon relative to the research instrument used. This coding process assisted in the depiction of a graduated indication of the collected data in terms of its purposive congruence with the phenomenology and research instrument but was not intended nor used to depict representative frequency counts of the entire number of research participants.

Table 4.5: Evidence coding assigned to the Thematic Conceptual Matrix (excerpt of legend and sample of coding)

		Thema DATA COLL									
Research Question	**Breakdown of question (phenomenol-ogical concept)**	**SME ’A’**				**SME ’B’**			**SME ’C’**		
		Research participants									
		Do	*Dw*	*Ol*	*Ma*	*Em*	*Br*	*Ma*	*Ma*	*Wa*	*Da*
s business parameters identify and record the s hazards?	Concept of a hazard profile	●	●	●	✪	●	●	✪	✪	✪	✪
	Design features of a hazard profile	●	●	✪	✪	●	●	✪	✪	✪	✪

Legend: Evidence coding		
○ Not evident Not evident (absence of notable event/comment that element is present)	✪ Partially evident Partially evident (at least one notable event/comment)	● Evident Evident (two or more notable events/comments)

Source: Author, 2019.

The use of coding in the analysis assisted in the organisation of raw data to a conceptual level where it could be analysed further. From this point, the methods of analysis required further refinement beyond the codes in order to draw greater meaning from the data and identify themes arising from the research.

4.3.3 A constructivist analytical framework: categories, themes and thematic analysis

Data reviewed within the codes was organised into categories. A category can represent 'a collection of codes that relate to the same issue, topic, or feature in the data' (Goodrick & Rogers 2015, p. 564). The creation of categories from the initial codes facilitated the identification of relationships between features within the data and assisted in bringing together different concepts at a higher level of abstraction. Categorisation was undertaken in a similar way to the coding, where collected data was noted accordingly in the Thematic Conceptual Matrix and also labelled within the research instrument (see Table 4.6). The categories were generated inductively by examining the text statements taken from observations, interviews, focus groups and graphical recordings such as the constructed hazard profiles.

4.3.3.1 The development of categories

Categories were sought where different concepts could be integrated, so that several properties characterised the category. Electronic review notes were added to transcripts of collected data as notations and a reference point for categories, and summaries of these were entered within the respective column in the Thematic Conceptual Matrix (see Table 4.6).

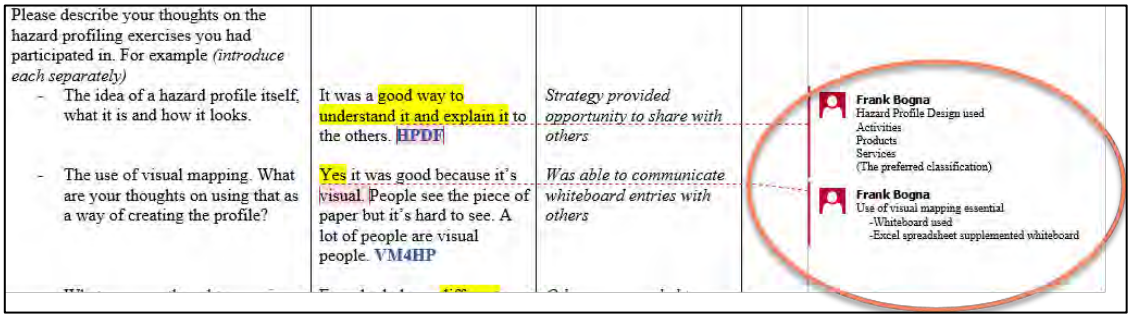
The creation of categories provided a logical sequence from the initial coding of collected data for its classification and organisation into themes. The categories were not a replication of the coding, but rather a summation and extension of the initial coding used to illustrate and explain properties within the codes.

The establishment of categories provided the foundation for themes, which were used as a final classification within the constructivist paradigm to identify the emergence of patterns and events that could be described within that paradigm, and then examined for causality within a critical realist paradigm. This process elicited substantial meaning from the collected data and provided a foundation for explaining realistic findings relevant to the phenomenology and research questions.

Table 4.6: Sample of categories marked in research instrument and matrix

Thematic Conceptual Matrix
DATA COLLECTION TOOL: INTERVIEWS

Research Question	Breakdown of question (phenomenol-ogical concept)	SME 'A'				SME 'B'			SME 'C'				SME 'D'				Codes	Categories
		Research participants																
		Do	Dw	Ol	Ma	Em	Br	Ma	Ma	Wa	Da	Tr	Ni	De	Ma	Mar		
MEs business parameters identify and record the SMEs hazards?	*Concept of a hazard profile*	●	●	●	✪	●	●	✪	✪	✪	✪	✪	●	●	●	●	HPC HPDF VM4HP CA	Hazard profile (activities, products, services) Key informants acknowledge HP Hazard-Risk association Alternative categories for HP design - Activities, People (Products) Services.
	Design features of a hazard profile	●	●	✪	✪	●	●	✪	✪	✪	✪	○	●	●	✪	✪	HPC HPDF NS	Spreadsheet Activities, Products, Services, People. Hazard-Risk association Alternative categories for HP design



Source: Author, 2019.

4.3.3.2 The development of themes and thematic analysis

Themes were used within the research analysis to lead from data groupings within particular codes and categories to the next phase of analysis, where broader ideas and concepts could be interpreted from the data in relation to the research questions and associated phenomenon that had occurred. Themes are described as an interpretive integration of different sets of data that comprise the research findings (Sandelowski & Barroso 2003; Vaismoradi, Turunen & Bondas 2013) and represent the interpreted patterns and meaning that the researcher draws from the data in relation to the research question (Braun & Clarke 2006, p. 88). The development of themes requires an explanation of how they are developed (Sandelowski & Barroso 2003, p. 217) in order to provide clarity and transparency regarding their creation and use.

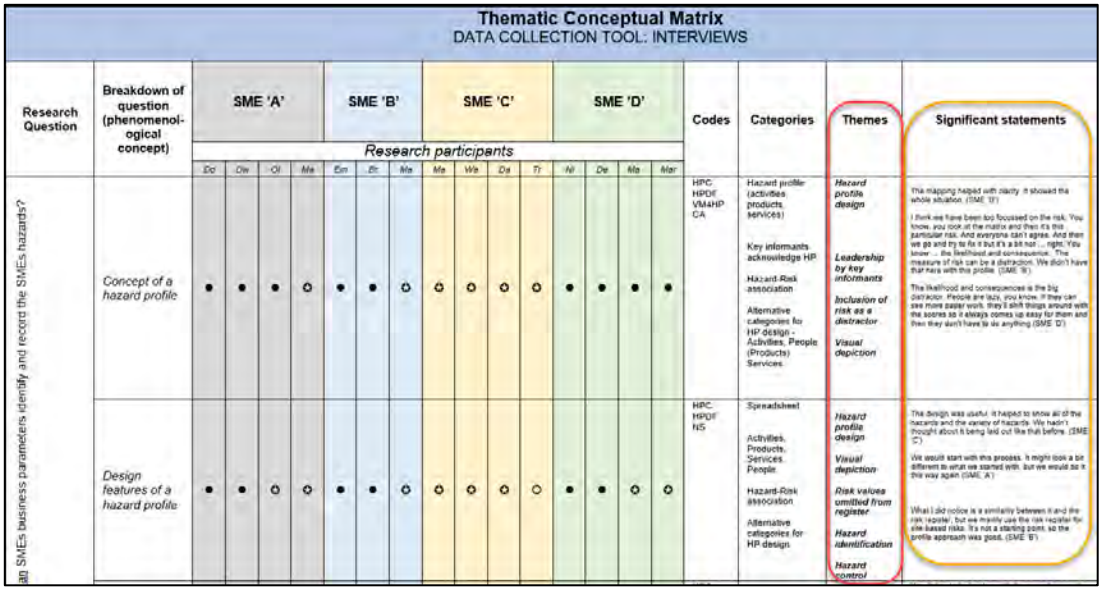
The themes and accompanying significant statements and observations presented in the Thematic Conceptual Matrix (see Table 4.7) were the culmination of integrated sets of data arising from the codes and categories and informed by the phenomenology contained within the research questions and associated research instruments, a sample of which is provided in Table 4.7. Themes were expressed as titles, short statements and descriptions to reflect unifying patterns and meaning within the data at a more developed, cumulative level of analysis than that presented within the codes and categories. A summary list of all identified themes is listed in Table 4.2.

Thematic analysis is a method used for 'identifying, analysing and reporting patterns (themes) within data' (Braun & Clarke 2006, p. 79). This analytical approach was used to determine appropriate and relevant themes, by reflecting on associations and patterns in the data, both inductively and deductively within the Thematic Conceptual Matrix. The adoption of a thematic analysis required the search for themes from within the coding and categories, and across the data collected.

A search was conducted for repeated patterns of data linked to the research questions and underlying phenomenology. The researcher found that within the thematic qualitative text analysis, one text passage at times could be aligned to different phenomena and classifications. Therefore, some text passages within the data were assigned multiple codes, categories and more than one theme. Some of the identified phenomena appeared within different research instruments, thereby generating the triangulation of some data (see Chapter 4, Section 4.4).

Each theme is discussed in detail in Chapter 5 in relation to the research results. This formed the final part of the initial analysis of the data using a constructivist approach. The allocated themes were accompanied by significant statements and observations taken from narratives recorded with various research participants. The component titled 'narrative accounts of data' within the Analytical framework (Figure 4.1) was mobilised within the Thematic Conceptual Matrix as significant statements (see Table 4.7) and significant observations for the data collection tools of observations and graphical recordings to support the allocation of themes. Selected statements arising from the interviews and focus group phases of data collection were included to illustrate and support the associated themes and their narratives analysed within the next chapter (see Chapter 5, Section 5.2.1). Significant statements were drawn from excerpts recorded in interviews and focus group discussions. Descriptive narrative accounts of the data assisted in providing clarity and utility to the analysis.

Table 4.7: Sample of themes and significant statements and observations in matrix



Thematic Conceptual Matrix
DATA COLLECTION TOOL: INTERVIEWS

Research Question	Breakdown of question (phenomenol-ogical concept)	SME 'A'				SME 'B'			SME 'C'				SME 'D'				Codes	Categories	Themes	Significant statements
		Research participants																		
		Dc	Dw	Ol	Me	Em	Et	Ma	Ma	Wa	Da	Ti	Ni	De	Ma	Mar				
an SMEs business parameters identify and record the SMEs hazards?	*Concept of a hazard profile*	•	•	•	o	•	•	o	o	o	o	o	•	•	•	•	HPC HPDF VM4HP CA	Hazard profile (activities, products, services) Key informants acknowledge HP Hazard-Risk association Alternative categories for HP design - Activities, People (Products) Services	***Hazard profile design*** ***Leadership by key informants*** ***Inclusion of risk as a distractor*** ***Visual depiction***	This mapping helped with clarity. It showed the whole situation. (SME 'D') I think we have been too focussed on the risk. You know, you look at the matrix and then it's this particular risk. And everyone can't agree. And then we go and try to fix it but it's a bit not ... right. You know ... the likelihood and consequence. The measure of risk can be a distraction. We didn't have that here with this profile. (SME 'B') The likelihood and consequences is the big distractor. People are lazy, you know. If they can see more paper work, they'll shift things around with the scores so it always comes up easy for them and then they don't have to do anything (SME 'D')
	Design features of a hazard profile	•	•	o	o	•	•	o	o	o	o	o	•	•	o	o	HPC HPDF N5	Spreadsheet Activities, Products, Services, People Hazard-Risk association Alternative categories for HP design	***Hazard profile design*** ***Visual depiction*** ***Risk values omitted from register*** ***Hazard identification*** ***Hazard control***	The design was useful. It helped to know all of the hazards and the variety of hazards. We hadn't thought about it being laid out like that before. (SME 'C') We would start with this process. It might look a bit different to what we started with, but we would do it this way again (SME 'A') What I did notice is a similarity between it and the risk register, but we mainly use the risk register for risk based risks. It's not a starting point, so the profile approach was good. (SME 'B')

Source: Author, 2019.

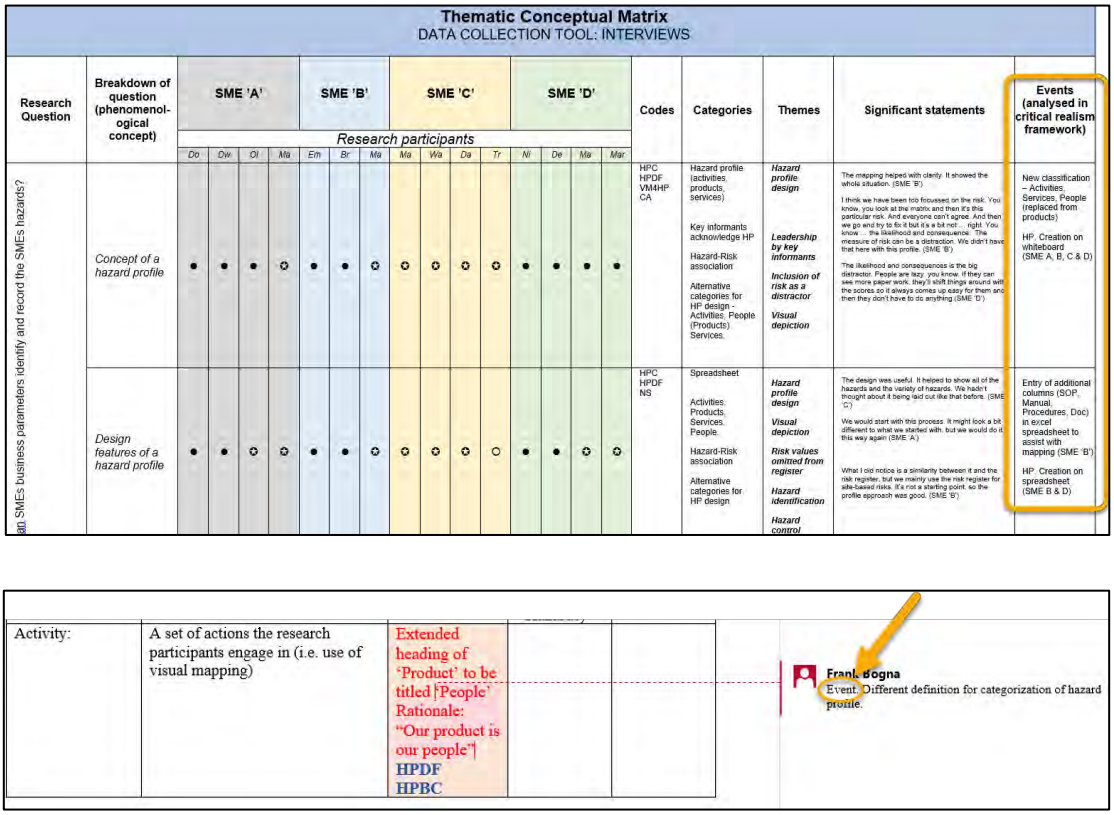
The actions of ordering and analysing data obtained from the research instruments was firstly conducted within a constructivist research paradigm, bound by an initial approach incorporating the coding and categorising of data, and organisation of themes that could represent broad concepts aligned to the phenomenology. The analysis to this point could provide substantial material in relation to the world views and multiple realities of research participants reflected within the data.

However, events as defined within a critical realism paradigm (see Chapter 3, Section 3.4.2.2) arising from the research activities were not readily explained within a constructivist paradigm and required further analysis to determine their causation. These events, identified within the column titled ‘events’ in the Thematic Conceptual Matrix, were able to be explored for their causality within a critical realism framework as the final portion of the analysis.

4.3.4 Identification and analysis of events using a critical realism framework

Within the context of critical realism, an event is defined as an occurrence or action arising from a mechanism (see Chapter 3, Section 3.4.2.2). Events were firstly identified within the research instruments and then recorded in the Thematic Conceptual Matrix after the process of coding, categorisation and the allocation of themes was undertaken (see Table 4.8). Some significant statements recorded within the matrix also provided a reference point for the occurrence of events.

Table 4.8: Sample of events listed in the matrix and their identification within a research instrument



Thematic Conceptual Matrix
DATA COLLECTION TOOL: INTERVIEWS

Research Question	Breakdown of question (phenomenol-ogical concept)	SME 'A'				SME 'B'			SME 'C'				SME 'D'				Codes	Categories	Themes	Significant statements	Events (analysed in critical realism framework)
		Research participants																			
		Do	Dw	Ol	Ma	Em	Br	Ma	Ma	Wa	Da	Tr	Ni	De	Ma	Mar					
an SMEs business parameters identify and record the SMEs hazards?	*Concept of a hazard profile*	●	●	●	✪	●	●	✪	✪	✪	✪	✪	●	●	●	●	HPC HPDF VMHHP CA	Hazard profile (activities, products, services) Key informants acknowledge HP Hazard-Risk association Alternative categories for HP design - Activities, People (Products), Services.	***Hazard profile design*** ***Leadership by key informants*** ***Inclusion of risk as a distractor*** ***Visual depiction***	The mapping helped with clarity. It showed the whole situation. (SME 'B') I think we have been too focussed on the risk. You know, you look at the matrix and then it's this particular risk. And everyone can't agree. And then we go and try to fix it but it's a bit not ... right. You know ... the likelihood and consequence. The measure of risk can be a distraction. We didn't have that here with this profile. (SME 'B') The likelihood and consequences is the big distractor. People are lazy, you know. If they can see more paper work, they'll shift things around with the scores so it always comes up easy for them and then they don't have to do anything (SME 'D')	New classification – Activities, Services, People (replaced from products) HP. Creation on whiteboard (SME A, B, C & D)
	Design features of a hazard profile	●	●	✪	✪	●	●	✪	✪	✪	✪	○	●	●	✪	✪	HPC HPDF NS	Spreadsheet Activities, Products, Services, People. Hazard-Risk association Alternative categories for HP design	***Hazard profile design*** ***Visual depiction*** ***Risk values omitted from register*** ***Hazard identification*** ***Hazard control***	The design was useful. It helped to show all of the hazards and the variety of hazards. We hadn't thought about it being laid out like that before. (SME 'C') We would start with this process. It might look a bit different to what we started with, but we would do it this way again (SME A) What I did notice is a similarity between it and the risk register, but we mainly use the risk register for site-based risks. It's not a starting point, so the profile approach was good. (SME 'B')	Entry of additional columns (SOP, Manual, Procedures, Doc) in excel spreadsheet to assist with mapping (SME 'B') HP. Creation on spreadsheet (SME B & D)

Activity:	A set of actions the research participants engage in (i.e. use of visual mapping)	Extended heading of 'Product' to be titled 'People' Rationale: "Our product is our people" HPDF HPBC		

Frank Bogna
Event. Different definition for categorization of hazard profile.

Source: Author, 2019.

Each event was drawn from the Thematic Conceptual Matrix and analysed individually in order to identify and understand the underlying mechanisms connecting the structures within the SME to various mechanisms and conditions that were present, thereby allowing the event to occur. The technique used for this analysis incorporated the components within the paradigm of critical realism, as depicted in the Paradigms Model theoretical framework (see Figure 3.3). A chart titled 'Events: Investigative Worksheet' (see Figure 4.2) was designed, drawing on elements from the Paradigms Model featuring structures, mechanisms, conditions and the resultant event as the units within which each event was analysed.

Evidence collected within the research instruments was examined with each event and checked for newly emerging mechanisms and recurring mechanisms using the processes of retroduction and retrodiction (see Chapter 3, Section 3.4.2.2). This required the researcher to check forwards and backwards with the data to confirm the presence of the structure, mechanism or condition. The inclusion of 'definitions and prompts' within the worksheet assisted in maintaining a consistent use of definitions and interpretation with this process, and also in validating the data against its allocation within the elements located in the Investigative Worksheet.

Entries reflecting structures and mechanisms were connected by lines in a similar manner to that adopted by Sayer (1992), in order to identify links between structures and events. However, this approach was extended further than what is depicted in the Paradigms Model (see Figure 3.3), by including the assigning of the conditions (see Chapter 3, Section 3.4.2.2) and their linkage to the mechanisms and resultant event. The detailing of conditions is advocated by Sayer (1992, p. 212), but only where one condition leads to one event. The researcher used an alternative approach, finding that more than one condition could be linked to an event, and that some conditions were more closely linked to other proximal conditions rather than the event (see Figure 4.2). This demonstrated clearer pathways of emergence and causation due to defined linkages between structures, mechanisms, conditions and the event.

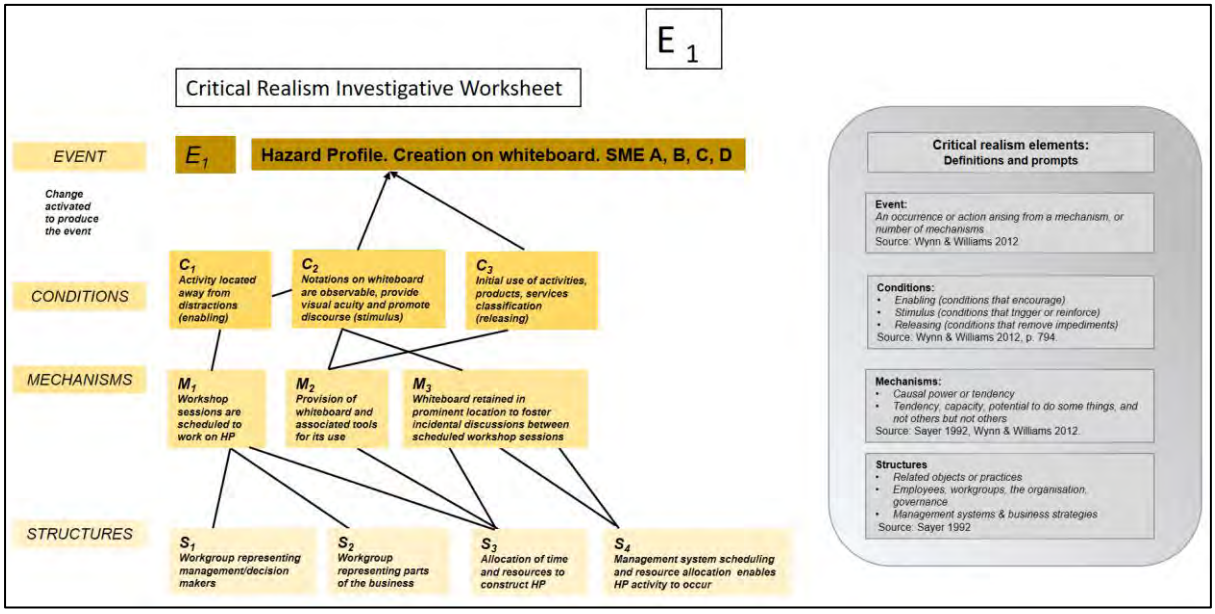


Figure 4.2: Sample of Critical Realism Investigative Worksheet
Source: Author, 2019.

Fourteen events were identified during this process, for which each Investigative Worksheet is presented in Figure 5.1. A summary table (see Table 5.2) drawn from these was used as an additional record, containing entries logged for the structures, mechanisms and conditions for each event and is presented concurrently with the series of investigative worksheets (see Figure 5.1). This table provided a reference point for the researcher to identify patterns that emerged from events experienced by one or a number of SMEs, thereby assisting in establishing causal relationships arising from different triggers located within the critical realism framework.

4.4 Validating the analysis

The hermeneutic method of analysis adopted for this project sought to organise the data to elicit and draw meanings using both constructivist and critical realist research paradigms, in order to establish decisive explanations about the data and its implicit significance in relation to the research questions. The analytical methods used across the two paradigms and the adoption of both a deductive and inductive approach required the detailing of interpretive strategies. Such strategies should be both visible and auditable (Gale et al. 2013; Miles & Huberman, 2014). Visibility has been addressed in sections 4.1 to 4.3 of this chapter. Auditable criteria was applied to the analysis in order to establish its sufficiency and validity.

The initial level of auditability for the analysis undertaken within this research was applied by referring to the Analytical framework (see Figure 4.1), to ensure that each element within the framework was addressed at the relevant juncture itemised in the matrix. This was a useful but superficial method for validating the analysis.

The auditability of the analysis resided more broadly within measures incorporating the validity, reliability, and generalisability of the analytical process (Huberman & Miles 1998; Strauss & Corbin 1998). In relation to the criteria associated with validity, this would require a determination of the appropriateness of the research instruments, processes and collected data. The reliability of the analysis would seek consideration for the replicability of the processes of analysis. The generalizability of the analysis would require consideration for how this study might be articulated against other present or future studies containing ‘similarities between the time, place, people and other social contexts’ (Leung 2015, p. 324).

Some caution needed to be exercised in the adoption of specific criteria in order to avoid what Johnson et al. (2006, p.146) describe as the limitation of using ‘one set of all-embracing, indisputable, regulative standards to interrogate and methodically police qualitative management research’. A synthesis of recently developed frameworks proposed by Gale et al. (2013) and Goodrick and Rogers (2015) was adopted, incorporating the principles of validity, reliability, and generalisability (see Table 4.9). The selected evaluation criteria identified how particular elements of the methodological principles (Chapter 3, Figure 3.1) and analytical methods (Chapter 4, Figure 4.1) were applied within the analysis.

The criteria also required the adoption of relevance to the study, to ‘enable detection of findings/phenomena in the appropriate context for it to be valid’ (Leung 2015, p. 325). The context of the study was adopted within the specified criteria detailed in Table 4.9, within the column titled ‘Audit criteria title/statement’ or the consecutive column titled ‘Analysis principles’.

Table 4.9: Audit criteria and supporting evidence used to determine the validity of the analysis

Audit criteria and supporting evidence used to determine the validity of the analysis		
Audit criteria title/statement	**Analysis principles**	**Supporting evidence**
Utility	Data analysis decisions are fit for purpose and relevant to the research questions.	Data analysis methods identified before data collection begins. Data analysis decisions reviewed throughout the period of analysis. Research questions stated and aligned in the Thematic Conceptual Matrix. Explicit requirements stated for each type of analysis (research paradigm) – collated in the Thematic Conceptual Matrix and Investigative Worksheets.
Accuracy	Analysis process is rigorous and transparent.	Hermeneutic method of analysis adopted with explanatory approach following an analytical framework. Use of reflexivity and triangulation.
Feasibility	Analysis method is realistic for analytic objective, resources, and periods.	Analysis commenced after data collection phase. Resources and periods allocated in research project plan spanning 36 months.
Propriety	Analysis processes protects the rights of participants.	Collection of data not commenced until ethics approval obtained. Research participants signed 'Consent Form', which detailed the preservation of anonymity and maintenance of confidentiality.
Accountability	Analysis process is documented and linkages between data, analysis, interpretation, and reporting is explicit.	Use of Thematic Conceptual Matrix, Investigative Worksheets and explanation of analytical process in Chapter 4 (sections 4.1 – 4.3).
Summary of data during charting	Data reduction practices employed to reduce need to revisit all transcripts.	Use of coding, categorisation, themes and events employed to reduce volume of data and identify underlying patterns.
Data is kept in the wider context	Data arising from different research instruments is visible	Data is reduced and shown within the Thematic Conceptual Matrix and Investigative Worksheets. Inclusion of significant statements support data shown in the wider context.
Data presentation is straightforward	Identification of data can be easily identified.	Data summaries presented in Table 5.1, 5.2 and Figure 5.1. Facilitates recognition of patterns in the data.

Systematic procedure for analysis	Facilitates ease of comprehension	Explanation of process in Chapter 4 (sections 4.1 – 4.3).
Ability to accept deductive data	Data not directly part of the research instruments can be included	Deductive data included in all research instruments.
Ease of identifying data extracts	Allows for checking of inductive and deductive data, including the use of retroduction and retrodiction.	Research instruments coded with initial codes, highlighting of data and identification of events. Some data extracts transposed into Thematic Conceptual Matrix (significant statements).
Clear audit trail from raw data to final themes and events	Allows clear paths to examine, particularly when using reflexive analysis.	Trail can be followed through explanation of analytical process in Chapter 4 (sections 4.1 – 4.3). Data summaries presented in Table 5.1, 5.2 and Figure 5.1.

Source: Adapted from Gale et al. (2013, p. 6) and Goodrick & Rogers (2015, p. 592)

During the analysis, Table 4.9 was adopted as a reference point to apply reflexive consideration for associations between the collected data, its classification and analysis within the Thematic Conceptual Matrix (see Table 5.1) and the Investigative Worksheets (see Table 5.2). This would ultimately provide a basis to strengthen the rigor of assertions and associations made between the data and its links to the phenomenology, and to provide transparency in the analytical process.

4.5 Summary

This chapter has outlined the methods of analysis used for this research project and its integration with the research questions. The use of both a constructivist and critical realist research paradigm required ordering of the analysis into distinct phases (see Figure 4.1). A hermeneutic method of analysis was used to firstly identify and draw significance from the data by adopting a constructivist approach using coding, and the consequent classification of the data by categories and themes, culminating in a thematic analysis.

The identified events arising from the data were then examined through a process of causal analysis, utilising core principles of the critical realism paradigm through the construct of Investigative Worksheets. The following chapter presents the research results from applying a constructivist paradigm and critical realist paradigm, and then provides a synthesis of findings, and answers the research questions.

5 Research results and discussion

This chapter presents and discusses the results of data collected within this research project. The chapter answers the research questions (see Figure 1.1), through the lens of both a constructivist and critical realist paradigm.

The chapter is organised into five main sections. Firstly, the triangulation of data is discussed regarding the intersection points that emerged from the data within the research instruments. Data recorded within the research instruments uncovered several related aspects of empirical reality, each contributing to the reliability of the data by strengthening confidence in the conclusions drawn from the research.

Secondly, results of the constructivist analysis are drawn from the data collected in the Thematic Conceptual Matrix (see Table 5.1 in Section 5.2) and presented according to the identified themes. The data is also supported by significant statements, extracted as excerpts from communications provided by research participants during the interviews and focus group activities. Themes within the matrix connect the observations and narratives to the phenomenology and research questions.

Thirdly, the results of the events as analysed using a critical realism paradigm are detailed within the Investigative Worksheets (see Figure 5.1 in Section 5.3). Immediately preceding the Investigative Worksheets, each event is summarised in Table 5.2 in Section 5.3, by detailing the underlying structures, causal mechanisms and emergent conditions and discussed in relation to its causality by examining the triggers that activated a change.

Fourthly, analysis arising from the constructivist and critical realist paradigms is examined for correlations and junctures, thereby validating the use of the two research paradigms in the one study. A synthesis of the discourse and consequent individual realities identified within the constructivist paradigm is presented, coupled with an explanation of events that occurred in unison with and supporting those realities. The merging of findings from the two paradigms was essential to providing a deeper explanation of what had occurred within the research activities, and why it had occurred.

Finally, the research questions and associated phenomenological concepts are answered against both the constructivist and critical realist paradigm, within the framework of the research phenomenology.

5.1 The triangulation of data

The triangulation of data sources collected through the data collection tools of observation, interviews, focus groups and graphical recordings (see Table 5.1) was collated in the Thematic Conceptual Matrix. The organisation of the phenomenological concepts was retained in the same manner within each table, providing a consistent basis from which the codes, categories and themes could be compared for similarities and consistency across each data collection tool represented by individual tables within the matrix.

Soon after the commencement of the data collection, a preliminary analysis revealed a definitive triangulation of data sources. Several consistent patterns emerged where the same coding, categories and themes appeared across different data collection tools as aligned against the phenomenological concepts. The data collection methods and graphical recordings indicated a considerable degree of homogeneity for certain phenomenological concepts. This increased the credibility and dependability of the data, countering the potential that one single data source could distort the data and suggest bias in the results.

A continual reflection of the transcripts offered some emergent patterns; for example, where dialogue recorded within the observations reappeared in similar ways within an interview or focus group discussion. Data collection methods also highlighted different aspects of the empirical reality offered by research participants.

The epistemology associated with this research was not considered foundationalist, where there was a necessity for the ultimate grounding of claims and correlations between the research questions and the knowledge associated with it. Inconsistencies found across data and collection methods are offered as opportunities for further research into the relationship between the data collection methods, the phenomenological inquiry and analysis of business practices within SMEs.

5.2 Results of the constructivist analysis

The analysis of data collected through observations, interviews, focus groups and graphical recordings in this section is presented according to the identified themes in the Thematic Conceptual Matrix (see Table 5.1).

5.2.1 Thematic Analysis

The construction of a hazard profile as undertaken by research participants within each SME was characterised and influenced by many factors associated with the phenomenology, challenging the researcher to identify and classify items of data into meaningful segments and divisions. Further challenges emerged with the recognition of multiple realities and the

researcher's obligation to convey research participants' viewpoints that characterise the environment and context within which they were collected.

The use of codes and categories within the Thematic Conceptual Matrix (Table 5.1) assisted in determining initial meaning that could be attached to the data. The decision to name a theme was made through a reflexive process involving comparisons between the phenomenological concepts, coding, categories and discourse, some of which was noted as significant statements in Table 5.1. Several inductive codes emerging due to the researcher's interaction with the data and consequent identification of additional codes relevant to the phenomenological concepts are not allocated separate discussion, since it is the subsequent themes that are being examined within this analysis. However, the emergence of inductive codes and their significance is discussed at relevant junctures in this chapter.

Each theme is discussed in the next subsection and represents a broad concept aligned to the phenomenology. An overall summary of key findings associated with each theme is supported by actions that were observed, significant statements made by research participants and the identified junctions that support the phenomenology or identify a point of departure from it.

The research data is collated and summarised within Table 5.1; however, this data does not represent one point in time. The research activities had extended over several weeks within each SME, identified as phases (see Table 3.3 Data collection methods and schedule) resulting in an accumulation of knowledge and experience with the research participants in each SME over the duration of the three data collection phases.

5.2.1.1 Hazard profile design

Each SME was offered an initial structure from which to commence the design of a hazard profile, based on the classification framework of activities, products and services as provided in several standards relating to the establishment and implementation of OHSMS (Standards Australia 2001a; BSI 2007; AS/NZS ISO 2018). Research participants within each SME were advised during the first session that the adoption of such a classification was a suggestion that could be modified, should participants identify a more suitable classification system.

Research participants in all four SMEs decided to retain the adoption of activities, products and services as a preferred classification framework, and the evidence coding entries aligned to this theme support a general acceptance of its usefulness. Each SME also decided to share the design of the hazard profile visually by utilising a whiteboard (see section 5.2.1.10). One participant had noted in an interview:

> ‘The design was useful. It helped to show all of the hazards and the variety of hazards. We hadn’t thought about it being laid out like that before.’ (SME C)

Another participant had expressed a similar opinion in a focus group discussion.

> ‘It was a mindset previously, where we had a structure but we might have missed some things’.
>
> ‘Yeah, the whiteboard was a trigger. It made us think about what the managers have to use’ (SME A)

The classification of hazard entries for one organisation (SME C) did present some challenges for the research participants in establishing a clear delineation between activities, products & services. However, it was acknowledged by the research participants that their organisation had no OHSMS developed of their own design. A lack of clarity regarding the design of an OHSMS may have contributed to the uncertainty over the design of the hazard profile within that SME.

5.2.1.2 Categorisation

The classification of activities, products and services was noted as useful for two of the four SMEs, where entries could be made for hazards across all three categories. However, two SMEs were not able to include hazard groups under the classification of ‘products’, since their core business of labour hire and road transport did not generate products within the scope of the business.

As an alternative, research participants within the SME providing labour hire determined that a reorganisation of categories was required to accommodate several concerns relating to its workforce. A category of ‘People’ was created to replace ‘Products’, with the key informant stating in the focus group activity:

> ‘Our products are our people’. (SME B)

Entries for hazards under this classification were predominantly made under a broad heading termed human factors by research participants, but more succinctly identified as sociotechnical factors (see Chapter 1, Section 1.4.2) and included fatigue related issues and inadequate supervision, leading to the identification of symptomatic behaviours associated with unacceptable hazard exposures. This action exemplifies the ability of an organisation to mould its hazard profile classification structure to suit its scope of business and include the factors it identifies as important to its own business context and social construct of reality.

5.2.1.3 Hazard identification

Research participants provided affirmative responses regarding the ability of a hazard profile to identify and record known and unforeseen hazards. Within three of the four SME's, a positive correlation between the research activity and its facilitation of hazard identification was expressed during interviews, and again during the focus group discussions. However, responses to baseline questions (see Appendix 7) regarding the phenomenological concepts associated with the research questions conducted at the commencement and conclusion of the data collection phases showed no discernible difference in the responses, potentially due to the provision of collective responses rather than the administration of individual responses.

The activity and benefits of hazard identification arising from the construct of a hazard profile were more acutely acknowledged by a company director within one of the SMEs, reflecting an acknowledgement that the activity of hazard profiling was a useful exercise to identify previously unforeseen hazards.

> 'For a small business we have a lot of exposure. It came out of nowhere. It wasn't something I was expecting'. (SME D)

In association with the decision to adopt a different classification of 'People' to replace 'Products', the key informant for the SME identified below summarised a benefit of hazard identification for the SME within the focus group activity.

> 'It showed us a lot in the people space. We haven't captured that before, you know the things to do with our people. The supervisor space. Leading on from that, you know we saw issues there with fatigue management, vehicles and supervisor training'. (SME B)

Each SME had identified new hazards not previously recorded within its OHSMS. A constructivist-based analysis indicated that the contributors to the identification of new hazards arose from the tacit knowledge shared within the group activities in the construction of the hazard profile. However, other mechanisms and structures contributed to this, as identified within the critical realist analysis (see Chapter 5, Section 5.3.1.2 Identification of hazards).

5.2.1.4 Hazard control

Required hazard control strategies arising from the identification of hazards with the hazard profile, as observed within the focus group discussions and graphical hazard profile recordings, was a logical and instinctive consequence that follows the risk management process (ISO 2018), where hazard identification is a preliminary step prior to the establishment of risk control. Research participants expressed a logical desire to mitigate

and control the hazards nominated within the hazard profile, and voluntarily reported the presence or absence of various control strategies independent of any prompt contained within the research instruments.

However, the adoption of hazard control strategies for unmitigated hazards was not shared with the same urgency and necessity by each SME. The research data demonstrated some latitude in the consequent actions that research participants may seek to adopt or defer for an identified hazard. One SME had decided to set aside the hazard profile to serve as a record of having identified hazards that might be reviewed on an infrequent basis, implying that the recordings made within the hazard profile may be sufficient.

> 'We won't look at it all the time. We might come back to it in 12 months and see what has changed or need [sic] to be reviewed.' (SME A)

Conversely, another research participant in a different SME shared a need to develop actions arising from the hazard profiling activity, particularly since gaps were identified between the OHSMS planning and the implemented controls.

> 'I thought it would map out the hazards of the business. We would have hazards and some controls, but I thought that would be the end of it. But … we delved deeper and deeper and the controls we had were sort of happening but weren't documented. Or, we would have documentation, but when you go and check in the workshop, it's not happening.' (SME B)

This prompted the need for that particular SME to create an implementation plan arising from the newly identified hazards, and for another SME to introduce a range of consultation strategies to assist in the communication of hazards and planned controls within the OHSMS to the workforce.

5.2.1.5 Systems knowledge and use of systems

All research participants within each participating SME were operating at the most senior level in the organisation. An analysis of interview data suggested that knowledge of the OHS management system and its functioning across each SME was largely confined to the key informant and the most senior person in the organisation. This was also supported by the evidence coding used across the data collection tools. The key informant in three SMEs was charged with establishing and implementing the OHSMS. Limited knowledge of the OHSMS by participants other than the key informant was expressed by research participants in interviews, where deferral of knowledge to others in the organisation was reported as commonplace. Such approaches support findings of other research (see Chapter 2, Section 2.6), where SMEs do not use integrated management systems and individuals adopt a silo approach to the use of management systems within the SME.

5.2.1.6 Availability of OHSMS

Three of the four key informants had made the OHSMS available within the hazard profiling activities, to be used as a possible reference point for consideration of the profile's alignment to the OHSMS. One other SME could not produce a current OHSMS, since one that had been developed by a consultant was found to be irrelevant to the business and no other OHSMS had yet been developed.

> 'We've got the one we bought from XXXX, but we don't understand it and we don't think we can use it. The other one is what XXX (Administration staff) has brought in and she will change it a bit to suit our business.' (SME 'C')

Where the OHSMS had been produced, research participants made limited comparisons between the profile and the OHSMS, tending to itemise particular procedures located within the system. Some uncertainty regarding the structure and use of the OHSMS was reported by research participants

> 'It's pretty broad but we know we have work to do to make the system more realistic.' (SME 'C')

> 'I'm not sure how it all looks. I know that I have to learn more about it and need to become more involved (as a supervisor).' (SME 'A')

Therefore, the OHSMS was not readily used with any SME in the hazard profiling activities, although portions of it were added to a redesigned profile by SME B (see section 5.2.1.8 Integration of safety into the business).

5.2.1.7 Integration of safety into the business

Three of the four SMEs had organised an OHSMS as a stand-alone management system that operated separately from other management systems. As identified in section 5.2.1.5 of this analysis, not all the research participants demonstrated a grounding in management systems. One director responding to an interview question regarding the OHSMS stated:

> 'I can't explain it that well. It's looked after by our administration manager.' (SME C)

As identified by Legg et al. (2015), the integration of OHS into existing systems is often not addressed within many SMEs. The research data confirmed the piecemeal integration of OHS within other management systems that is symptomatic of many SMEs (Hasle 2013).

One exception to this is reflected by one SME that had developed a management system drawing on many contexts of the business, termed an Integrated Management System. This was proudly raised in the focus group discussion with this SME.

> 'The IMS and the OHS system fed into it (the hazard profile).'

‘Well, it mapped across to the IMS (Integrated Management System) quite well.’ (SME B)

A further investigation as to the causality of this is addressed in section 5.3.1.4 of this chapter.

5.2.1.8 Alignment of hazard profiling to systems

Observations and analysis associated with the alignment of the hazard profile to business systems of the SME follows from the previous themes regarding systems knowledge, availability of the OHSMS and the integration of safety into the business.

A potential alignment of the hazard profile to other systems was only acknowledged by one participant early in the data collection phase, during an observation where a director proposed a systems-based modification that could merge the profile with other business systems.

All four SMEs raised issues within the hazard profile that were recognised as potential elements within an OHSMS. These elements were associated with Risk Assessment, Training and Risk Control. Two SMEs chose to adopt strategies arising from the hazard profile that could be aligned to OHS consultation within an OHSMS.

Research participants did not actively seek out an alignment of the hazard profile to its systems within the allocated research activities. This item emerges as one part of the research question that was only partially answered by the research data and is discussed in section 5.5 of this chapter.

5.2.1.9 Visual depiction

The development and depiction of the hazard profile by using mediums that could be easily shared among research participants was a significant feature arising from the research activities. Each SME had decided to detail the hazard profile using a whiteboard. In two cases, participants also decided to utilise a spreadsheet. The causality associated with these decisions is analysed in section 5.3.1 of this chapter.

Research participants strongly favoured visual depiction, as indicated in the evidence coding and responded positively to the use of visual mediums, as exemplified in the following statements provided during the interviews and focus group activities.

‘The mapping helped with clarity. It showed the whole situation.’ (SME B)

‘Yeah, the whiteboard was a trigger.’ (SME A)

‘Using the whiteboard was useful. Everyone could see what was going on.’ (SME A)

> ‘Yes it was good because it’s visual. People see the piece of paper but it’s hard to see. A lot of people are visual people.’ (SME D)

Visual depiction using mediums of a whiteboard and spreadsheet was reported by the research participants as being useful in making connections between various entries and elements within the hazard profile and consequently facilitated the visualisation, comprehension and synthesis of data as it was developed.

5.2.1.10 Leadership by key informants

The key informant within each SME had adopted the role of facilitating the research activities through the organisation of physical resources and the engagement of research participants prior to the conduct of each research activity. Within three of the four SMEs, the key informant occupied the role of safety coordinator, and in those SMEs emerged as the dominant person with specialist knowledge on OHS that was shared with other research participants.

Key informants within three of the four SMEs guided the identification of additional hazards and the provision of the OHSMS for reference during the hazard profiling activities. The causality associated with these actions is analysed in several events within section 5.3 of this chapter.

5.2.1.11 Tacit and explicit knowledge

The explicit knowledge regarding hazards that is openly shared within each SME was an essential starting point for the hazard profile, laying the foundations for the details initially entered in the profile. However, several previously unrecognised or unrecorded hazards emerged for each hazard profile in each SME. Research participants valued the engagement of tacit knowledge provided by the group members as this contributed to additional knowledge not previously shared or recorded across the OHS understandings and practices of the SME. Significant statements recorded within the interviews and focus groups support this view below.

> ‘The hierarchy of the management team was useful. I knew we had to have those people in the room, and they have to know more about what’s going on with safety.’ (SME A)

> ‘Some things came up with [sic] some hazards that we weren’t aware of.’ (SME B)

> ‘There hasn’t been enough involvement from others.’ (SME A)

> ‘You think you have it all covered, but I could see we really needed the group set up. It helped to get more ideas going.’ (SME C)

Drawing on the combination of both explicit and tacit knowledge was recognised as a necessary requirement by research participants in order to acquire and record a more comprehensive suite of hazards within the hazard profile.

5.2.1.12 Omission of risk from the hazard profile

The research objectives and research questions established for this project (see Table 1.1) sought to focus on the identification and classification of hazards within an SME. The hazard profile associated with the research questions required the establishment of a boundary that would exclude some elements of the broader process of risk management as prescribed in the international standard for risk management ISO 31000 (ISO 2018).

The choice to remove the description of risk and the assignment of a risk value to the hazards recorded within the hazard profile (see Chapter 1, Section 1.4.3) was a necessary omission to align to the research questions. This also presented the study in a more comprehensive way, rather than introducing the variable of risk that would extend the study beyond the scope of the research questions and objectives.

The exclusion of a risk description and the assigning of a value to hazards identified within the hazard profile was regarded as a useful omission by research participants. Two significant statements are provided below illustrating the usefulness of the omission.

> 'I think we have been too focussed on the risk. You know, you look at the matrix and then it's this particular risk. And everyone can't agree. And then we go and try to fix it but it's a bit not … right. You know … the likelihood and consequence. The measure of risk can be a distraction. We didn't have that here with this profile.' (SME B)

> 'The likelihood and consequences is the big distractor. People are lazy, you know. If they can see more paper work, they'll shift things around with the scores so it always comes up easy for them and then they don't have to do anything.' (SME D)

The omission of risk from the hazard profile was reported to have accelerated the process of identifying and logging hazards without the need to describe and assign risk values to each hazard. One participant summarised the usefulness of this approach by proposing that a hazard profile would be used at the commencement of the risk management process (ISO 2018), where an assignment of risk is not yet required, and another participant proposed that a risk register would be utilised after the completion of the profile.

> 'What I did notice is a similarity between it and the risk register, but we mainly use the risk register for site-based risks. It's not a starting point, so the profile approach was good.' (SME B)

> 'The connection is between the profile and the risk register. That's the next step.' (SME 'D')

5.2.1.13 Interactive teamwork

The requirement to share information and record it in a systematic and meaningful way was a key requirement of developing the hazard profile. Within the first two research activity sessions with each SME, recorded observations indicated some uncertainty and concern associated with the commencement of the profile's structure. Another concern involved the level of detail regarding each hazard that may be suitable for a hazard profile intended to represent all of the SME's activities, products and services.

The use of a key informant and the incorporation of key personnel managing the SME were key contributors to the development of interactive teamwork contributing to the hazard profile. With these two factors present, hazard recordings and their relationship to business functions were observed to be easily identified, acknowledged and annotated into the categorisation organised within the Thematic Conceptual Matrix (Table 5.1). These factors were intimately associated with allied themes of tacit and explicit knowledge and leadership by key informants, with the key informants adopting a facilitator in this process.

5.2.1.14 Operational controls

Operational controls are defined within this project as those items used by organisations within the OHSMS to specify how work is required to be performed. They comprise specific procedures and work instructions designed to identify and manage OHS hazards associated with specific work. Examples of operational controls used by SMEs participating in this research include refuelling of trucks, operation of a pedestal drill and the slinging of materials to be moved by an overhead crane.

A strong correlation was evident between the hazard profile and the current use of operational controls by each of the SMEs. One interview question that asked, 'can the hazard profile assist in managing OHS risks?' received several responses correlating the hazard profile to the identified need for linkages to and a review of operational procedures.

> 'Yeah, for parts of it. We want to use it in the process and operational controls. That's basically all the things we have going on in the workshop.' (SME A)
>
> 'Yes, with our procedures. You could see in the profile where we mentioned 'servicing of trucks' and then we need some procedures for that. So that raised a few issues.' (SME 'C')
>
> 'Definitely. I probably have the most number of Work Method Statements so you are sort of reengineering whether we had captured those hazards. The documentation may not be linked.' (SME 'D')
>
> 'The profile will be the base for operational controls. We will use it to refer to, to make sure we have the right procedures sorted out.' (SME 'A')

Interview responses to the use of the hazard profile offered consequent control plans where, in two instances, strategies to communicate operational controls more effectively to the workforce were proposed.

> 'We'll develop a user guide for operational controls. We're also going to set up a computer in the workshop or maybe the smoko room so the workers can look up the procedures if they want to … or need to. You know, so it's all there for them. We haven't done that before.' (SME 'A').

> 'We have to check our procedures and look at our communications. We don't communicate enough with our drivers.' (SME 'C')

One manager discussed a proposal for the support of operational controls within the focus group activity, in the context of how supervisors may be supported to implement operational controls more effectively.

> 'We want to develop Supervisor Packs. We're working on a project to develop these packs, so we then have the resources to help them (the supervisors) with the procedures. They have to be able to relate and manage the crews.' (SME 'B')

One other SME had detailed how the hazards had aligned to operational controls by designing additional columns within a hazard profile spreadsheet that would act as a gap analysis. This is discussed further in this chapter as an event (see Chapter 5, Section 5.3.1.4). Such items of data collected within the research instruments support the use of the hazard profile as a tool for SMEs to identify hazard sources across the operations and systematically align hazards to them in order to determine the sufficiency of those controls.

5.2.1.15 Strategic planning

The theme of strategic planning aligns to a term provided in the literature review in this research (see Chapter 2, Section 2.6), defining the approach as a desired goal that is accompanied by a series of actions and a sequence to achieve the goal (Karel, Adam & Radomir 2013; Gandee 2014). The strategic planning that emerged from the data was centred around the operational controls, the establishment of new consultation strategies and the support of supervisors in the conduct of their duties.

Operational controls were discussed earlier in this chapter (see section 5.2.1.14). The raising of some issues by research participants were not able to be analysed further for their meaning or causality as they had not been activated, that is arising as an event or contributing to an event that could be further analysed for its causality. However, those concerned with the establishment of consultation strategies and the support of supervisors were more immediate targets that can be defined as events within the critical realism framework and are discussed further regarding their causality in section 5.3 of this chapter.

Table 5.1: Thematic Conceptual Matrix – Data collection obtained from research instruments

Thematic Conceptual Matrix DATA COLLECTION TOOL: **OBSERVATIONS**										
Research Question	**Breakdown of criteria (phenomenological concept)**	**SME 'A'**	**SME 'B'**	**SME 'C'**	**SME 'D'**	**Codes**	**Categories**	**Themes**	**Significant observations**	**Events (analysed in critical realism framework)**
		Collective analysis representing all research participants per SME								
Does a hazard profile mapped to an SMEs' business contexts identify and record the SMEs hazards?	*Concept of a hazard profile*	✪	●	✪	✪	HPC HPDF	Hazard profile	***Hazard profile design***	Offered specific work types rather than broad categories (SME 'B')	'No entry'
	Design features of a hazard profile	✪	●	○	●	VM4HP HPDF HPBC	Activities, Products, Services. People.	***Categorisation*** ***Interactive teamwork***	Vague on potential/goal due to structure of profile (SME 'A') Initially unsure of structure SME A,B,C & D) Emergent themes are consultation, training, procedures and risk management (SME 'C')	HP. Creation on whiteboard (SME A, B, C & D) HP. Creation on spreadsheet (SME B & D)
	Usefulness of the hazard profile (for managing hazards and consequent risks)	✪	●	✪	●	HPBC HPUS	Connecting hazards and business components	***Hazard identification*** ***Hazard control***	Participants see hazard profile as an end goal (SME 'D')	'No entry'
Does hazard profiling facilitate alignment to the OHSMS framework used by the SME, and will this assist in managing OHS risks?	*Alignment between the hazard profile and the SME's business contexts*	✪	✪	○	✪	HPBC SMSUSE HPSMSLNK	Element of OHSMS Mapping	***Integration of safety into the business*** ***Interactive teamwork***	Emergent themes of consultation, training, procedures and risk management only meaningful linkage for SME 'C' A number of business functions flowed freely into the categories for annotation (SME 'A', 'B' & 'D')	Seeking of risk controls prior to linking HP to OHSMS (SME 'A')
	Knowledge on the OHSMS and its use	●	●	✪	✪	SMSUSE SMSKN	Integration of safety <> OHSMS	***Systems knowledge and use of systems***	Vague knowledge of OHSMS (SME 'C' & 'D')	'No entry'
	Links between hazard profiling and the OHSMS	✪	✪	○	✪	CA CS HPSMSLNK	Mapping of hazard profile to OHSMS Teamwork	***Alignment of hazard profiling to systems*** ***Interactive teamwork***	Risk Assessment Training Controls discussed as key components of OHSMS (SME 'A') Links to OHSMS discussed but not actively sought (SME 'D') Director proposed systems-based modification – merging of business and OHS system (SME 'D')	Link HP to legislation (SME 'A') Use of HP to rectify hazards using a systems tool. (SME 'B')
	Visual mapping as a tool used in the creation of the profile	●	●	●	●	VM4HP	Whiteboard Spreadsheet	***Visual depiction***	Visual mapping + spreadsheet. Not conducive to group. Continue using whiteboard (SME 'A')	HP. Creation on whiteboard (SME A, B, C & D)

										Spreadsheet discontinued during group design of HP (SME 'A')
	Reflective learning arising from the research activity	●	●	✪	●	RL TK HPDF HPUS HPBC	Systems knowledge dominated by key informant Obtaining implicit/unstated knowledge Breadth of hazards Alternative categories for HP design Availability of OHSMS Allocation of tasks - development of profile	***Leadership by key informants*** ***Tacit and explicit knowledge*** ***Categorisation*** ***Interactive teamwork*** ***Systems knowledge and use of systems***	Safety coordinator dominant person with specialist knowledge (SME 'A') Additional hazards (fuelling, sales on site, journeys identified) (SME 'A') New Psychosocial hazards identified (SME 'B') Reorganisation of categories to Activities, Services, People (SME 'B') 'Our products are our people'. Identified need to map hazards into an OHSMS, but SME has no existing OHSMS reflecting its business (SME 'C') OHSMS not readily used with any SME in the hazard profiling activities. Outcomes of hazard profile are largely delegated to OHS coordinator. Lack of ownership across management team (SME 'D')	New hazards identified - fatigue, fitness for work, vehicle journeys, communication by and experience of supervisors (SME 'A ' & 'B') New main category (redesign of profile) to activities, services and people (SME 'B')

Legend: Evidence coding

Notes:
'No entry' denotes no evidence or relevant data found.

○ Not evident
Not evident (absence of notable event/comment that element is present)

✪ Partially evident
Partially evident (at least one notable event/comment)

● Evident
Evident (two or more notable events/comments)

Code list:

Deductive codes	
HPC	Hazard profile concept
HPDF	Hazard profile design features
HPUS	Usefulness of hazard profile
HPBC	Alignment of hazard profile to SME business contexts
SMSKN	Knowledge of OHSMS
SMSUSE	Use of OHSMS
HPSMSLNK	Links between hazard profiling and the OHSMS
VM4HP	Visual mapping as a tool for creating hazard profiles
RL	Reflective learning arising from the research activity
Inductive codes	
CA	Collaborative approach
CS	Communication strategies
NS	New strategies for development of hazard profile and links to OHSMS
TK	Tacit knowledge

Thematic Conceptual Matrix
DATA COLLECTION TOOL: INTERVIEWS

Research Question	Breakdown of question (phenomenol-ogical concept)	SME 'A'				SME 'B'			SME 'C'				SME 'D'				Codes	Categories	Themes	Significant statements	Events (analysed in critical realism framework)
		Research participants																			
		Do	*Dw*	*Ol*	*Ma*	Em	*Br*	*Ma*	*Ma*	Wa	*Da*	*Tr*	*Ni*	De	*Ma*	*Mar*					
Does a hazard profile mapped to an SMEs business contexts identify and record the SMEs hazards?	*Concept of a hazard profile*	●	●	●	✪	●	●	✪	✪	✪	✪	✪	●	●	●	●	HPC HPDF VM4HP CA	Hazard profile (activities, products, services) Key informants acknowledge HP Hazard-Risk association Alternative categories for HP design - Activities, People (Products) Services.	***Hazard profile design*** ***Leadership by key informants*** ***Omission of risk from the hazard profile*** ***Visual depiction***	The mapping helped with clarity. It showed the whole situation. (SME 'B') I think we have been too focussed on the risk. You know, you look at the matrix and then it's this particular risk. And everyone can't agree. And then we go and try to fix it but it's a bit not … right. You know … the likelihood and consequence. The measure of risk can be a distraction. We didn't have that here with this profile. (SME 'B') The likelihood and consequences is the big distractor. People are lazy, you know. If they can see more paper work, they'll shift things around with the scores so it always comes up easy for them and then they don't have to do anything.(SME 'D')	New classification – Activities, Services, People (replaced from products) HP. Creation on whiteboard (SME A, B, C & D)
	Design features of a hazard profile	●	●	✪	✪	●	●	✪	✪	✪	✪	○	●	●	✪	✪	HPC HPDF NS	Spreadsheet Activities, Products, Services. People. Hazard-Risk association Alternative categories for HP design	***Hazard profile design*** ***Visual depiction*** ***Omission of risk from the hazard profile*** ***Hazard identification*** ***Hazard control***	The design was useful. It helped to show all of the hazards and the variety of hazards. We hadn't thought about it being laid out like that before. (SME 'C') We would start with this process. It might look a bit different to what we started with, but we would do it this way again (SME 'A') What I did notice is a similarity between it and the risk register, but we mainly use the risk register for site-based risks. It's not a starting point, so the profile approach was good. (SME 'B')	Entry of additional columns in HP (SOP, Manual, Procedures, Doc) in spreadsheet to assist with mapping (SME 'B') HP. Creation on spreadsheet (SME B & D)
	Usefulness of the hazard profile (for managing hazards and	●	●	●	✪	●	●	✪	✪	✪	✪	✪	●	●	✪	●	HPC HPDF HPUS HPBC	Hazard identification and control Mapping of hazard profile to OHSMS	***Hazard identification*** ***Hazard control***	Yes. It has to be lined up with the procedures and then it can all come together.(SME 'A') Yes it can (assist in managing OHS risks). We won't look at it all the time. We might come back to it in 12 months and see what has changed or need [sic] to be reviewed. (SME 'A') It's a good business strategy. (SME 'B')	'No entry'

	consequent risks)																Hazard profile alignment to the SME's business	***Integration of safety into the business***	I'm definitely looking at it deeper now. I can see the need for more risk assessments. (SME 'D') I thought it would map out the hazards of the business. We would have hazards and some controls, but I thought that would be the end of it. But … we delved deeper and deeper and the controls we had were sort of happening, but weren't documented. Or, we would have documentation, but when you go and check in the workshop, it's not happening.(SME 'B') Yes, but most of our hazards are managed on the fly. We are just always on the go and things pop up we need to fix as we go.(SME 'C')	
Does hazard profiling facilitate alignment to the OHSMS framework used by the SME, and will this assist in managing OHS risks?	*Alignment between the hazard profile and the SME's business contexts*	●	✪	●	✪	●	●	●	✪	✪	✪	✪	●	●	✪	●	HPSMS LNK HPBC	Availability of OHSMS Operational issues in the OHSMS Mapping of hazard profile to OHSMS	***Operational controls*** ***Integration of safety into the business***	The previous safety system was too brief. We had stuff happening in the workshop but it wasn't all captured.(SME 'A') Yes, the connection is between the profile and the risk register. That's the next step.(SME 'D') I can't explain it that well. It's looked after by our administration manager. (SME 'C')	'No entry'
	Knowledge on the OHSMS and its use	●	✪	✪	○	●	●	✪	✪	✪	○	○	●	●	✪	●	SMSKN CA	OHSMS Familiarity with OHSMS Integration of safety	***Systems knowledge and use of systems***	I don't use it. That's left to our administration manager.(SME 'C')	'No entry'
	Links between hazard profiling and the OHSMS	●	●	●	✪	●	●	✪	✪	✪	✪	✪	●	●	✪	●	CA CS HPBC	Elements of OHSMS Mapping of hazard profile to OHSMS	***Hazard identification and control*** ***Operational controls***	Yes, the connection is between the profile and the risk register. That's the next step.(SME 'D') Yes, and it can be linked to the risk register.(SME 'B') Definitely. I probably have the most number of Work Method Statements so you are sort of reengineering whether we had captured those hazards. The documentation may not be linked.(SME 'D') Yes, with the IMS (Integrated Management System). We showed that with the mapping.(SME 'B') Yes, with our procedures. You could see in the profile where we mentioned 'servicing of trucks' and then we need some procedures for that. So that raised a few issues.(SME 'C')	Linked procedures to hazard profile (SME 'B')
	Visual mapping as a tool used in the creation of the profile	●	●	●	●	●	●	●	●	●	●	✪	●	●	●	●	VM4HP TK	Use of whiteboard Spreadsheet	***Visual depiction***	Using the whiteboard was useful. Everyone could see what was going on. (SME 'A) Yes it was good because it's visual. People see the piece of paper but it's hard to see. A lot of people are visual people.(SME 'D')	HP. Creation on whiteboard (SME A, B, C & D) Creation of spreadsheet for HP (SME 'B')
	Reflective learning arising from the research activity	●	●	●	✪	●	●	●	●	●	●	✪	●	●	●	●	RL NS HPSMS LNK HPBC HPUS CA TK	Obtaining implicit/unstated knowledge Breadth of hazards	***Tacit and explicit knowledge*** ***Hazard identification and control***	The hierarchy of the management team was useful. I knew we had to have those people in the room, and they have to know more about what's going on with safety.(SME 'A') Yeah, the whiteboard was a trigger (SME 'A') We'll develop a user guide for operational controls. We're also going to set up a computer in the workshop or maybe the smoko room so the workers	

																	Alternative categories for HP design Allocation of tasks - development of profile	***Hazard profile design*** ***Strategic planning*** ***Interactive teamwork*** ***Operational controls***	can look up the procedures if they want to … or need to. You know, so it's all there for them. We haven't done that before. (SME 'A'). The profile will be the base for operational controls. We will use it to refer to , to make sure we have the right procedures sorted out.(SME 'A') The profile helps to see where that gaps are so you can implement them. (SME 'B') You think you have it all covered, but I could see we really needed the group set up. It helped to get more ideas going.(SME 'C') It's too general (OHSMS). It's been written by a consultant and it doesn't cover any depth on most of the things we do. (SME 'D'). For a small business we have a lot of exposure. It came out of nowhere. It wasn't something I was expecting.(SME 'D') It has shown me that people on the floor know their job better than anyone else.(SME 'D')	Planning of hazard communication methods (SME 'A')

Legend: Evidence coding

Notes:	○ Not evident	✪ Partially evident	● Evident
'No entry' denotes no evidence or relevant data found.	Not evident (absence of notable event/comment that element is present)	Partially evident (at least one notable event/comment)	Evident (two or more notable events/comments)

Code list:

Deductive codes	
HPC	Hazard profile concept
HPDF	Hazard profile design features
HPUS	Usefulness of hazard profile
HPBC	Alignment of hazard profile to SME business contexts
SMSKN	Knowledge of OHSMS
SMSUSE	Use of OHSMS
HPSMSLNK	Links between hazard profiling and the OHSMS
VM4HP	Visual mapping as a tool for creating hazard profiles
RL	Reflective learning arising from the research activity
Inductive codes	
CA	Collaborative approach
CS	Communication strategies
NS	New strategies for development of hazard profile and links to OHSMS
TK	Tacit knowledge

Thematic Conceptual Matrix DATA COLLECTION TOOL: FOCUS GROUPS										
Research Question	**Breakdown of question (phenomenological concept)**	**SME 'A'**	**SME 'B'**	**SME 'C'**	**SME 'D'**	**Codes**	Categories	**Themes**	**Significant statements**	Events (analysed in critical realism framework)
		Collective analysis representing all research participants per SME								
Does a hazard profile mapped to an SMEs business contexts identify and record the SMEs hazards?	*Concept of a hazard profile*	●	●	●	●	HPC HPDF VM4HP CA	Hazard profile (activities, products, services) Key informants acknowledge HP Hazard-Risk association	***Hazard profile design*** ***Leadership by key informants*** ***Omission of risk from the hazard profile***	It was a mindset previously, where we had a structure but we might have missed some things. There were distractions that contributed to that.(SME 'A') Just removing all of the risk worked well you know with the columns and risk levels. They are a distractor.(SME 'B')	New classification – Activities, Services, People (replaced from products) HP. Creation on whiteboard (SME A, B, C & D)
	Design features of a hazard profile	●	●	●	●	HPC HPDF NS	Spreadsheet Mapping of hazard profile to OHSMS Alternative categories for HP design	***Hazard profile design*** ***Visual depiction*** ***Hazard identification and control***	Putting the information into categories helped to not miss things, like the main parts of a job or how things get done. (SME 'A') There's a potential to include (allocate) legislation (provisions) in the profile. t could be allocated. We started doing a bit of it ourselves. (SME 'A') The profile was influenced by the structure of the safety system.(SME 'B')	Link HP to legislation (SME 'A') Additional columns in spreadsheet derived from OHSMS.(SME B')
	Usefulness of the hazard profile (for managing hazards and consequent risks)	●	●	●	●	HPDF VM4HP HPUS	Hazard profile Hazard identification Communication Collaboration Mapping Integration of safety Obtaining implicit/unstated knowledge Breadth of hazards Allocation of tasks - development of profile	***Hazard profile design*** ***Hazard identification and control*** ***Interactive teamwork*** ***Tacit and explicit knowledge*** ***Strategic planning***	The breakdown of tasks. There was a fair bit involved once you looked at it. Its introduced new ways of communication. We introduced Tool Box Talks that we hadn't used before with the workers. (SME 'A') Some things came up with some hazards that we weren't aware of. (SME 'B') Yes. The GAPS column are easy fixes for many low hanging fruit. We are halfway there. (SME 'B'). It's helped us to think about our objectives a bit more. We have them for 2018, but we need to build on them for next year as part of our operational plan. (SME 'B'). Well, yes but we have to work out our own way of doing that (SME 'D')	Toolbox talks introduced, regarding hazards and their management SME 'A')

Does hazard profiling facilitate alignment to the OHSMS framework used by the SME, and will this assist in managing OHS risks?	*Alignment between the hazard profile and the SME's business contexts*	●	●	✪	●	HPSMSLNK	Integration of safety Mapping of hazard profile to OHSMS Whiteboard Spreadsheet	***Availability of OHSMS*** ***Operational controls*** ***Interactive teamwork*** ***Visual depiction*** ***Leadership by key informants***	Definitely a connection. We could see that when the entries were lined up against the system. (SME 'A') It helped us look at the gaps and content, otherwise it may stayed the same. (SME 'B') We do need to line it up against the safety system.(SME 'C') We've got to, as a group ensure that it's in the original format (Activities, Products, Services) and an original list, from the top down. We can put it in a table and then cross reference it to the system and that is how the gaps are done (SME 'D')	'No entry'
	Knowledge on the OHSMS and its use	✪	●	✪	✪	SMSUSE	OHSMS Familiarity with OHSMS	***Systems knowledge and use of systems*** ***Operational controls***	We've got the one we bought from XXXX, but we don't understand it and we don't think we can use it. The other one is what XXX (Administration staff) has brought in and she will change it a bit to suit our business. (SME 'C') The operational controls. That is what we use every day. We know we have to work on communication and training a lot more.(SME 'A')	'No entry'
	Links between hazard profiling and the OHSMS	●	●	✪	●	HPBC SMSUSE HPSMSLNK	OHSMS Integration of safety Mapping of hazard profile to OHSMS	***Hazard identification and control*** ***Operational controls***	Well, it mapped across to the MS (Integrated Management System) quite well (SME 'B') The MS and the OHS system fed into it (the hazard profile) (SME 'B')	Linked procedures to hazard profile (SME 'B')
	Visual mapping as a tool used in the creation of the profile	●	●	●	●	VM4HP	Collaboration Whiteboard Spreadsheet	***Visual depiction***	Using the whiteboard and then putting it into the spread sheet suits our business (SME 'B')	HP. Creation on whiteboard (SME A, B, C & D) Creation of spreadsheet for HP (SME 'B')
	Reflective learning arising from the research activity	●	●	●	●	CA CS TK NS RL SMSUSE SMSKN	Collaboration Whiteboard Tacit knowledge Breadth of hazards Alternative categories for HP design Allocation of tasks - development of profile	***Interactive teamwork*** ***Tacit and explicit knowledge*** ***Hazard identification and control*** ***Hazard profile design*** ***Strategic planning***	It helped to get a lot more ideas out there in the open.(SME 'A') It was obscure with too many levels There hasn't been enough involvement from others (SME 'A') It showed us a lot in the people space. We haven't captured that before, you know the things to do with our people. The supervisor space. Leading on from that, you know we saw issues there with fatigue management, vehicles and supervisor training. (SME 'B').	New hazards identified - fatigue, fitness for work, vehicle journeys, communication by and experience of supervisors (SME 'A ' & 'B') New main category (redesign of profile) to

									We want to develop Supervisor Packs. We're working on a project to develop these packs, so we then have the resources to help them (the supervisors) with the procedures. They have to be able to relate and manage the crews. (SME 'B') Its evidence to say we do it better than some others. You know, we want to be leaders in the field for our type of business. (SME 'B') We have to check our procedures and look at our communications. We don't communicate enough with our drivers. (SME 'C') There's a lot of things going on that we don't capture very well at the moment. (SME 'D') It will be easier for our audits. (SME 'D')	activities, services and people (SME 'B')

	Legend: Evidence coding			
Notes: 'No entry' denotes no evidence or relevant data found.	○ Not evident Not evident (absence of notable event/comment that element is present)	✪ Partially evident Partially evident (at least one notable event/comment)	● Evident Evident (two or more notable events/comments)	**Code list:**

Deductive codes	
HPC	Hazard profile concept
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Inductive codes	
CA	Collaborative approach
CS	Communication strategies
NS	New strategies for development of hazard profile and links to OHSMS
TK	Tacit knowledge

Thematic Conceptual Matrix DATA COLLECTION TOOL: GRAPHICAL RECORDINGS										
Research Question	**Phenomenological concept**	**SME 'A'**	**SME 'B'**	**SME 'C'**	**SME 'D'**	**Codes**	**Categories**	**Themes**	**Significant observations**	**Events (analysed in critical realism framework)**
		Collective analysis representing all research participants per SME								
Does a hazard profile mapped to an SMEs business contexts identify and record the SMEs hazards?	*Concept of a hazard profile*	●	●	●	●	HPC	Hazard profile Activities, Products, Services. People.	***Hazard profile design*** ***Visual depiction***	Adoption of activities, Products and Services framework (SME 'A', 'B', 'C' & 'D')	HP. Creation on whiteboard (SME A, B, C & D)
	Design features of a hazard profile	●	●	●	●	HPDF HPBC	Activities, Products, Services. People. Integration of safety Availability of OHSMS	***Visual depiction*** ***Integration of safety into the business***	Commencement of legislation column (incomplete for this project duration). SME 'A' Classification of hazard entries under activities, products & services not clear on profile (SME 'C')	Link HP to legislation (SME 'A')
	Usefulness of the hazard profile (for managing hazards and consequent risks)	Not applicable Usefulness of hazard profile not measured graphically				'No entry'	'No entry'	'No entry'	'No entry'	'No entry'
Does hazard profiling facilitate alignment to the OHSMS framework used by the SME, and will this assist in managing OHS risks?	*Alignment between the hazard profile and the SME's business contexts*	●	●	●	●	HPSMSLNK HPBC	Mapping of hazard profile to OHSMS Collaboration Whiteboard Spreadsheet Tacit knowledge Availability of OHSMS	***Availability of OHSMS*** ***Operational controls*** ***Visual depiction***	Breakdown of hazards in depth (SME 'B' & 'D')	OHSMS made available and used for HP (SME 'B') OHSMS not made available and not used (SME 'A', 'C' & 'D')
	Knowledge on the OHSMS and its use	Not applicable Knowledge of OHSMS not measured graphically				'No entry'	'No entry'	'No entry'	'No entry'	'No entry'
	Links between hazard profiling and the OHSMS	✪	●	○	○	HPSMSLNK	OHSMS Integration of safety Mapping of hazard profile to OHSMS Hazard profile alignment to the SME's business	***Visual depiction*** ***Operational controls*** ***Alignment of hazard profiling to systems***	Alignment employed between hazards, controls, management system documentation and identified gaps – created as additional columns in spreadsheet (SME 'B')	Entry of additional columns (SOP, Manual, Procedures, Doc) in spreadsheet to assist with mapping (SME 'B')
	Visual mapping as a tool used in the creation of the profile	●	●	●	●	VM4HP	Collaboration Whiteboard	***Visual depiction*** ***Categorisation***	Employed in each session by each SME Spreadsheet developed by SME 'B' & 'D'	HP. Creation on whiteboard (SME A, B, C & D)

							Alternative categories for HP design Spreadsheet	***Strategic planning***		
	Reflective learning arising from the research activity					NS RL	Whiteboard Tacit knowledge Breadth of hazards Alternative categories for HP design	***Interactive teamwork*** ***Hazard identification and control*** ***Strategic planning*** ***Categorisation***	Additions made to profile between researcher visits (SME 'B', 'C' & 'D')	Additions made to hazard profile independently of researcher and research activities (SME 'B', 'C' & 'D') New hazards identified - fatigue, fitness for work, vehicle journeys, communication by and limited experience of supervisors (SME 'A ' & 'B')

Notes:
'No entry' denotes no evidence or relevant data found.

Legend:

○ Not evident
Not evident (absence of notable event/comment that element is present)

✪ Partially evident
Partially evident (at least one notable event/comment)

● Evident
Evident (two or more notable events/comments)

Code list:

Deductive codes	
HPC	Hazard profile concept
HPDF	Hazard profile design features
HPUS	Usefulness of hazard profile
HPBC	Alignment of hazard profile to SME business contexts
SMSKN	Knowledge of OHSMS
SMSUSE	Use of OHSMS
HPSMSLNK	Links between hazard profiling and the OHSMS
VM4HP	Visual mapping as a tool for creating hazard profiles
RL	Reflective learning arising from the research activity
Inductive codes	
CA	Collaborative approach
CS	Communication strategies
NS	New strategies for development of hazard profile and links to OHSMS
TK	Tacit knowledge

Source: Author, 2019.

5.2.2 Summary of the Thematic Analysis

The constructivist paradigm adopted for this first part of the data analysis found many valid interpretations of reality co-created by the research participants that evolved from the social interactions, participatory processes and operational contexts (see Figure 1.1) incorporated into the research methods. A summary of the analysis revealed some significant matters associated with the phenomenology.

The creation of a hazard profile was confirmed as a useful activity across each SME. The adoption of 'activities, products and services' as a preferred classification framework was reported across all four SMEs, although some adjustment to the classification was undertaken by one SME and is examined in the critical realist analysis. Research participants recounted the ability to mould the hazard profile classification structure to suit their business context, with several accounts in the interviews and focus group data supporting the phenomenological concept of reflective learning (see Chapter 4, Section 4.3.1).

The omission of the measure of risk as a descriptor and value associated with the hazards was met favourably by research participants, where it was noted that it allowed the development of the hazard profile without an additional distraction that may not directly add value to the profile at the point in time when the profile is being constructed.

Phenomenological concepts associated with the design of the hazard profile can be identified across several themes. Several newly identified hazards were reported by each SME during each of the three data collection phases, within areas incorporating sociotechnical factors associated with human resources, fatigue and supervision. A supporting factor contributing to the identification of these hazards was reported consistently in interviews as the ability to see the business visually represented in a large format on the whiteboard. A strong emphasis was reported on the need to share information visually in the design of the hazard profile. Further potential underlying causes and associated events for this observation are examined in the critical realist analysis.

Phenomenological concepts relating to systems knowledge and knowledge of the OHSMS were observed as limited overall when compared between research participants in each SME. The OHSMS was made available in the four SMEs by the key informant, but its sparing use was reflected in research participant responses and the connections made between the OHSMS and the hazard profile.

The hazard profile had been aligned to only a few elements of the OHSMS, with the strongest alignment being linked to the operational controls, confirming a limited application of the phenomenology linking a hazard profile to the OHSMS and associated business contexts. This recognition led to the reporting of some actions in developing new controls for managing specific hazards, and an additional initiative in three of the SMEs to establish additional communication and consultation strategies. The development of longer-term strategic planning was not observed or reported during the research.

A final significant matter that emerged from the interviews and focus group discussions concerned the value placed on the tacit knowledge obtained from the team members. Specific knowledge was drawn from persons having a grounding in specific work processes and the ability to nominate hazards that may have been previously unrecorded and also not acknowledged by others within the SME, providing a significant link to the phenomenological concept associated with reflective learning.

5.3 Results of events obtained within a critical realism paradigm

Events have been defined within this research as an occurrence arising from structures and mechanisms containing causal powers, that in association with certain conditions contribute to the event. Within the paradigm of critical realism, events are investigated within a definable framework containing the elements of structure, mechanisms and conditions (Sayer 1992; Bhaskar 2008). Events were analysed in this research by utilising this framework which was incorporated within Investigative Worksheets (see Figure 5.1) and modelled on a visual causal analysis process proposed by Sayer (1992, p. 117).

Each event was analysed through a process of retroduction and retrodiction (see Chapter 3, Section 3.4.2.2) using an investigation method seeking the underlying structures, causal mechanisms and emergent conditions (see Table 5.2 and Figure 5.1) that contributed to the event. Entries in Table 5.2 represent a summary of the investigation findings for each event using the investigative framework. A detailing of the connections and associations between structures, causal mechanisms and associated conditions is provided graphically within each Investigative Worksheet in Figure 5.1, linking how these gave rise to the event.

The analysis of events discussed in section 5.3.1 is organised under collective titles to reflect their occurrence at a fundamental level where common structures, mechanisms and conditions were shared across more than one event. For example, ‘Section 5.3.1.1 Hazard Profile: Creation in selected mediums’ investigates the causality associated with three events, being the creation of a hazard profile on a whiteboard, in addition to the creation and discontinuation of the hazard profile on a spreadsheet. Analysing events under collective

titles aided in the examination of interactions between properties shared within the structures and mechanisms, revealing associations between these and research participant actions that produced the nominated events. Such observations were better explained holistically by exploring these associations between the properties, since the phenomenology was shared across several events, thereby allowing a more succinct examination of the triggers that activated the events.

5.3.1 Analysis of events

The organisation of events within this section comprises a total of eight collective titles. Each is discussed below regarding their causation. The consistent entry noted across all Investigative Worksheets, and not discussed with each event, is the activation within the structures of resource allocation, where relevant personnel and appropriate time investment contributed to the establishment of the hazard profile.

5.3.1.1 Hazard Profile: Creation in selected mediums (Event 1, 2 & 3)

Each SME had produced a hazard profile during the research activities. The mechanisms contributing to the creation of the hazard profile comprised the scheduling of targeted sessions for this activity, the assurance of relevant tacit knowledge being available within the group, and the provision of a medium, selected as a whiteboard to commence and record the hazards against a chosen framework. The conditions facilitating this activity comprised a location remote from other work distractions, the progressive making of annotations on a whiteboard and the use of the chosen classification framework of activities, products and services to create the profile.

Two SMEs had commenced the notations for the hazard profile on a spreadsheet (see Appendix 11) in unison with the recordings made on the whiteboard, for the purposes of an enhanced classification system for later use. In both cases this decision was initiated by the key informant, and in both cases the research participants had deferred to the use of the whiteboard as the primary reference point for the addition of hazards. Recordings within the interview responses suggested this was largely due to the ease of visual clarity and the sharing of information amongst other participants in real time.

5.3.1.2 Identification of hazards (Event 4)

Each SME had identified newly recognised hazards through the creation of a hazard profile. Two SMEs having similar business functions associated with fabrication and engineering services both required workers to commute to remote locations via road transport for the performance of work over the course of several consecutive days in a shift cycle. In this context, research participants voiced the same newly identified hazards comprising issues

associated with fatigue, fitness for work, vehicle journeys, inadequate communication and limited experience of supervisors.

Mechanisms contributing to this identification were linked to the research activity. The detailing of hazards against the nomination of business functions within the framework of activities, products and services on the whiteboard, coupled with the availability of tacit knowledge from the research participants, produced newly identified hazards. This observation resonated with Bhaskar's claim (1998, p. 41) that events can emerge due to social interactions and emerge by virtue of the mechanisms supporting those events, being the research activity and accompanying tools such as a whiteboard.

5.3.1.3 Use of OHSMS in creation of hazard profile (Event 5 and 6)

Research participants in three of the four SMEs had elected not to use the OHSMS in the creation of a hazard profile, although the OHSMS had been made available during the research activities by each of these three SMEs. A comparison of evidence was made between the interviews and focus group discussions within the constructivist analysis for these SMEs, confirming a lack of familiarity with the OHSMS. Although the structures were in place to provide the required resources for the potential use of the OHSMS, tendencies by the research participants to not utilise the OHSMS in three of the SMEs acted as mechanisms that negated its use. Data supporting this choice was identified in the interviews (see Chapter 5, Section 5.2.1.6).

Within one other SME, the key informant had decided not to produce the OHSMS which had been written by a consultant, reporting within the interviews that the OHSMS was not understood and not relevant to the business. This was identified as a different mechanism to other mechanisms explained in event five, where in this instance the choice not to use the system was a result of unfamiliarity with it. However, the choice to not use the system inevitably contributed to the same event.

Alternatively, research participants in one other SME had used portions of the OHSMS to design additional features within the hazard profile. A key mechanism contributing to this was the actions of the key informant in providing, guiding and directing the design of the hazard profile to accommodate additional features that may be of use to consider alignment between the OHSMS and the hazard profile. The activation for this event was dependent on the provision of the OHSMS and the actions of the key informant to guide the modification of the hazard profile for a foreseeable benefit by engaging the other research participants within the SME.

This critical realist analysis assisted in answering one of the research questions, where the hazard profile facilitated some alignment to the OHSMS framework, but not across all participating SMEs. The identification of mechanisms associated with actions of the key informant and the grasp of the SME's OHSMS were key contributors to identifying what works in the use of OHSMS to assist in the development of a hazard profile for SMEs.

5.3.1.4 Procedures are linked to hazard profile (Event 7)

Two of the four SMEs had made linkages between the identified hazard groups in the hazard profile and their own enterprise procedures, being the operational controls prescribed for a variety of high-risk work; for example, welding and use of an overhead crane. The mechanisms involved in this process were largely dependent on the actions of the key informant to produce a listing of the procedures, thereby assisting the research participants to compare the procedures to the hazard profile as presented on the whiteboard. To determine the level of congruence between the hazards noted within the procedures, the observed mechanism entailed a high reliance on the tacit knowledge available within each group rather than the examination of individual procedures.

One key informant had proposed to create additional columns in the spreadsheet within which procedures could be named and aligned to hazards in the profile. This mapping exercise was circumvented by the research participants in the SME and undertaken solely by the key informant with some validation of the mapping commented on by the research participants towards the end of the process. This linkage of procedures to the hazard profile demonstrated that a hazard profile tool is malleable to change. The mechanisms, in this case being the key informant and the tool itself, can be moulded and adapted to the SME's context, and conditions associated with its validation are a likely requirement to its acceptance and use.

5.3.1.5 Additions made to hazard profile (Event 8, 9 & 10)

The initial classification framework of the hazard profile, based on a detailing of hazards under activities, products and services was modified by two SMEs and identified as three separate events. Each modification added features aligned to the specific context of the SME and the organisation of its business systems. The three events are explained individually as follows.

One SME was a provider of mechanical and fabrication services. Research participants reported the hazard profile framework as conducive to allocating hazards to activities and services but limited in the allocation of hazards to products, since the organisation did not manufacture products. This factor was recognised within the Investigative Worksheet as

aligned within the structures of the SME, since it was linked to the governance and business strategies of the organisation.

Mechanisms associated with the capacity to modify the profile to the SME's business context emerged as research participants considered an alternative classification to 'products'. The key informant proposed the use of the classification 'people' to replace products, justifying the selection on the basis that hazard groups identified and labelled as fatigue, fitness for work, inadequate communication and limited experience of supervisors were closely associated with 'people' factors. Therefore, the hazard profile for this organisation was redesigned to use the categories of activities, services and people with the new classification emerging as a socially constructed reality for those research participants.

Research participants within the SME that redesigned the profile as described above had also considered the structure of its OHSMS against the profile and decided to add to the profile's features by the construction of additional columns to align portions of the OHSMS such as procedures against the main hazard groups. The mechanisms adopted for this to take effect were again associated with the initiative provided by the key informant, along with the establishment of a facilitative environment. Notations were discussed and evaluated among research participants, with the proposals aligned against the context of the SME prior to finalising each entry.

One other event occurred where additions were made to the hazard profile involved the linkage of hazards to legislative provisions. The SME utilising this feature had pre-existing supporting structures for OHS legislation recorded in its own systems. Mechanisms employed by the key informant led to the decision of including legislative requirements as an alignment across several hazards. A linkage to legislative provisions had emerged as an event, however potential entries remained incomplete due largely to time constraints experienced at the end of the research project.

5.3.1.6 Use of Hazard Profile to rectify hazards using a systems tool (Event 11)

An event initiated by one SME involved the use of a pre-existing tool within its OHSMS to record and mitigate newly identified hazards within the hazard profile. Structures within the existing OHSMS supported the use of a corrective actions register. Mechanisms associated with knowledge transfer employed by research participants triggered the recognition of a corrective actions register as a suitable tool to record, control and mitigate the newly identified hazards. This was undertaken by producing the register, transposing the relevant hazards onto the register and allocating actions and persons responsible for their implementation. This event confirmed the ability of the research activity to contribute to

answering a research question, where the hazard profile assisted in identifying and recording the SME's hazards.

5.3.1.7 Hazard profiling triggers a need for communication strategies (Event 12 & 13)

Two events associated with OHS communication and consultation emerged during the research. One event occurred within two SMEs, where the planning of methods for hazard communication arose from the recognition of its need within the management practices of the SMEs. Mechanisms associated with a visual and verbal gap analysis had identified the need for employment of additional communication methods by both SME's. Conditions supporting the subsequent planning consisted of the strategic formulation of initiatives to be introduced to the workforce.

A specific tool identified by one SME was a Tool Box talk, consisting of the regular and planned presentation of information and opportunities for consultation relating to work scheduling and associated hazards, tabled in an open forum to work crews at the commencement of work shifts. These events contributed to an affirmative association with the second research question posed in this study (see Figure 1.1), where the hazard profile had facilitated some alignment to a part of the OHSMS used by the SME's to communicate hazards and associated risks.

5.3.1.8 Additions made to hazard profile independently of research activity (Event 14)

One final event involved the initiative taken by three SMEs to make additions to the hazard profile in the course of the research during periods when the researcher was not present at the workplace and the research activities were not scheduled. Decisions for this choice of action by the SMEs were not able to be verified qualitatively as there had been no provision for this possible action factored into the research instruments, for example with an additional interview question.

An examination of the structures underpinning these actions revealed the allocation of additional time within a work day by managers of the SME to permit additional work to be undertaken on the hazard profile. The mechanisms under which this occurred arose within the motivation and capability for the research participants to invest time into the addition of entries to the hazard profile. Conditions facilitating this event comprised the continued provision of the whiteboard and its entries in an accessible locality in the SME's business premises along with the presence of the key informant to help guide the process.

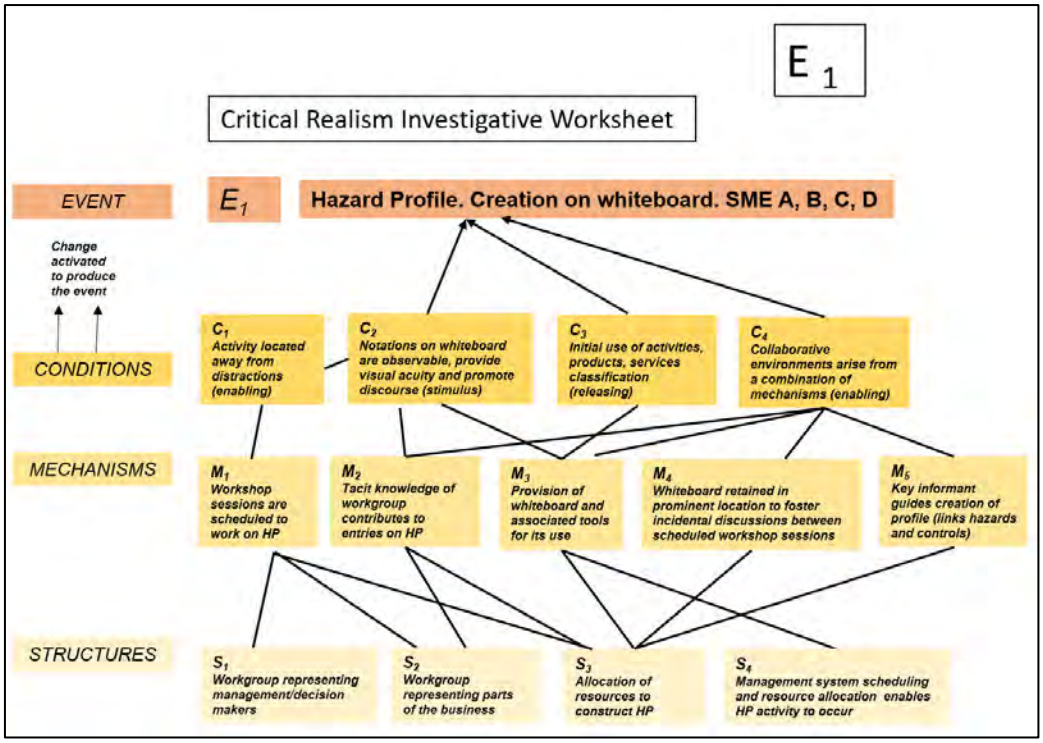
Table 5.2: List of events

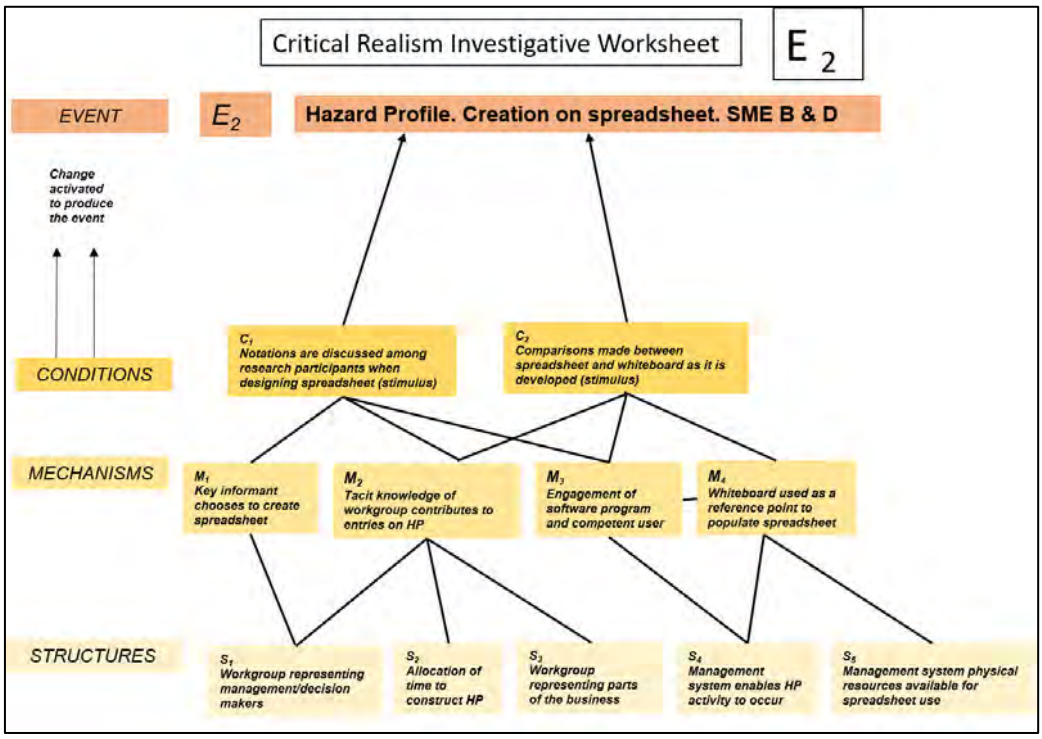
Event number	Details of Event	Change activated / not activated	Conditions	Mechanisms	Structures
1.	HP. Creation on whiteboard (SME A, B, C & D)	Activated	• Activity located away from distractions • Notations on whiteboard are observable, provide visual acuity and promote discourse • Initial use of activities, products, services classification • Collaborative environments arise from a combination of mechanisms (enabling)	• Workshop sessions are scheduled to work on HP • Tacit knowledge of workgroup contributes to entries on HP • Provision of whiteboard and associated tools for its use • Whiteboard retained in prominent location to foster incidental discussions between scheduled workshop sessions • Key informant guides creation of profile (links hazards and controls)	• Workgroup representing management/decision makers • Workgroup representing parts of the business • Allocation of resources to construct HP • Management system scheduling and resource allocation enables HP activity to occur
2.	HP. Creation on spreadsheet (SME B & D)	Activated	• Notations are discussed among research participants when designing spreadsheet • Comparisons made between spreadsheet and whiteboard as it is developed	• Whiteboard used as a reference point to populate spreadsheet • Tacit knowledge of workgroup contributes to entries on HP • Engagement of software program and competent user • Key informant chooses to create spreadsheet	• Workgroup representing management/decision makers • Workgroup representing parts of the business • Allocation of time to construct HP • Management system enables HP activity to occur • Management system physical resources available for spreadsheet use
3.	Spreadsheet discontinued during group design of HP (SME 'A')	Not activated	• Spreadsheet not produced in remainder of research activity sessions (releasing)	• Key informant chooses to discontinue use of spreadsheet • Research participants refer to whiteboard rather than spreadsheet – discontinue reference to spreadsheet • Whiteboard used as a reference point to continue populating hazard profile	• Workgroup representing management/decision makers • Allocation of time to construct HP • Management system enables HP activity to occur • Management system physical resources available for spreadsheet use
4.	Additional hazards identified - fatigue, fitness for work, vehicle journeys, inadequate communication by supervisors and limited experience of supervisors (SME 'A '& 'B')	Activated	• Design of hazard profile is conducive to accepting additional entries • Research participants accept new additions to hazard profile	• Research participants examine activities and services across complete range of business • Whiteboard used to populate hazard profile • Tacit knowledge of workgroup contributes to entries for new hazards on hazard profile	• Workgroup representing management/decision makers • Allocation of resources to work on research activity • Structure of business is examined across all its functions and environments
5.	OHSMS not used to assist with creation of hazard profile (SME 'A', 'C' & 'D')	Not activated	• Research participants do not ask to use OHSMS to assist with hazard profile creation • Research participants not familiar with OHSMS	• Hazard profile is designed without questioning need for OHSMS (SME 'A', 'C' & 'D')	• Workgroup representing management/decision makers • Allocation of time to construct HP • Management system physical resources are available for use

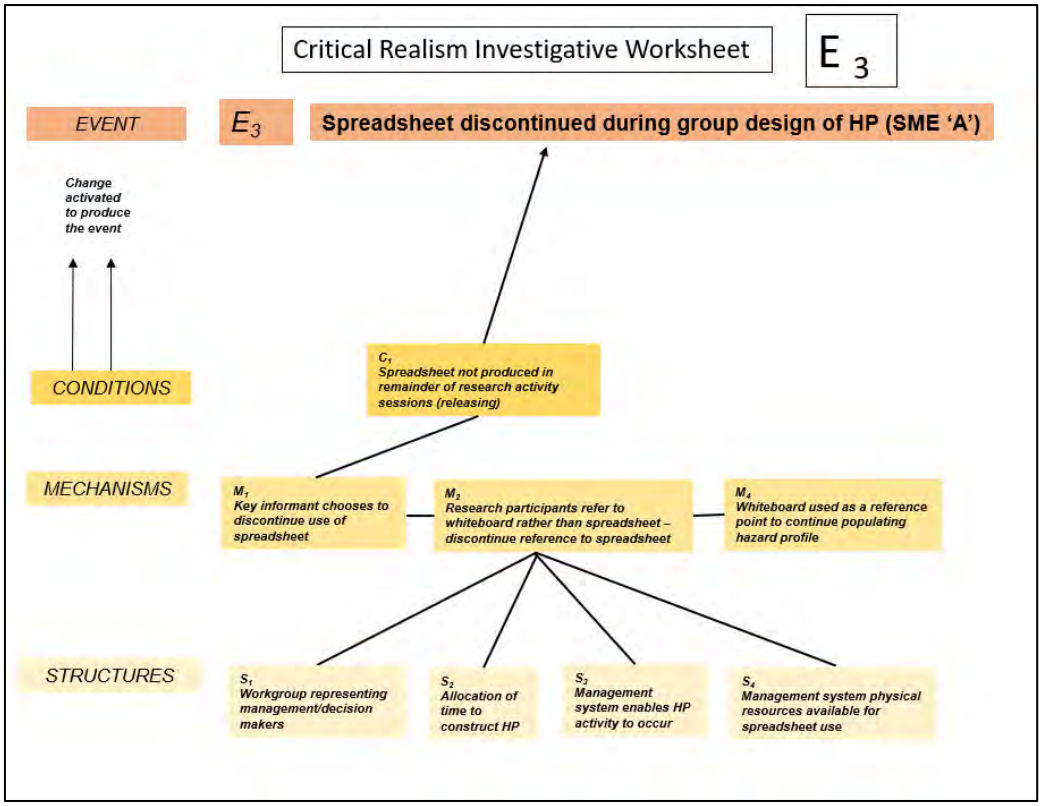
Event number	Details of Event	Change activated / not activated	Conditions	Mechanisms	Structures
			• OHSMS not made available	• Key informant decides to not provide research participants with OHSMS (SME 'C') • Research participants do not understand framework and functioning of OHSMS • OHSMS has been developed by consultant and is not relevant to business needs (SME 'C') • Existing OHSMS produced but not used to compare to hazard profile (SME 'A' & 'D')	
6.	OHSMS made available and used for HP (SME 'B')	Activated	• Additional columns added in spreadsheet reflecting use of OHSMS	• Research participants decide to use OHSMS to assist with hazard profile creation • Portions of existing OHSMS used to frame design of additional columns – whiteboard and spreadsheet • Key informant provides, guides and directs research participants to OHSMS	• Workgroup representing management/decision makers • Allocation of time to construct HP • OHSMS available for use
7.	Linked procedures to hazard profile (SME 'B')	Activated	• Notations are discussed among research participants when linking procedures • Knowledge of existing procedures largely drawn from tacit knowledge • Management system can accommodate changes/additions to structure of tools	• Key informant and operations manager choose to create additional columns in spreadsheet • Tacit knowledge of workgroup contributes to entries in additional columns • Portions of existing OHSMS used to frame design of additional columns • Engagement of software program and competent user	• Workgroup representing management/decision makers • Workgroup representing parts of the business • Allocation of time to construct HP • Management system physical resources available for spreadsheet use
8.	New main category (redesign of profile) to activities, services and people (SME 'B')	Activated	• Redesign of hazard profile to include 'people' as a category • Research participants accept new category for hazard profile	• Research participants examine activities and services across complete range of business • Research informant proposes new category of 'people' instead of 'products' to reflect business contexts • Business operations considered against hazard profile categories (Activities, Products, Services). Participants identify the business does not produce 'products'.	• Workgroup representing management/decision makers • Allocation of resources to work on research activity • Structure of business is examined across all its functions and environments
9.	Link HP to legislation (SME 'A')	Activated	• Notations on legislative provisions allocated to particular hazard groups by research informant • Hazards are considered against legal requirements • Column established in hazard profile for legislative requirements	• Key informant promotes nomination of legislative requirements associated with hazard groups • Engagement of research participants to nominate legislative requirements • Research participants have knowledge of legislative requirements	• Workgroup representing management/decision makers • Workgroup representing parts of the business • Management system enables HP activity to occur

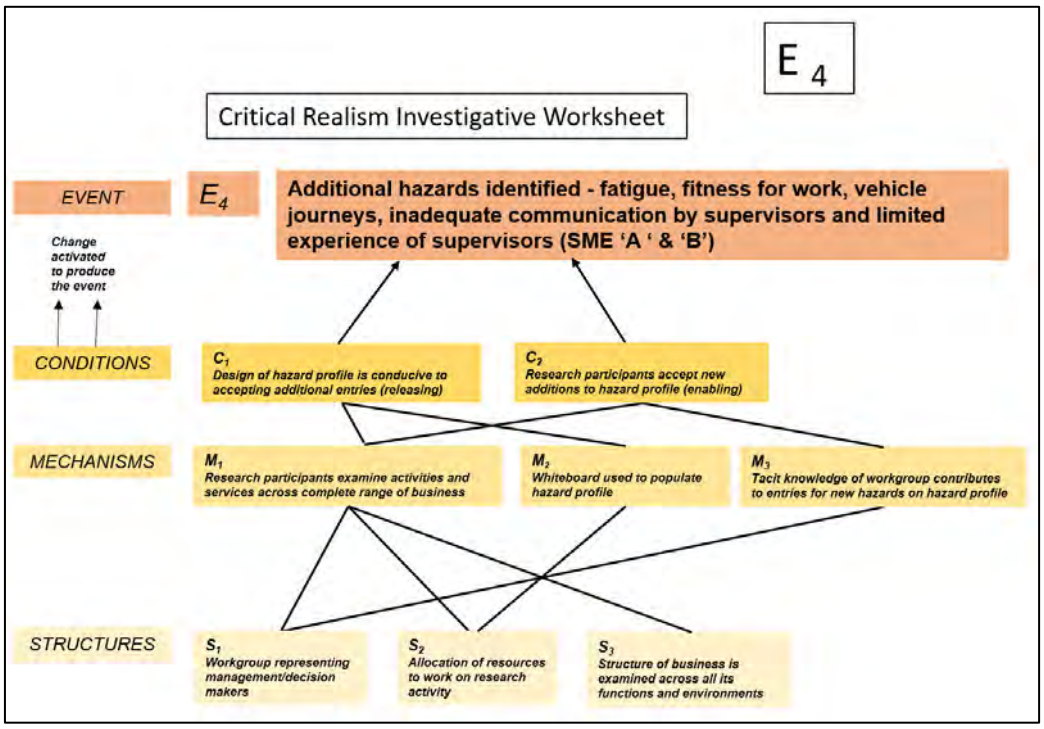
Event number	Details of Event	Change activated / not activated	Conditions	Mechanisms	Structures
					• Management system itemises legislation in its elements
10.	Entry of additional columns in HP (SOP, Manual, Procedures, Doc) in spreadsheet to assist with mapping (SME 'B')	Activated	• Notations are discussed among research participants when re-designing spreadsheet • Management system can accommodate changes/additions to structure of tools	• Key informant chooses to create additional columns in spreadsheet • Tacit knowledge of workgroup contributes to entries in additional column • Portions of existing OHSMS used to frame design of additional columns • Engagement of software program and competent user	• Workgroup representing management/decision makers • Allocation of time to construct HP • Management system physical resources available for spreadsheet use
11.	Use of HP to rectify hazards using a systems tool > Corrective actions register (SME 'B')	Activated	• Research participants (manager & key informant) seek input of research participants in transposition of hazards from hazard profile to corrective actions register • Key informant promotes and controls links between hazard profile and corrective actions register • Visualisation on whiteboard assists comparison	• Research participants (manager & key informant) choose to use findings from hazard profile for immediate management of OHS risks • Research participants (manager & key informant) share knowledge in OHS business systems used in the SME	• Workgroup representing management/decision makers • Allocation of time and resources to work on research activity • Existing management system contains range of tools used to manage OHS risks
12.	Planning of strategies to communicate hazards to workgroups (SME 'A' & 'B')	Activated	• Notations regarding communication discussed among research participants when linking procedures • Strategies regarding communication tools planned • Visualisation on whiteboard assists comparison	• Communication strategies used in SME scrutinised against hazards listed in hazard profile • Hazard profile reveals identified gaps in work systems regarding hazard communication	• Workgroup representing management/decision makers • Workgroup representing parts of the business • Allocation of time to construct HP • Identification of Communication as an essential element to manage hazards
13.	Too box talks introduced, regarding hazards and their management (SME 'A')	Activated	• Planning of toolbox talks discussed among research participants when linking hazards in profile to OHSMS • Strategies regarding too box talks planned	• Information sharing regarding hazards compared against hazards listed in hazard profile • Identified gaps in work scheduling regarding planned use of toolbox ta ks • Need to implement Toolbox talks – identified	• Workgroup representing management/decision makers • Workgroup representing parts of the business • Allocation of time to construct HP • Need to implement Too box talks – identified
14.	Additions made to hazard profile independently of researcher and research activities (SME 'B', 'C' & 'D')	Activated	• Key informant is present and adopts facilitative approach when research participants make additional entries • Whiteboard is made available for more entries	• Key informant promotes additional entries to be made in hazard profile at other times to research activities • Research participants make entries at own time of choosing and own volition	• Workgroup representing management/decision makers • Workgroup representing parts of the business • Allocation of additional time to that provided for structured research activities is used to construct HP

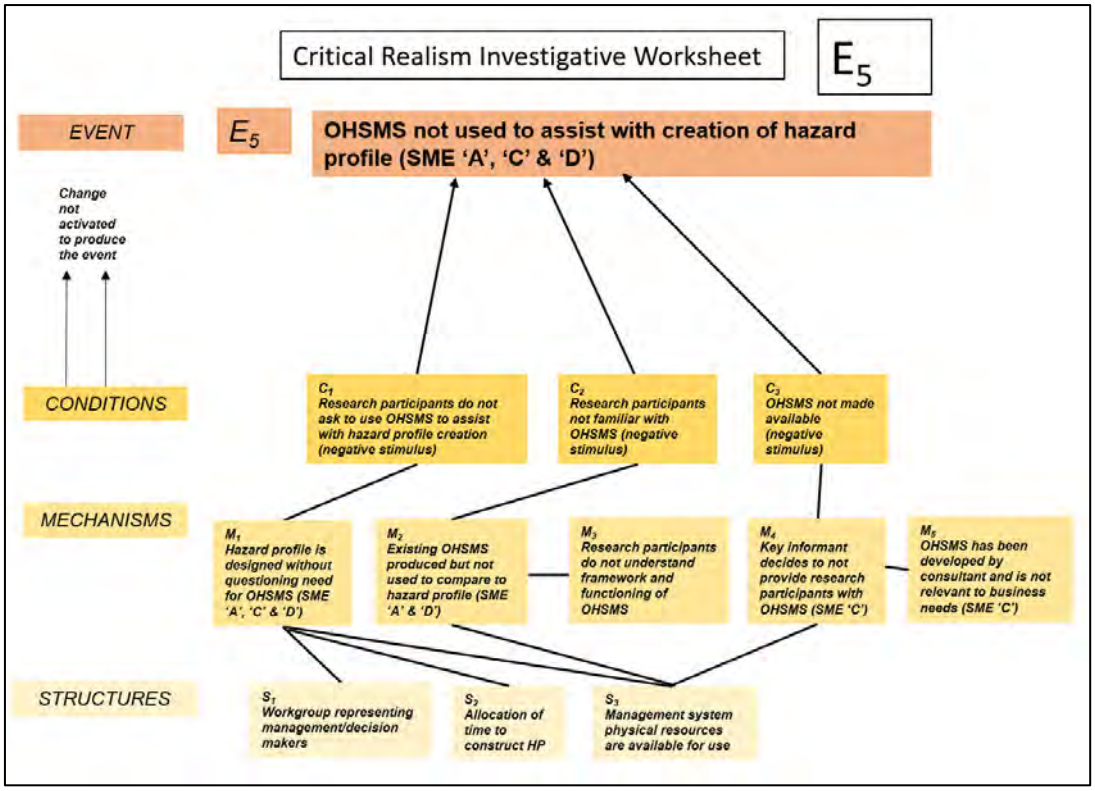
Source: Author, 2019.

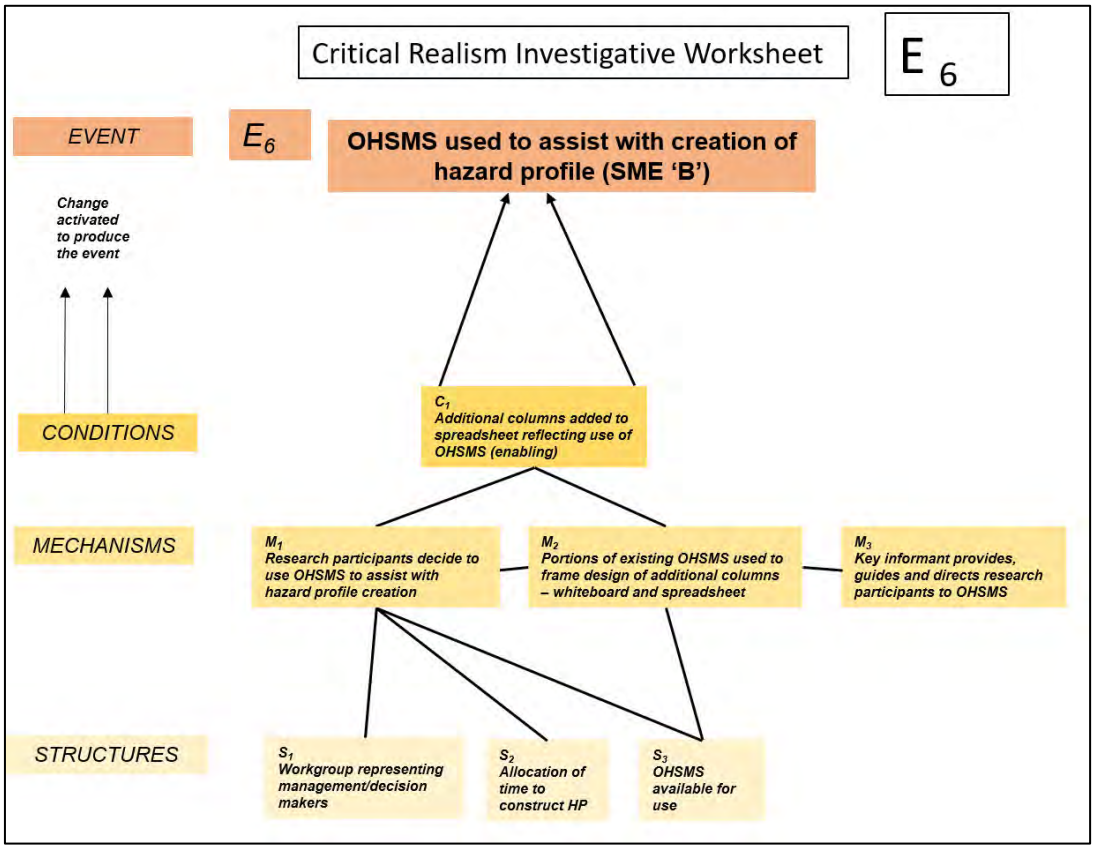

E 1
Critical Realism Investigative Worksheet
EVENT
E1
Hazard Profile. Creation on whiteboard. SME A, B, C, D
Change activated to produce the event
CONDITIONS
C1 Activity located away from distractions (enabling)
C2 Notations on whiteboard are observable, provide visual acuity and promote discourse (stimulus)
C3 Initial use of activities, products, services classification (releasing)
C4 Collaborative environments arise from a combination of mechanisms (enabling)
MECHANISMS
M1 Workshop sessions are scheduled to work on HP
M2 Tacit knowledge of workgroup contributes to entries on HP
M3 Provision of whiteboard and associated tools for its use
M4 Whiteboard retained in prominent location to foster incidental discussions between scheduled workshop sessions
M5 Key informant guides creation of profile (links hazards and controls)
STRUCTURES
S1 Workgroup representing management/decision makers
S2 Workgroup representing parts of the business
S3 Allocation of resources to construct HP
S4 Management system scheduling and resource allocation enables HP activity to occur

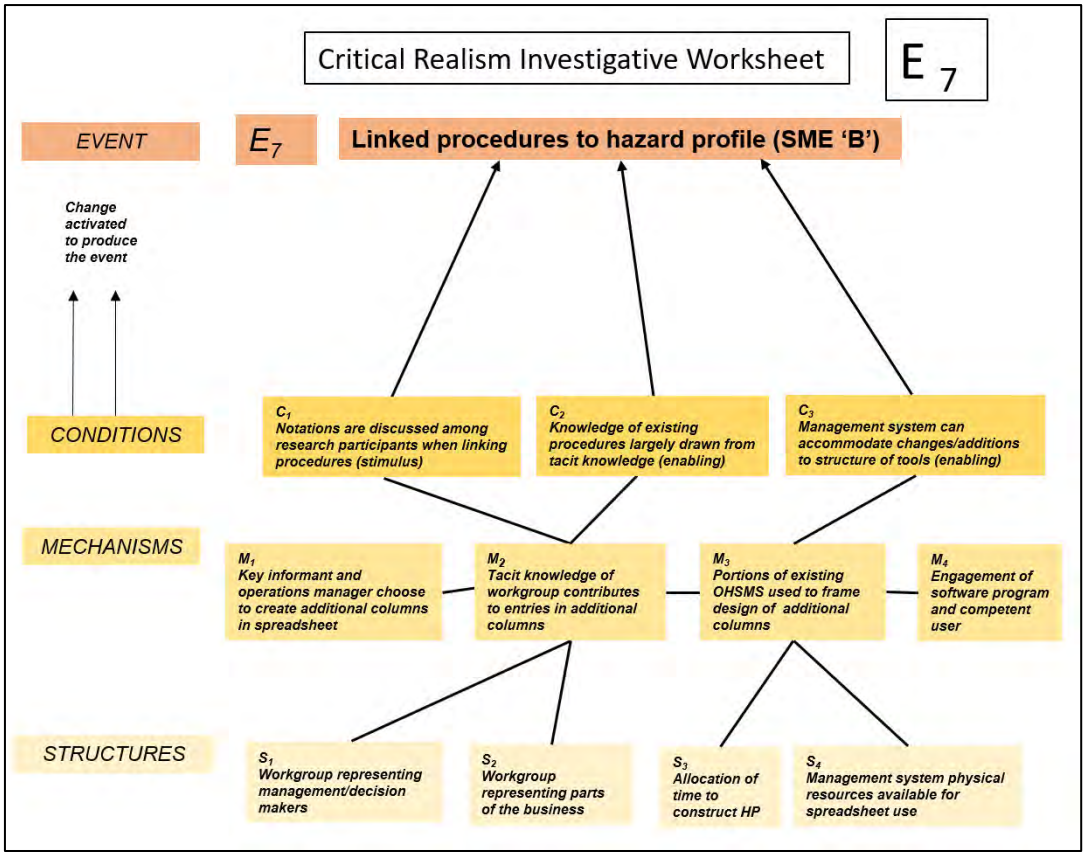

E 2
Critical Realism Investigative Worksheet
EVENT
E2
Hazard Profile. Creation on spreadsheet. SME B & D
Change activated to produce the event
CONDITIONS
C1 Notations are discussed among research participants when designing spreadsheet (stimulus)
C2 Comparisons made between spreadsheet and whiteboard as it is developed (stimulus)
MECHANISMS
M1 Key informant chooses to create spreadsheet
M2 Tacit knowledge of workgroup contributes to entries on HP
M3 Engagement of software program and competent user
M4 Whiteboard used as a reference point to populate spreadsheet
STRUCTURES
S1 Workgroup representing management/decision makers
S2 Allocation of time to construct HP
S3 Workgroup representing parts of the business
S4 Management system enables HP activity to occur
S5 Management system physical resources available for spreadsheet use

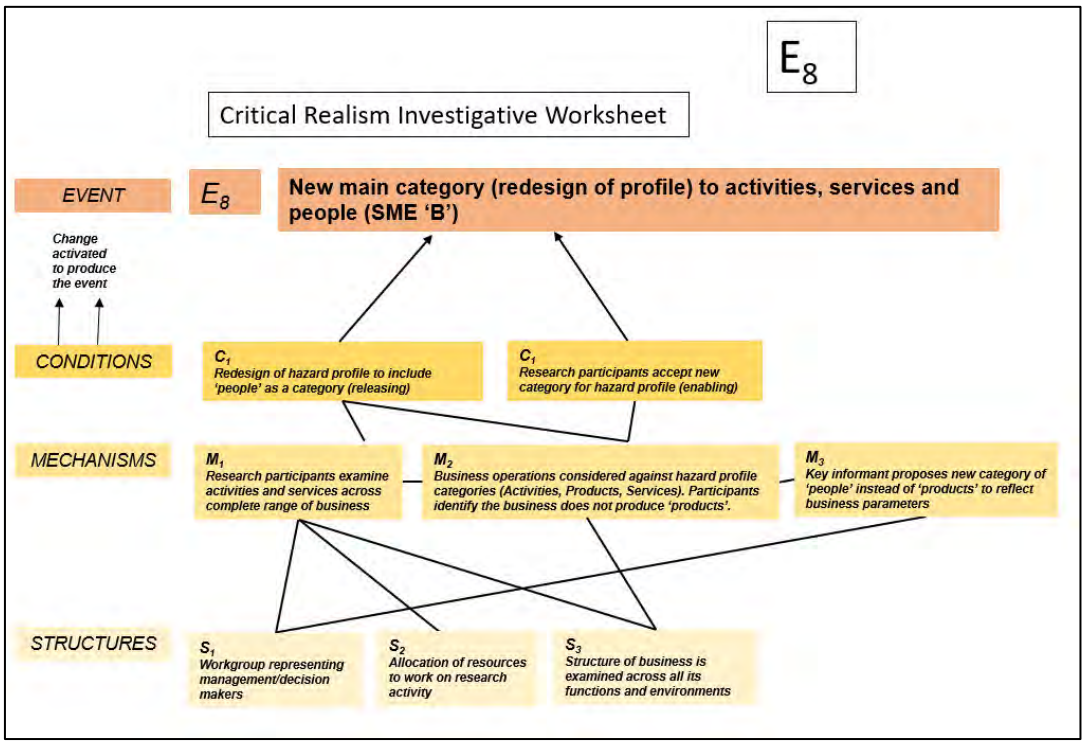

Critical Realism Investigative Worksheet
E 3
EVENT
E3
Spreadsheet discontinued during group design of HP (SME 'A')
Change activated to produce the event
CONDITIONS
C1 Spreadsheet not produced in remainder of research activity sessions (releasing)
MECHANISMS
M1 Key informant chooses to discontinue use of spreadsheet
M2 Research participants refer to whiteboard rather than spreadsheet – discontinue reference to spreadsheet
M4 Whiteboard used as a reference point to continue populating hazard profile
STRUCTURES
S1 Workgroup representing management/decision makers
S2 Allocation of time to construct HP
S3 Management system enables HP activity to occur
S4 Management system physical resources available for spreadsheet use

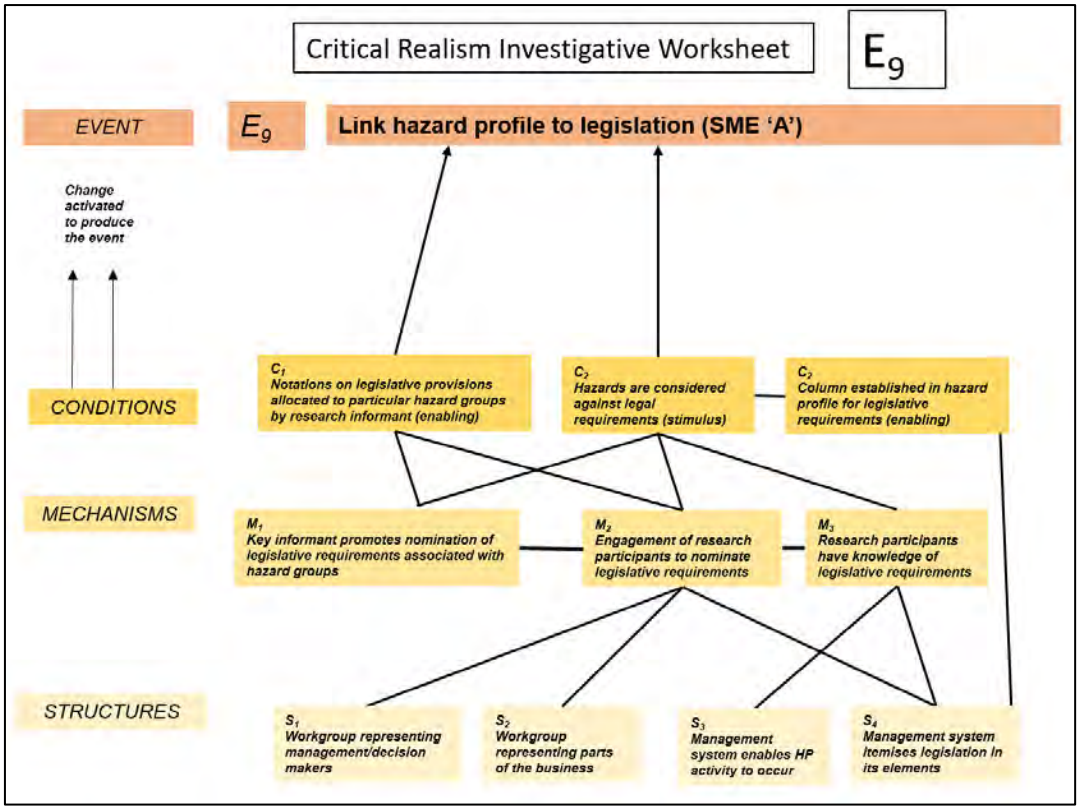

E 4
Critical Realism Investigative Worksheet
EVENT
E4
Additional hazards identified - fatigue, fitness for work, vehicle journeys, inadequate communication by supervisors and limited experience of supervisors (SME 'A ' & 'B')
Change activated to produce the event
CONDITIONS
C1 Design of hazard profile is conducive to accepting additional entries (releasing)
C2 Research participants accept new additions to hazard profile (enabling)
MECHANISMS
M1 Research participants examine activities and services across complete range of business
M2 Whiteboard used to populate hazard profile
M3 Tacit knowledge of workgroup contributes to entries for new hazards on hazard profile
STRUCTURES
S1 Workgroup representing management/decision makers
S2 Allocation of resources to work on research activity
S3 Structure of business is examined across all its functions and environments

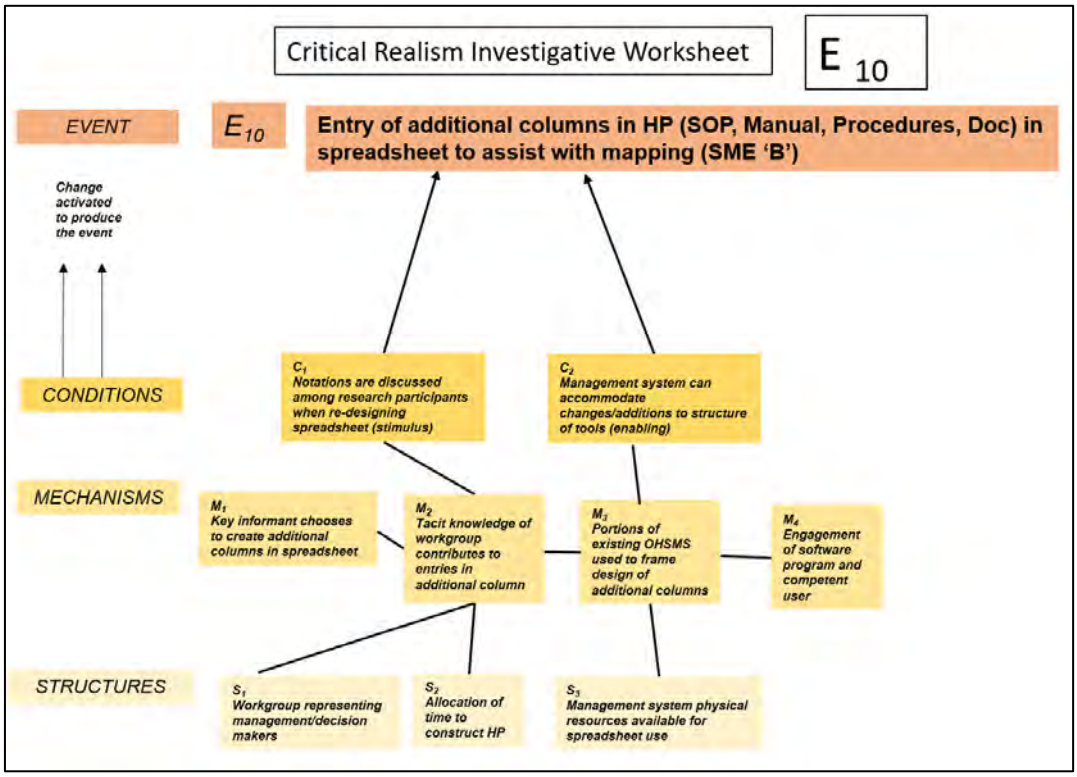

Critical Realism Investigative Worksheet
E5
EVENT
E5
OHSMS not used to assist with creation of hazard profile (SME 'A', 'C' & 'D')
Change not activated to produce the event
CONDITIONS
C1 Research participants do not ask to use OHSMS to assist with hazard profile creation (negative stimulus)
C2 Research participants not familiar with OHSMS (negative stimulus)
C3 OHSMS not made available (negative stimulus)
MECHANISMS
M1 Hazard profile is designed without questioning need for OHSMS (SME 'A', 'C' & 'D')
M2 Existing OHSMS produced but not used to compare to hazard profile (SME 'A' & 'D')
M3 Research participants do not understand framework and functioning of OHSMS
M4 Key informant decides to not provide research participants with OHSMS (SME 'C')
M5 OHSMS has been developed by consultant and is not relevant to business needs (SME 'C')
STRUCTURES
S1 Workgroup representing management/decision makers
S2 Allocation of time to construct HP
S3 Management system physical resources are available for use

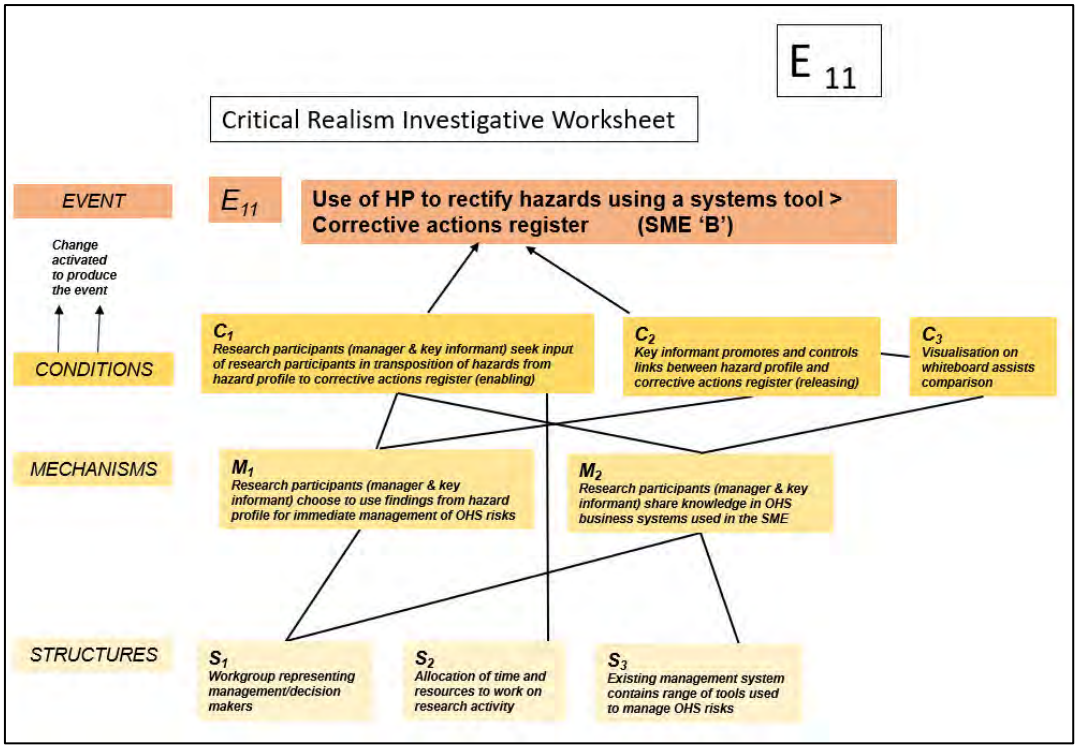

Critical Realism Investigative Worksheet
E 6
EVENT
E6
OHSMS used to assist with creation of hazard profile (SME 'B')
Change activated to produce the event
CONDITIONS
C1 Additional columns added to spreadsheet reflecting use of OHSMS (enabling)
MECHANISMS
M1 Research participants decide to use OHSMS to assist with hazard profile creation
M2 Portions of existing OHSMS used to frame design of additional columns – whiteboard and spreadsheet
M3 Key informant provides, guides and directs research participants to OHSMS
STRUCTURES
S1 Workgroup representing management/decision makers
S2 Allocation of time to construct HP
S3 OHSMS available for use

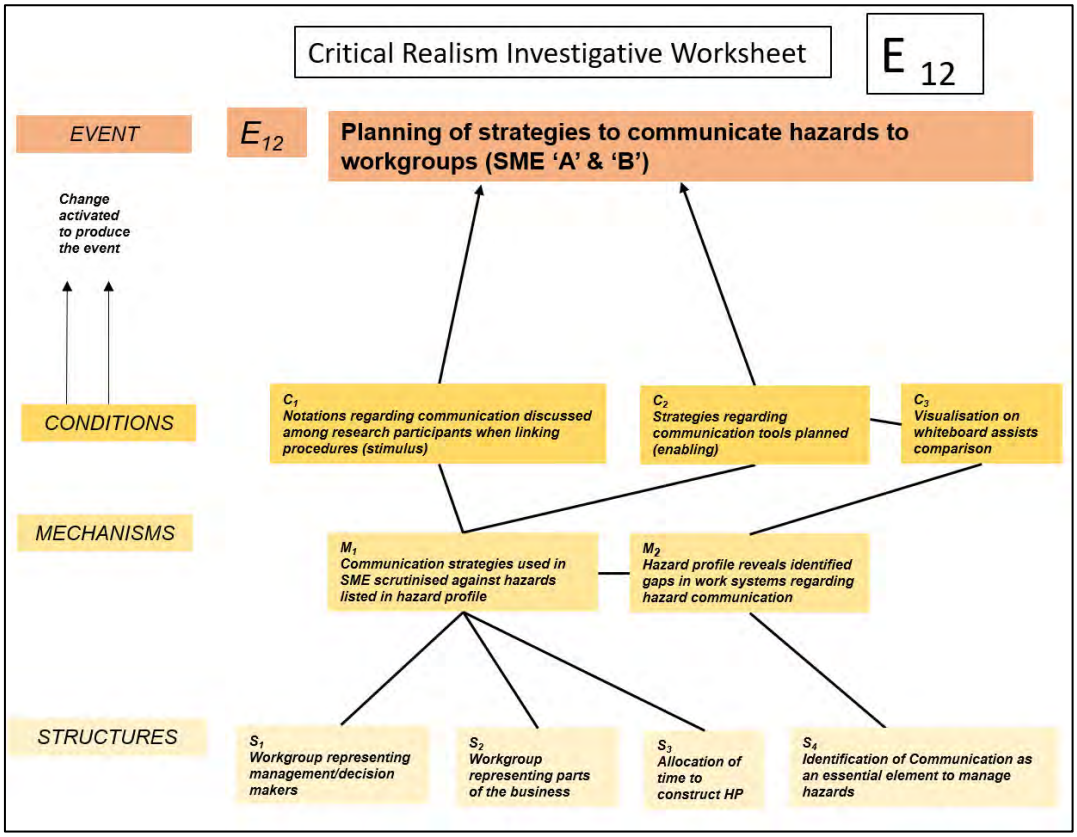

Critical Realism Investigative Worksheet
E 7
EVENT
E7
Linked procedures to hazard profile (SME 'B')
Change activated to produce the event
CONDITIONS
C1 Notations are discussed among research participants when linking procedures (stimulus)
C2 Knowledge of existing procedures largely drawn from tacit knowledge (enabling)
C3 Management system can accommodate changes/additions to structure of tools (enabling)
MECHANISMS
M1 Key informant and operations manager choose to create additional columns in spreadsheet
M2 Tacit knowledge of workgroup contributes to entries in additional columns
M3 Portions of existing OHSMS used to frame design of additional columns
M4 Engagement of software program and competent user
STRUCTURES
S1 Workgroup representing management/decision makers
S2 Workgroup representing parts of the business
S3 Allocation of time to construct HP
S4 Management system physical resources available for spreadsheet use

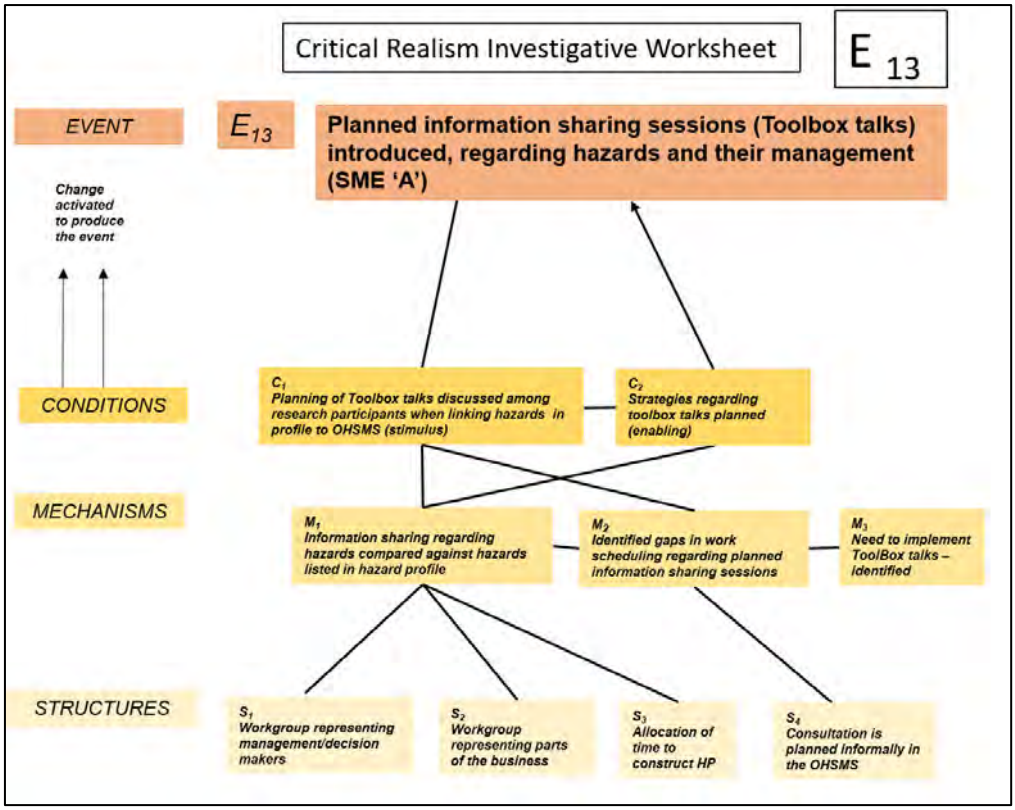

E8
Critical Realism Investigative Worksheet
EVENT
E8
New main category (redesign of profile) to activities, services and people (SME 'B')
Change activated to produce the event
CONDITIONS
C1 Redesign of hazard profile to include 'people' as a category (releasing)
C1 Research participants accept new category for hazard profile (enabling)
MECHANISMS
M1 Research participants examine activities and services across complete range of business
M2 Business operations considered against hazard profile categories (Activities, Products, Services). Participants identify the business does not produce 'products'.
M3 Key informant proposes new category of 'people' instead of 'products' to reflect business parameters
STRUCTURES
S1 Workgroup representing management/decision makers
S2 Allocation of resources to work on research activity
S3 Structure of business is examined across all its functions and environments


Critical Realism Investigative Worksheet
E9
EVENT
E9
Link hazard profile to legislation (SME 'A')
Change activated to produce the event
CONDITIONS
C1 Notations on legislative provisions allocated to particular hazard groups by research informant (enabling)
C2 Hazards are considered against legal requirements (stimulus)
C2 Column established in hazard profile for legislative requirements (enabling)
MECHANISMS
M1 Key informant promotes nomination of legislative requirements associated with hazard groups
M2 Engagement of research participants to nominate legislative requirements
M3 Research participants have knowledge of legislative requirements
STRUCTURES
S1 Workgroup representing management/decision makers
S2 Workgroup representing parts of the business
S3 Management system enables HP activity to occur
S4 Management system itemises legislation in its elements


Critical Realism Investigative Worksheet
E 10
EVENT
E10
Entry of additional columns in HP (SOP, Manual, Procedures, Doc) in spreadsheet to assist with mapping (SME 'B')
Change activated to produce the event
CONDITIONS
C1 Notations are discussed among research participants when re-designing spreadsheet (stimulus)
C2 Management system can accommodate changes/additions to structure of tools (enabling)
MECHANISMS
M1 Key informant chooses to create additional columns in spreadsheet
M2 Tacit knowledge of workgroup contributes to entries in additional column
M3 Portions of existing OHSMS used to frame design of additional columns
M4 Engagement of software program and competent user
STRUCTURES
S1 Workgroup representing management/decision makers
S2 Allocation of time to construct HP
S3 Management system physical resources available for spreadsheet use


E 11
Critical Realism Investigative Worksheet
EVENT
E11
Use of HP to rectify hazards using a systems tool > Corrective actions register (SME 'B')
Change activated to produce the event
CONDITIONS
C1 Research participants (manager & key informant) seek input of research participants in transposition of hazards from hazard profile to corrective actions register (enabling)
C2 Key informant promotes and controls links between hazard profile and corrective actions register (releasing)
C3 Visualisation on whiteboard assists comparison
MECHANISMS
M1 Research participants (manager & key informant) choose to use findings from hazard profile for immediate management of OHS risks
M2 Research participants (manager & key informant) share knowledge in OHS business systems used in the SME
STRUCTURES
S1 Workgroup representing management/decision makers
S2 Allocation of time and resources to work on research activity
S3 Existing management system contains range of tools used to manage OHS risks


Critical Realism Investigative Worksheet
E 12
EVENT
E12
Planning of strategies to communicate hazards to workgroups (SME 'A' & 'B')
Change activated to produce the event
CONDITIONS
C1 Notations regarding communication discussed among research participants when linking procedures (stimulus)
C2 Strategies regarding communication tools planned (enabling)
C3 Visualisation on whiteboard assists comparison
MECHANISMS
M1 Communication strategies used in SME scrutinised against hazards listed in hazard profile
M2 Hazard profile reveals identified gaps in work systems regarding hazard communication
STRUCTURES
S1 Workgroup representing management/decision makers
S2 Workgroup representing parts of the business
S3 Allocation of time to construct HP
S4 Identification of Communication as an essential element to manage hazards



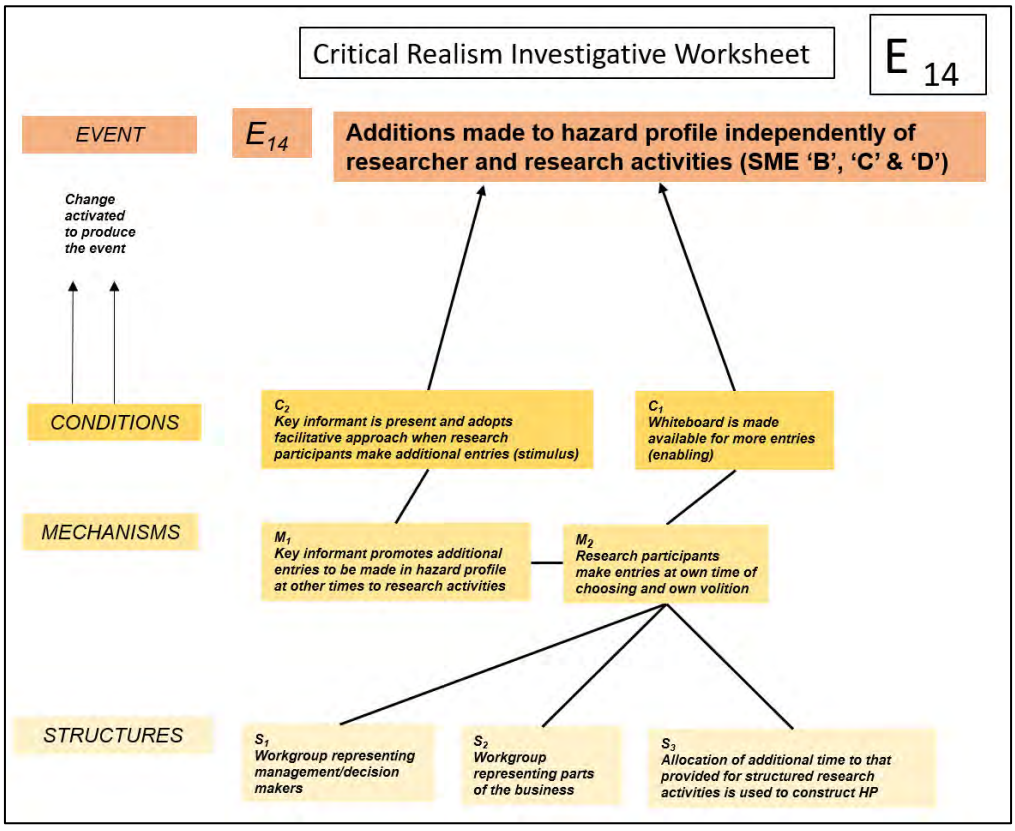


Figure 5.1: Results of the analysis of events

Source: Author, 2019.

5.3.2 Summary of events

The analysis of events revealed some significant factors associated with their causation and connections with the phenomenology. The creation of a hazard profile itself was at the forefront of the events, confirming that research participants had developed a conceptual design based on a socially constructed reality within their own organisational context. Each SME had produced a hazard profile graphically on a whiteboard and within two SME's the profile had also been created on a spreadsheet. Fundamental requirements for the profile's creation that were categorised within the structures of the critical realism framework lay in the necessity for the assigning of suitable human resources, allocated scheduling to work on the collaborative creation of the profile and the provision of physical resources to facilitate the development and recording of the profile. The adoption of these by each SME is a prominent feature within each of the structures found in the Investigative Worksheets and reflects the sociotechnical context that was required to facilitate the development of the hazard profile.

The visual depiction and sharing of information in the design of the hazard profile was a common mechanism appearing across several events. The graphical display of the hazard profile was also dependent on other mechanisms, being the tacit knowledge related to hazards and their management, and the key informant's facilitation in engaging other research participants to draw out knowledge. These mechanisms supported the conditions characterised by collaborative social interactions, giving rise to a transparent and visible profile which was reproduced structurally in similar ways across the SMEs to produce the same event.

Two other significant events sharing similar mechanisms and conditions involved contextual changes to the profile itself. Firstly, the use of a modified classification to 'activities, products and services' for one of those elements was designed to better reflect the context of the business. Another event involved the creation of additional criteria in a matrix to compare hazards against parts of the OHSMS to determine if and how they were managed. Mechanisms supporting this included the ability to modify the profile's structure to accommodate additional criteria to compare against the hazards named in the profile, tacit knowledge drawn from the research participants and guidance provided by the key informant. The events arising from these mechanisms and conditions support the phenomenology associating the hazard profile with the SME's business contexts.

Systems knowledge and knowledge of the OHSMS were observed as limited when examined between research participants in each SME. Several responses from interviews regarding knowledge of the OHSMS confirmed a limited knowledge of the OHSMS. The

choice to not elect to use the OHSMS was recorded as a tendency within the mechanisms. Phenomenology associated with knowledge of the OHSMS and its use in the creation of a hazard profile confirmed as not having a significant presence within three of the four SMEs. However, some linkages were made between the hazard profile and the OHSMS, principally in the use of procedures in one instance in the determination of OHS legal requirements against the hazard profile and in another where an alignment was made against operational controls.

A recognition of newly identified hazards and others that had not been adequately addressed formed a basis for action within three events, where a corrective actions register was developed, and some consultative strategies were introduced to assist in the communication of hazards. The mechanisms associated with these events shared common sociotechnical factors regarding information systems analysis and information transfer. They can be associated with the phenomenology relating to the usefulness of the hazard profile for managing hazards and consequent risks, and the emergence of reflective learning from those specific activities.

Several emergent factors contributing to the events associated principally with the creation of a hazard profile can be summarised from this analysis as follows:

- the allocation of suitably skilled and knowledgeable human resources
- the provision of time allocated during work hours for its construction
- the employment of a visual medium to record the profile
- the availability of the OHSMS
- the use of a key informant to guide the hazard profiling activity
- the adoption of a classification framework for the profile that is adapted to the context of the SME.

These factors represent the cornerstone of the structures and mechanisms that emerged from the research activities for a hazard profile to be developed to the needs and context of each SME. Events associated with the creation of the hazard profile in turn triggered other events such as the use of a corrective actions register to assist in mitigating newly identified hazards, and identified the need to employ consultation strategies to assist in communicating hazards and associated risks to the workforce.

However, a note of caution is made regarding these observations recorded and analysed within the paradigm of critical realism. Bhaskar (1998, p. 41) proposes that social structures and associated mechanisms ‘cannot be empirically identified independently’ of the events.

Therefore, the structures, mechanisms and conditions that have contributed to their existence within this research lay a foundation for the recognition of what had produced them but may not be ‘causally sufficient’ (Wynn & Williams 2012, p. 795) to identify all causes and exclude any other contributory factors. The events are a product of the activities and contributions that influenced their outcome, which may or may not be reproduced in other circumstances where hazard profiling is undertaken within another research project or other intervention strategy.

5.4 A synthesis of findings from the two paradigms

Results arising from the adoption of the two research paradigms used in this study can be synthesised into several distinctive and interconnected findings. The constructivist-based exploration of world views expressed by the research participants reflected their individual and socially constructed realities in relation to the phenomenology, which are formed in specific time-based and social circumstances (Zhang et al.2011). The causality associated with those realities and the actions arising from them were explored using the critical realist framework encompassing structures, mechanisms and conditions. Individual and socially constructed realities resided within that framework, offering a composition of worldviews and observable events linked to causal mechanisms. The junctures in the phenomenology associated with the two paradigms and the associated organisational contexts that gave rise to the dialogue and events are discussed in this section, utilising the contextual terminologies associated with both constructivism (Denzin & Lincoln 2013) and critical realism (Sayer 1992; Wynn & Williams 2012).

5.4.1 Hazard profile design framework

The hazard profile design framework of activities, products and services was reported through the discourse and associated worldviews of research participants as one that can be readily adopted from the standard AS/NSZ ISO 45001 (AS/NZS ISO 2018). Research participants had noted immediate relevance to this framework. The underlying causality for this framework to be accepted and used laid within the following structures and mechanisms:

- an investment in human resources that harnessed relevant tacit knowledge related to the SME’s business operations
- the provision of conditions for interactive teamwork
- the use of a facilitator to guide the process
- the adoption of various visual mediums, with a strong preference for those that can be easily viewed by the group.

The research identified that the categorisation of activities, products and services may not suit all organisations, where some do not develop products for sale, although the supply of services and the conduct of activities are likely to represent the two main pillars for the conduct of the business. Innovative approaches adopted through the introduction of new mechanisms, for example, a reclassification of 'product' to 'people' for a service-oriented organisation, supported the adaptability of the framework.

5.4.2 Hazard identification: a key feature within a hazard profile

The adoption of hazard identification strategies arose through social activities and interactions and was reported by research participants as a substantial outcome associated with the design of a hazard profile. Although this was observed as arising from a subjectivist epistemology, a consistent causality within the events associated with this action relied on:

- the use of a facilitator to guide the process
- an investment in human resources that harnessed relevant tacit knowledge in relation to hazards generated within the SME
- the provision of conditions for interactive teamwork
- the adopted framework of activities, products and services which promoted a diverse exploration for hazards, identifying newly recognised hazards in conjunction with confirming existing hazards.

These observations reflect the need to ensure that the operational context (see Figure 1.1) regarding the design and implementation strategies for the creation of a hazard profile are addressed to ensure a firm foundation from which hazards can be identified. The recognition of existing and newly realised hazards consequently prompted research participants to determine the presence or absence of mitigation strategies to manage those hazards.

5.4.3 Adoption of control strategies to manage hazards within the profile

The adoption of control strategies to mitigate the effects of hazards identified within the hazard profile was observed where research participants voluntarily reported this as a required action. This was not explicitly planned within the research but emerged as a prominent outcome of the research data. The planning of control strategies was observed within similar multiple realities of the research participants across three of the SMEs and was characterised by attention directed to operational controls and workforce communication initiatives occurring across the events. This causality was supported by structures that invested in human resources and the management systems used to implement control strategies within the SME's operations. The mechanisms giving rise to the event consisted of:

- the tendency for research participants to actively seek controls to mitigate hazards identified within the hazard profile
- the use of a facilitator to source and provide appropriate enterprise documentation related to the controls
- the capacity of the research participants to draw on tacit knowledge to formulate control strategies
- the adoption of existing tools or creation of new initiatives to implement control strategies.

Hazard control strategies were an unexpected event that occurred within the research activities and reflect the property of emergence within the critical realist paradigm (Easton 2010, p. 121; Wynn & Williams 2012, p. 792), where various structures and mechanisms interact and influence an outcome. An association emerged between the structures representing workgroups within the business and the mechanism or causal power (Wynn & Williams 2012) of comparing gaps within various systems used to control hazards. Conditions associated with the visual presentation of the hazard profile facilitated the immediacy of recognised gaps and the shared tacit knowledge communicated between research participants within the collaborative environment interacted to influence the development of hazard control strategies.

5.4.4 Linking the hazard profile to the OHSMS

When examined within the constructivist paradigm, the use of the OHSMS to seek alignment to the hazard profile was not strongly associated within any of the SMEs participating in this research. World views and realities exhibited by the research participants reported limited knowledge, involvement and use of the OHSMS. However, data gathered from interviews and focus groups in relation to this phenomenon was contrary to some events recorded within the critical realist paradigm, reflecting an intuitive causal action that pursued actions to rectify identified gaps in identified hazards and their management.

Events where the OHSMS was not used to assist with creation of a hazard profile shared structures that provided physical and human resources to use in the practice of seeking an alignment between the hazard profile and the OHSMS. However, the mechanisms that could give rise to the continuity of this process, being the active use of the OHSMS, were not prevalent in three of the four SMEs, thereby not providing the conditions for those linkages to be explored and established.

In the one event where the OHSMS was used to assist with the creation of the hazard profile, the mechanism associated with the tendency by the key informant to promote the

use of the OHSMS was instrumental in providing an environment that could promote the change. The event arising from these mechanisms led to the modification of the profile to include additional columns seeking to map the hazards within the profile to operational procedures and the use of a corrective actions register for newly identified hazards that required mitigation (see Section 5.4.3)

5.5 Constructivism and critical realism: complementary research paradigms

Constructivism offers a reflection of reality produced by individuals experiencing and interacting with something within their world, especially in social settings where mutually constructed meanings are formed. Within this research, those views and realities were recorded through discourse and observations, and then analysed and synthesised using a hermeneutic method (see Table 5.1).

The analysis undertaken within a constructivist framework in this research identified social phenomena confirming that hazard profiling was a useful activity for visually mapping the organisation's business against its hazards. Newly identified hazards could be recognised, documented within the OHSMS, and corrective actions formulated. The collaborative activities and tacit knowledge shared between the research participants were reported as being highly valued in contributing to the hazard profile. These observations and occurrences reported within a constructivist framework reflected social phenomena, comprising the beliefs and realities arising from the interactions between the research participants.

Social phenomena obtained and examined through empirical observations is proposed by Creswell (2014, p. 8) as being both subjective and complex, requiring the complexities associated with the meanings of the experiences to be identified. Hoddy (2019) draws a stratified critical realist view of the underlying basis and complexities of empirical observations, linking these to related events that occur in the actual world and the associated structures and mechanisms that generate those events. A stratified critical realist view of this is proposed in Figure 5.2.

Hoddy's conceptual model (Figure 5.2) proposes that reality is stratified into the domains of the 'real' (what can be identified as social objects, structures and mechanisms), the 'actual' (being the observable and unobserved events) and the 'empirical' (being the beliefs and experiences of individuals). The domain of the 'empirical' can encompass a constructivist paradigm, where reality is reflected in the discourse and observations obtained from research participants in relation to their social world and the subject in question. The

domains of the ‘actual’ and ‘real’ are aligned to the critical realist paradigm. Therefore, this conceptual model depicts a significant relationship between constructivism and critical realism, where empirical evidence as shown within the inner ring of Figure 5.2 is required as a foundation in order to examine events and their causality, depicted in the two outer rings.

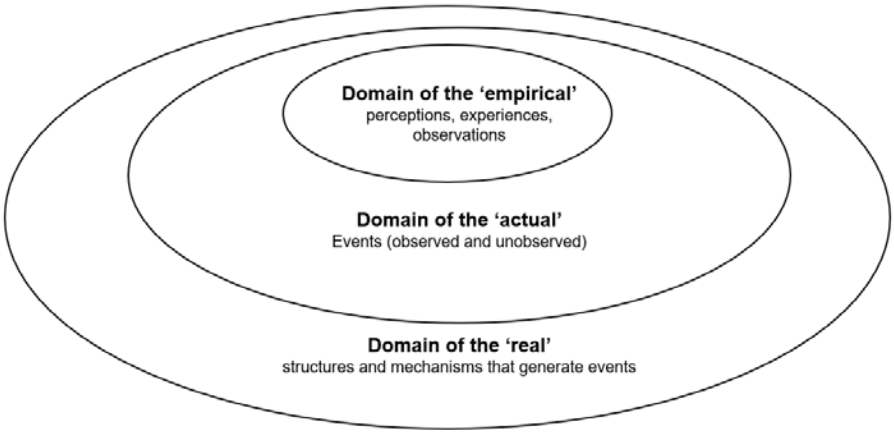


Figure 5.2 A critical realist view of stratified reality
Source: Hoddy, E.T (2019, p. 113).

This conceptualisation was adopted within the research approach in this study (see section 3.4.2.3 and Figure 4.1) by obtaining and analysing research data using a constructivist approach prior to undertaking a causal analysis using a critical realist approach. Empirical data obtained within a constructivist paradigm provided a rich foundation from which the critical realist paradigm could be applied to search for causality associated with events to better explain the reality and associated actions that research participants communicated and exhibited through their perceptions and actions.

The adoption of the critical realist view of stratified reality (Hoddy 2019) has been applied within this research, where the epistemology and methodology associated with the two research paradigms are summarised in a new conceptual model (see Figure 5.3) that draws on the work of Sayer (1992) and Hoddy (2019). Sayer’s critical realist model of structures, mechanisms and events (see Figure 3.2) contributes to the events within Figure 5.3, as it depicts a progression and sequence in seeking causality that incorporates the domains of the ‘actual’ and ‘real’ as also proposed by Hoddy (2019).

An overlap exists between the empirical findings, residing within the mutually constructed meanings and associated occurrences within the research activities located in the constructivist paradigm, and the critical realist paradigm that seeks a casual analysis for the events identified as arising from the empirical findings. The overlap is shown within Figure

5.3, where events are identifiable as they arise from the constructivist-based research and are identified as a starting point for the search for causality within the critical realist inquiry.

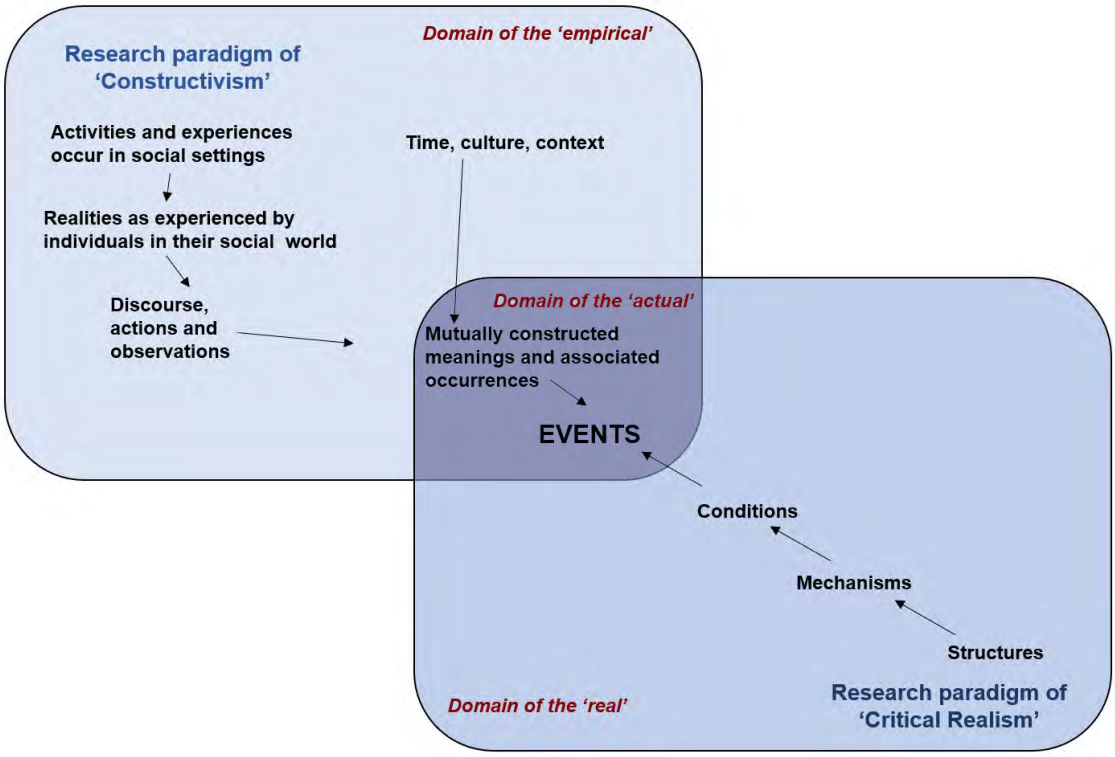


Figure 5.3 Events: A junction between constructivism and critical realism
Source: Adapted from Sayer (1992, p. 109 and p. 117) and Hoddy (2019, p. 113).

The adoption of such a sequential approach was instrumental in gathering sufficient data from which events could be identified and used to explore their causality. If a constructivist research paradigm was used on its own in this research, a descriptive collation of research participant accounts and narratives reflecting their reality and experiences at a point in time would have been evident, but a deeper analysis of the causality underpinning their thoughts, decisions, social interactions and observable actions would not have been possible. Conversely, a potential limitation of the critical realist paradigm was that if used on its own without a constructivist paradigm, the firm foundation of available empirical data would not have been gathered and available for analysis within the critical realist analysis.

The two research paradigms necessitated their integration within the analysis. Empirical observations obtained with a social constructivist paradigm, by their very nature are also temporary (Healy & Perry 2000, p.123). Occurrences, experiences and shared meanings may be transient and not reoccur within a similar context in the future, since what is found is relevant to a particular time, workplace culture and context (Syed, Mingers & Murray 2009, p. 74). The subjective, complex and potentially transient nature of the empirical data

collected using a constructivist paradigm was explored further, to search for the triggers and complexities that promoted those beliefs and realities, prior to that potential transience occurring.

In this study, a firmer foundation relating to the causality associated with those beliefs, realities and associated actions was identified. Critical realism offered a deeper study of the phenomena, where structures, mechanisms and conditions associated with events within the research activities could be further explored for causality, rather than focus only on the findings generated through a constructivist analysis at one point in time.

Masi et al. (2019, p. 53) propose a need for such fusion between realistic analysis and social change, where an 'interaction between a set of mechanisms promoting the social change and a context that enables or disables these mechanisms' should be used in order to identify the causality of what has succeeded within the research and for whom, and the associated conditions that explain how this has occurred. This interplay between elements of social construction and change was identified and examined in this research for their underlying causality.

This approach was one that can also be aligned to a pragmatic worldview. Pragmatism arises from 'actions, situations and consequences' (Creswell 2014, p. 10) that seek to determine what has worked and what can be offered as a solution (Patton 2002, p. 136). Pragmatism takes the view that the most important position adopted with the researcher's philosophy is the research question (Saunders, Lewis & Thornhill 2009, p. 128), which may require more than one type of inquiry. Therefore, research can adopt positions associated with different paradigms, assumptions, data collection methods and methods of analysis. A pragmatic standpoint is increasingly being used in research (Hannes & Pearson 2012) in order to draw on strengths from different paradigms.

The adoption of a constructivism and critical realism provided a richer analysis. Narratives were explored further to determine how they were initiated in a framework to identify the causal features contributing to their emergence by seeking structures, mechanisms and conditions giving rise to the events. This provided a better position to understand and report on the social world of the research participants and the SME's context, and consequently in part answered the research questions through the phenomenological concepts.

5.6 Reviewing the phenomenological concepts

This study sought to address the following research questions (see Figure 1.1):

1. Does a hazard profile mapped to an SME's business contexts identify and record the SME's hazards?
2. Does hazard profiling facilitate alignment to the OHSMS framework used by the SME, and will this assist in managing OHS risks?

These questions encompassed the variables of hazard profiling, the SME's organisational context and its OHSMS framework. In association with these variables, three contextual factors were incorporated into the research methods (see Figure 3.1) and associated research instruments, being the utilisation of a participatory approach to facilitate the engagement of tacit knowledge, establishing the relevance and alignment of approaches to stakeholder perspectives and the incorporation of organisational context.

The phenomenology associated with the two research questions (see section 4.3.1) was created as conceptual phrases integrated within the research variables and contextual factors. The outcomes of this integration and a closing analysis of the phenomenology underlying these questions, associated variables and contextual factors is addressed in this section. Each phenomenological concept is examined and draws on the analysis arising from the Thematic Conceptual Matrix (see Table 5.1), associated findings arising from the constructivist analysis (see section 5.2.2) and the critical realist analysis (see section 5.3.2).

5.6.1.1 Concept of a hazard profile

The concept of a hazard profile was readily grasped and used by research participants in each SME. For this to occur, actions associated with its design and construction required the use of a facilitator, recognised within this research as a key informant, along with the engagement of research participants familiar with the operational contexts of the business and the fostering of a participatory approach. A visual presentation of the hazard profile facilitated communication regarding the hazard profile as a concept and its application to selected business context and structures depicted within the profile. As a result, the hazard profile had the capacity to record the SME's hazards.

5.6.1.2 Design features of a hazard profile

The overall framework and design features of the hazard profile was dependent on the classification system used to reflect the operational context of the business and the relevance of this to the individual perspectives of the research participants. An initial classification of activities, products and services as proposed in AS/NZS ISO 45001 (AS/NZS ISO 2018) provided a sound point from which to commence the design. However, such a classification did not suit all SME operational contexts, particularly where one classification parameter was not represented within the business. However, the malleable

and generic nature of the hazard profile classifications and associated participatory practices allowing the expression of world views provided a means for research participants to adapt the classification to one that was more reflective of their own operational contexts.

5.6.1.3 Usefulness of the hazard profile

The hazard profile was reported as a useful tool by each SME. The operational context featured prominently within this phenomenology, where operational processes and tools were accessed and used by research participants to mitigate and control newly identified hazards within the hazard profile. This supported research undertaken by Islam and Telford (2012) which found that hazards are often identified in SMEs through targeted activities and tools supplied to the SME. The usefulness of the profile could also be measured in the planning of corrective actions that it had generated. These were identified through interview questions and observations, where discourse and participatory process contributed to the formulation of corrective action plans in a visual extension of the hazard profile on the whiteboard, thus validating its use.

5.6.1.4 Alignment between the hazard profile and the SME's business contexts

The alignment of the hazard profile to the SME's business contexts was evident within each SME's profile, where the classification framework of activities, products and services was adapted to the operational context of each SME. The organisational context was critical here, where inclusion of research participants suitably versed with the organisation's operations due to their hierarchical position within the SME and their accompanying tacit knowledge were critical factors in contributing to this alignment.

5.6.1.5 Knowledge on the OHSMS and its use

Research participant knowledge of the OHSMS and how it is used was not strongly exhibited across any of the SMEs by research participants, other than by the key informant. An OHSMS was previewed by the researcher in each of the SMEs, therefore verifying the existence of an OHSMS. The SME's operational context within their OHSMS was characterised by a tendency to deal with niche operational issues and a reliance on verbal communications, rather than a familiarity with and application of a range of elements in the OHSMS (see section 2.5 and 2.6.1). The association and practices reflected in this operational context and the organisational context of governance practices indicates that the key informant was a crucial part of the participatory process, providing tacit knowledge and guidance on how the operational contexts of the SME are incorporated into the OHSMS.

5.6.1.6 Links between hazard profiling and the OHSMS

Linkages between the hazard profile and the OHSMS were made principally by research participants within one SME. Linkages made by participants in other SMEs were established predominantly in the area of operational controls, highlighting a strong association between research participant perspectives that connect the OHSMS with operational procedures. Such observations suggested that within the participating SMEs for this research, the operational context is closely associated with operational procedures for the management of OHS hazards.

5.6.1.7 Visual mapping as a tool used in the creation of the profile

Visualisation of the hazard profile was used from the commencement of the research activities. The incorporation of the initial classification of activities, products and services and the adoption of the organisation's own operational contexts into the design and subheadings facilitated the engagement of tacit knowledge and the acknowledgement of existing or newly identified hazards using participatory processes that aligned to the research participant's perspective of the hazards generated within the SME. The use of visual mapping facilitated a participatory approach, where perspectives were shared and discussed, contributing to the visualisation of hazards as they exist within the SME's operations.

5.6.1.8 Reflective learning arising from the research activity

Reflective learning was addressed within the phenomenological concepts to determine whether research participants would consider their own development of knowledge and application of the phenomena associated with this research project, and how that may translate to future strategies associated with hazard profiling. The primary source of data for this phenomenon was drawn from interviews and focus group activities.

Reflections provided by research participants supported a positive association with the structures adopted within the hazard profile, contributing to an affirmation of the first research question regarding the ability of a hazard profile to identify and record the SME's hazards. Their engagement, tacit knowledge and acceptance of their own perspectives facilitated through participatory processes were acknowledged as contributing to the attainment of a greater understanding of hazard profiling.

However, the second research question sought an alignment of the hazard profile to the OHSMS, and was a phenomenon confirming less certainty. Most research participants expressed various levels of imprecision and pensiveness in forming such connections, suggesting that the operational context and organisational context did not presently support such linkages.

5.7 A summary of the research findings

The objective of this chapter has been to present, analyse, discuss and synthesise data collected within this research project. Research findings in relation to the phenomenology associated with the design and use of a hazard profile will be summarised firstly, followed by the phenomenology associated with linking the profile to the OHSMS.

5.7.1 Design and use of a hazard profile

At the commencement of this research, a hazard profile was proposed as a visual map of hazards that exist within an organisation, organised as broad groups against its various business functions. The concept of a hazard profile is a phenomenon that was readily grasped by research participants within each SME and reported as a useful tool. This was evidenced in the creation of a hazard profile by research participants in each of the four SMEs, and the consequent actions developed by some research participants to introduce corrective actions and consultation initiatives in response to some identified gaps. The operational context applied to the hazard profile was closely associated with operational procedures for the management of OHS hazards used within each SME.

Adopting the classification framework of ‘activities, products and services’ as provided in AS/NSZ ISO 45001 (AS/NZS ISO 2018) assisted in determining the SME’s own operational contexts and allowed for an immediacy in grasping the potential uses of a hazard profile. Structures and mechanisms needed to be established within the hazard profiling activity for this to occur, relying on a commitment by senior management to invest in human resources and the allocation of time for its development. The hazard profile activity was dependent on the key informant to assist research participants in relating the design and details within the hazard profile to operational work activities, therefore connecting its relevance to research participant perspectives.

The creation of the profile was also highly dependent on the sharing of tacit knowledge, which was facilitated by group discourse and supported through a visual presentation of the hazard profile. Reflections provided by research participants supported a positive association with the structures adopted within the hazard profile, contributing to an affirmation of the first research question regarding the ability of a hazard profile to identify and record the SME’s hazards.

A key factor not found within any literature reviewed for this study and demonstrated within each participating SME in this research is that SME’s can design their own hazard profile framework, that at least within their own perspectives identifies and assists in the management of OHS hazards across their business.

5.7.2 Linking a hazard profile to the OHSMS

Phenomenology associated with linking the hazard profile to the OHSMS was not strongly exhibited by research participants within this research. An OHSMS comprises core elements (see Chapter 2, Sections 2.5 and 2.6.1), but these were not recognised as functioning units of the OHSMS by research participants. Associations between the hazard profile and the OHSMS were established primarily in one element of an OHSMS, being the operational controls rather than across additional OHSMS elements. Links made between the hazard profile and operational controls used within the OHSMS relied on assistance from the key informant to describe and clarify relevant portions of the OHSMS associated with operational controls to research participants. Other research participants functioned as managers and line supervisors involved with governance of the organisation but were not adequately conversant with the functioning of the OHSMS.

Control strategies adopted to manage newly identified hazards arising from the hazard profile were evident in observations and associated communications between research participants but were applied without the acknowledgement of linkages to the OHSMS. Therefore, in answering the second research question, the hazard profile only facilitated a limited alignment to the OHSMS framework, being the portion concerned with operational controls and assisted in managing some OHS risks.

Observations and data collected from interview and focus group responses undertaken across each SME confirmed some research findings made by Legg et al. (2009), Hasle et al. (2012) and Masi and Cagno (2015) that SMEs are inadequately resourced and possess limited knowledge on OHSMS to be able to use them effectively. The forming of associations between the hazard profile and the OHSMS in order to better manage hazards in a systematic way is likely to require a specific targeted strategy for future research, perhaps in the form of a tool to further facilitate this process.

5.8 Concluding remarks for this chapter

This chapter has presented data collected within this research and discussed the results through the perspectives of both a constructivist and critical realist paradigm, affording a deeper explanation of the world views and actions observed within the research by also analysing and determining their causality. The findings provided in this chapter are presented in the next and final chapter of this research by firstly answering the research questions and then presenting a contribution to knowledge, where key inputs associated with the research phenomenology should be considered in the design of a hazard profile.

6 Conclusion

This final chapter answers the research questions through the triangulation of data and intersection points that relate to the underpinning phenomenology. Consequently, a case is presented for what can assist in the creation of a hazard profile through a graphic conceptualisation of inputs that contribute to its development and improved OHSMS practices. In addition, limitations associated with the research and key learnings of the researcher are discussed, prior to the presentation of recommendations and proposals for future research opportunities.

6.1 Answering the research questions

This section draws together the findings obtained from the two research paradigms used in this research (Chapter 5, Section 5.4) and the review of phenomenological concepts (Chapter 5, Section 5.6) to conclude this chapter on the research results and discussion, and accordingly answer the research questions. The findings serve a twofold purpose. Firstly, they summarise what occurred within the conduct of the research to answer the research questions. Secondly, they reflect guidance that may be sought for further research incorporating the associated phenomenology, or as an OHS intervention based on targeted activities that would seek to create a hazard profile independently of any research activity. The findings are synthesised in Figure 6.1 where inputs for creating a hazard profile are presented.

6.1.1 Research question 1: Hazard profiling and the recording of hazards

Research question one asks, ‘Does a hazard profile mapped to an SME’s business contexts identify and record the SME’s hazards?’

Evidence collected through the course of this research project confirmed the usefulness of the profile in identifying the SME’s hazards. Findings supporting this within the research phenomenology resided in the concept of a hazard profile, along with its design features and usefulness in managing hazards and consequent risks.

A hazard profile can be mapped to an SME’s business contexts and in so doing identify and record the SME’s hazards. The following factors were identified as needing to be present for this to occur:

- dedicated planning for the hazard profiling activity, where the organisational context of the SME is addressed through senior management commitment, the allocation of appropriate resources and the acknowledgement of the operational

context to ensure the hazard profiling activity is appropriately aligned to the SME's business

- a hazard profile development team that incorporates a cross section of persons involved in the governance of the SME, and the fostering of participatory approaches that draw on their tacit knowledge and perspectives when designing the hazard profile
- the use of a facilitator, being a person employed within the SME who has a high degree of familiarity with the OHSMS to guide the profiling activity
- the use of 'activities', 'products' and 'services' as a foundation for the classification, with a view to potentially adapting the classification to suit the SME's business contexts
- alignment of the profile to the operational contexts of the SME, in order that entries made in the profile reflect how the business operates
- the use of one or more mediums for the visualisation of the profile as it is developed, to foster transparency in its recording and promote discussion among the development team.

The underlying association among these factors lies in the context of the organisation. Each factor relates to the operational or organisational context within the SME. These factors have verified what was proposed earlier within this research in a conceptual model (see Figure 2.2) proposed by Bogna, Dell and Raineri (2018, p. 10) to support the development of a hazard profile, based on consideration for the internal context of the SME.

This research supports the view held by Masi et al. (2019) that consideration for the internal context is paramount when planning and implementing OHS interventions. These factors have been subsequently organised into an arrangement of inputs that may be readily usable for future research (see Figure 6.1) or conversely for the planning of intervention strategies that seek the creation of a hazard profile. These inputs are presented as the culmination of this research and are proposed as a contribution to knowledge (see section 6.3).

6.1.2 Research question 2: Alignment of a hazard profile to the OHSMS

Research question two asks, 'Does hazard profiling facilitate alignment to the OHSMS framework used by the SME, and will this assist in managing OHS risks'?

The research sought to establish whether research participants could make associations between the hazard profile's design and its identified hazards against the OHSMS

framework used by the SME, and so determine whether this association can assist in managing OHS risks. Phenomenology associated with this question comprised the alignment between the hazard profile and the SME's business contexts and knowledge on the OHSMS and its linkage to the hazard profile. This was facilitated by the phenomenology associated with visual mapping and was underpinned by the potential for reflective learning arising from the research activity.

This research question can be answered in two parts. Firstly, the association between the design of the hazard profile and its association to the SME's OHSMS can only be answered in the affirmative with one of the four SME's participating in the research. In referring to the events (see event '6' in Table 5.2), the causality associated with the use of the OHSMS was underpinned by the key informant providing guidance and direction to the research participants for this event to occur. In this instance, the research participants created the hazard profile to include additional sections of the OHSMS after which they designed corrective actions to be implemented, using a pre-existing tool used within the SME's OHSMS.

This event arose from the desire for the SME's business leaders to actively seek systemic improvements in their OHSMS, as evidenced by the focus group discussion which recorded the production manager as stating 'its evidence to say we do it better than some others …we want to be leaders in the field for our type of business' (see Table 5.1). The seeking of operational OHSMS targets was not observed in the other participating SME's, reflecting a need for future research to also consider the structures, mechanisms and conditions identified within the critical realist analysis that gave rise to this event.

The second part of the research question lay in the determination of whether the hazard profile could assist in managing OHS risks. Within the constructivist analysis, a majority of responses provided within the interviews and focus group activity exhibited an affirmative reply and positive reflective learning to the targeted questions regarding the usefulness of the hazard profile. However, the responses were not associated with the systematic use of the OHSMS in managing identified hazards, a point confirmed within the causality of events associated with this phenomenon. The seeking of reasons for this disassociation was not within the scope of the research. Causes may lie within the lack of effective OHSMS and resources to adequately create such systems (Sorensen, Hasle & Bach 2007) and consequently use them persistently in the management of hazards and associated risks, presenting an opportunity for further research.

6.2 Contribution to knowledge: inputs for creating a hazard profile

The contribution of this thesis lies in a synthesis of key factors arising from the research findings that can be used to create a hazard profile. A consolidation of these factors is assembled and presented as inputs in a unified, sequential process (see Figure 6.1) that contributes to the development of a hazard profile, and consequently to the potential for improved OHSMS practices.

Figure 6.1: Inputs for creating a hazard profile
Source: Author, 2019.

The inputs commence on the left of Figure 6.1, with the requirement for senior management commitment, after which various factors associated within the organisational context should be established in order to lay a foundation from which the hazard profiling activity can commence. Consideration for the operational context follows, requiring the integration of internal factors that includes accessing and using the current OHSMS and external standards that can provide guidance for a classification structure.

These inputs are drawn from the constructivist and associated thematic analysis (Chapter 5, Section 5.2), the analysis of events (Chapter 5, Section 5.3) and the associated phenomenological concepts reflected within the analysis (Chapter 5, Section 5.6). These factors position the operations of the organisation as central to the hazard profile. Finally, the creation of the profile is made using visual mediums that identify and records hazards in broad groups, during which an alignment is progressively sought against the OHSMS, and required actions or outcomes are recorded.

These inputs correlate with the framework of inquiry in Figure 1.1, where this study was firstly designed by incorporating the integration of organisational and operational contexts that embraced participatory approaches and alignment to stakeholder perspectives in testing whether these could contribute to the development of a hazard profile, record the SME's hazards and facilitate alignment to the OHSMS.

The finality of this study exhibited in Figure 6.1 represents the totality of inputs that were captured within the organisational and operational context and contributed to the outcome of a hazard profile. The removal of any factor may have resulted in a less comprehensive hazard profile. Using the approach proposed in Figure 6.1, these inputs can be observed, planned and used for the conduct of future research associated with hazard profiling, and by organisations wishing to develop a hazard profile as an intervention strategy. Its generic nature makes it applicable to both SMEs and larger organisations in any industry sector.

The requirements for the adoption of such an approach necessitates a substantial investment in time and human resources, but not in monetary outlay if the human resources used for its development are contained within the SME rather than engaging an intermediary or OHS consultant. The most effective interventions for SMEs are reported as those that are simple and offer a low-cost investment (Hasle & Limborg 2006; Legg et al. 2009) based on collaboration and dialogue that promotes information flow, which comprised one key facet of this research (see Figure 1.1).

6.3 Strengths and limitations

This study presented opportunities and outcomes for participating SMEs to gain further insight and practice in hazard identification within their own organisation by developing a hazard profile. Furthermore, it promotes discussion among researchers regarding the distinct research approach and design used for the analysis. These factors will be discussed first, prior to the itemisation of other factors that limited the potential depth of inquiry.

6.3.1 Strengths of this research

Two main strengths of the study are identified. The most salient lies in the presentation of a methodical approach that SMEs can adopt in their development of a hazard profile, rather than ask 'where do we start'? Figure 6.1 provides a framework of inputs for creating a hazard profile and can be used by SMEs, researchers and others adopting intervention strategies, in broad terms, to systematically identify hazards within an organisation.

This framework was cultivated from a processual research approach as proposed by Zanko and Dawson (2012, p. 339). Rather than exploring the existing scaled and abridged approaches provided by regulators and industry groups for SMEs (Curran & Blackburn 2011; Zanko & Dawson 2012; Holmes & Gupta 2015), processual research offered a departure from these prescriptive tools, techniques and practices resulting in a better explanation of how hazard identification and its application within the OHSMS operates within SMEs.

This processual research and the framework presented in Figure 6.1 were complemented and ultimately supported by the search for underlying causality (see Figure 5.3) associated with the empirical evidence. Masi et al. (2019, p. 53) propose this requirement within the context of OHS intervention research to 'properly consider the interaction between these two levels: the level of mechanisms and the context that selects, enables and somehow triggers these mechanisms.' This is the other significant strength of the study, providing a contribution to research practice through the use of two qualitative research paradigms.

Research approaches that strive to discover deeper meaning using a range of available methods tend to promote communication between researchers (Shepherd & Challenger 2013), thereby furthering a community of practice. They can also unearth situational qualities and complexities present within the research, as this research has done by merging discourse and narratives with causality. The research provides a rich suite of data translated into a series of inputs for use in future research and for interventions in this area (see Figure 6.1).

This research approach also challenges some existing paradigm typologies, nomenclatures and their associated epistemology that seek to 'represent hermetically-sealed intellectual compartments' (Kelemen & Rumens 2011, p 10). Approaching the analysis using two research paradigms may promote further discourse among researchers with an interest in research paradigm commensurability. Qualitative research paradigms are human constructs that should be subject to inquiry, testing and application in order to further knowledge in qualitative research.

6.3.2 Limitations of this research

Findings arising from this qualitative research are associated with distinct organisational contexts and a specific number of cases. Patton (2002, p. 563) recognises such observations as a natural outcome of qualitative research and notes that limitations can arise from situations within the sampling, the scheduling and associated data collection

undertaken and also with the research participants involved in the project. Each of these are pertinent to the identified limitations of this research and will be discussed in this section.

Two limitations of this research concern sampling size and the nature of the business operations. Four SMEs operating within the city of Mackay in the State of Queensland, Australia were used in the conduct of the research activities. This may pose the question of whether a larger sample size may have yielded different results compared to a small-scale study of this type. Another limitation associated with these SMEs was the nature of the work conducted, where participating SMEs operated across two industries, being road transport and the fabrication of metal and other products. All SMEs provided most of their products and services under contractual arrangements to multinational organisations operating in a heavily regulated and financially well-resourced coal mining sector.

Questions may be raised whether the influence of larger enterprises operating in such environments may impact on how SMEs establish and maintain the provision of products and services to them, and whether this affects how the SME operates its own business. Could the research findings be generalised across other industry sectors that operate in different geographic regions that may attract a more diverse client base? Generalisability considers whether research findings are significant enough to be more broadly applicable (Leung 2015) to the wider expanse of potential interest groups, beyond the focus of this research.

The question associated with generalisability is whether the findings have relevant information that can be communicated or applied to other SMEs and how can it be substantiated? Within this study, this can be answered through the provision of Figure 6.1, where the inputs for creating a hazard profile can be used by other researchers in various industries and diverse contexts, based on the application and findings arising from the research. Future research may consider the limitation of sampling size and seek to address this by engaging a greater number of SMEs, which may assist in validating or negating similar findings that align to the inputs proposed in Figure 6.1.

Another limitation concerned the scheduling and progressive sampling undertaken within the research project, which was dependent on the allocation of time periods aligned to the availability of research participants and associated operational planning within each SME. The researcher had no control over operational factors within each SME, and as a result experienced requests to postpone visits and work around the absences of a

research participant during scheduled research activities. Dynamics associated with operational management at times required adjustments and extensions to the research schedule, thereby not allocating an equivalent research period for each SME. Such factors can affect the continuity associated with the field work, although this was not observed within the research project.

The final limitation concerns the selection of research participants and their contribution to the hazard profile. These persons were nominated by each key informant, identified as persons involved in the governance of the organisation and likely to have sufficient insight into the operations of the SME and hence contribute substantially to the identification of hazards. Some interview respondents had identified the selection of research participants as potentially limiting, where the provision of further tacit knowledge from others within the SME who did not participate in the research may have contributed to the hazard profile.

An associated limitation of research participant selection is that of context specificity, where the sharing of realities and their meanings, along with the observable events are dependent on time and context. The unique set of circumstances occurring within the research activities represent one point in time reflecting the lived experiences of the research participants. The nature of qualitative enquiry lends itself to findings that are reliant on a specific context at a point in time and are also dependent on the particular cases studied at the time (Patton 2002, p584). This is both a limitation and a strength, since ‘the value of qualitative research lies in the particular description and themes developed in context of a specific site’ (Creswell 2014, p. 203).

6.4 Reflection of learning by the researcher

This project presented a rigorous, challenging and stimulating undertaking for the researcher. The initial expectation of gaining an immediate grounding in the fundamentals of research enquiry from the outset of the project did not materialise. The research process emerged as a diverse and complex maze that was not easily grasped or navigated. Through the journey, several realisations have emerged.

Firstly, insights into the vast foundations and breadth of qualitative research have led to a greater understanding of the research process. The construct of a research approach and design (Figure 3.1) provided a bedrock for the methodology. Secondly, application of the methodology within the fieldwork required actions that would facilitate the gathering of empirical evidence in ways that avoid manipulating the research towards a predetermined outcome. Thirdly, a yearning for improving the situation for SMEs

regarding the systematic identification of hazards compelled the researcher to adopt a pragmatic approach and seek the best way to analyse the data, resulting in the employment of two research paradigms. Each of these three realisations are discussed in this section under the key areas of self-reflection, the researcher as a potential interventionist to the conduct of the research and the resoluteness of the researcher in deciding to use two research paradigms.

6.4.1 Self-reflection by the researcher

This research journey commenced with high ideals on what can be done to help SMEs. The abundance of literature available on the challenges and impediments SMEs experience in managing OHS compelled the researcher to leap into action and assist SMEs willing to become involved in the research project. However, the researcher had little knowledge of the research process. An emerging grasp of the fundamentals of qualitative research and its application to fieldwork grew in the early stages of the project. This acted as a restraint and regulator that prevented the researcher from launching into field work without a planned methodical approach detailing and articulating the research questions, and consequently a research approach and research design.

The realisation that a systematic methodology should be applied to the entire project commenced with the literature review. The selection of foci used for the literature review (see Table 2.1) assisted the researcher to direct focus to certain key concepts and publications, thus defining the search for literature within certain boundaries. These foci assisted in establishing a keyword search (see Figure 2.1) that provided some certainty that the relevant, available literature could be searched against, and a definable pattern for reviewing the search as the thesis progressed in order to reconfirm publications and search for potential new publications. This approach also provides guidance for other researchers to undertake a similar search in a similar area of research.

The adoption of a reflexive approach to the methodology began as a series of questions within the early stages of the planning, although the researcher had not yet formally identified its need or construct. Patton (2002, p. 66) describes a reflexive approach as comprising reflexive questions used within a triangulated inquiry. Adoption of this approach commenced by considering how the research participants were likely to accept or react to the project, how the researcher's own research journey could be shaped within this thesis, and how the thesis would be organised with the reader in mind, in order that a cogent research journey could be represented. The fusion of these questions evolved during the project, and once galvanised were able to assist in clearly

articulating the researcher's ontological position in relation to the phenomenology, and hence its translation into the fieldwork.

The collection of data necessitated the development of organisational skills to not only plan the research but implement the data collection phase in the field. This required a request for physical access to the workplace, but what the researcher also sought was cognitive access (Saunders, Lewis and Thornhill 2009, p. 170) in order to collect data that could lead to answering the research questions. This could only be gathered after gaining the trust of research participants by employing integrity and confidentiality in the research process and adhering to the data collection methods and schedule (see Table 3.3).

The result of this planning can be measured not only in the outputs, but in the valued moments that emerged during the fieldwork. The following comment, in particular, reflects the significance of the hazard profiling activity for a manager of one SME:

> 'It's opened up my eyes. I never realised how I don't know everything about the business.' (SME 'D')

While the researcher anticipated professional and personal growth as an outcome of this project, such comments reflect the value of hazard profiling in helping the research participants and the organisation to grow. The research provided meaning to research participants, some of whom divulged their concerns and at times their enlightenment with the activity of hazard profiling. Their own learning inspired the researcher**,** where a greater depth of understanding of others was gained through a new lens, which in turn can be translated into research outputs. Within this project, the greatest fulfilment for the researcher has been to witness SMEs use a hazard profile and make changes within their organisation in order to prevent the potential for harm in something they came to recognise through the process of hazard profiling.

6.4.2 The researcher's background as a potential intervention to the study

The researcher's professional background and experiences (see Chapter 1, Section 1.1) were a challenge in relation to the maintenance of ethical standards in research integrity. The researcher's experience in the field of OHS over many years placed him in a position of technical competence where he had a command of applying OHSMS to operational contexts, and experience in adopting strategies to liaise with others in an organisation to achieve targeted outcomes.

It was not appropriate, however, to exercise those professional skills within the field activities (NHMRC 2015, p. 15) as it could impact on the integrity of the research by affecting the direction taken by the research participants themselves, should they be provided with strategic direction on OHS management practices. This factor had the potential to affect the credibility and quality of the collected data if the researcher had offered professional advice in the field. Such a practice was likely to affect the course of the data collection throughout the fieldwork, and therefore compromise the research objectives and research questions.

The adoption of a reflexive approach (see Chapter 3, Section 3.4.1 and Chapter 6, Section 6.3.1) assisted in rationalising the researcher's role within the framework of the research objectives and research questions. The integrity of the research was approached with the intention to have the research participants make their own self discoveries in relation to hazard profiling. This was addressed through the systematic suite of instructions within the research instruments communicated to research participants at the commencement of the fieldwork to establish the context, framework and ground rules for the research. This included expressing the neutrality of the researcher in the project (see Appendix 2-Information Brief) and instructions contained with the research instruments (Appendices 4-6).

However, some research participants had seen the researcher's professional background as an opportunity to glean a bountiful supply of information on hazard identification and OHS management, akin to what might be offered by an OHS consultant. The researcher, on occasion was required to review the boundaries and aims of the research activities with research participants, within the context of the research aims and objectives. One research participant asked 'How are we going?' during each visit, inquiring as to the overall progress of the hazard profile. The researcher responded in each instance by advising that ownership of the activity resided with the research participants, and that the research instruments to be used in the latter parts of the research regarding interviews and focus groups would assist the research participants in answering that question for themselves through a process of self-reflection.

This enforced the retention of a border around the inquiry and negated the potential influence of bias possible through the provision of prominent information on OHS practices for the research participants, which may in turn have affected the construct and details developed within the hazard profile. The challenge for the researcher was to act in an ethical manner within the boundaries of the research project and not introduce any bias that might have assisted research participants in determining how to assemble the

hazard profile or identify hazards other than by their own volition. The researcher was required to maintain a distance from the flow of information and direction the hazard profile would take, in order to avoid prejudicial interjections.

Such an account demonstrated that research participants may not recognise a demarcation between a research activity and a consultation service, irrespective of how this is explained to them in an information brief (see Appendix 2). Where this was the case, the distinction between the two required clarification and ongoing review by the researcher.

6.4.3 Taking a pragmatic approach: using two research paradigms in one study

A substantial transformation experienced by the researcher in this project occurred in the sensemaking associated with how the research methods would be developed and employed within the project, and how they would be underpinned by a research paradigm (see Figure 3.1). This required the researcher to firstly establish a dedicated research approach and design (see Figure 3.1) and secondly to determine a way of answering the research questions in a comprehensive way by employing the use of a research paradigm.

The search for research paradigms used to explore the social construction of reality led to the identification of constructivism as a logical choice. However, as limitations associated with this paradigm were identified (see Chapter 3, Section 3.4.2.1), the researcher sought additional ways to better explain why certain things occur, envisaging the requirement to use an additional research paradigm. Some major paradigm typologies developed by Burrell and Morgan (1979) and another by Guba and Lincoln (1994) that could inform and guide qualitative inquiry had been identified. However, these were resistant to the synthesis of different research paradigms (Kelemen & Rumens 2011), prompting the researcher to explore why this was the case, and whether the use of additional paradigms was a viable endeavour.

Much of the literature on qualitative research paradigms aligns itself to broad classifications that have been challenged for over 30 years by the emergence of the ‘paradigm wars’ (Shepherd & Challenger 2013, p. 225) which have questioned the apparent incontestability of theoretical assumptions associated with various research paradigms and typologies. The strategy of ‘multiparadigm research’ proposed by Schultz and Hatch (1996, p. 529) provided the researcher with a stimulus to seek further developments in this area of qualitative research. However, a dearth of empirically applied paradigm models adopting a multiparadigm research approach exist. The recent

publication of Hoddys' critical realist view of stratified reality (Hoddy 2019), reproduced in Figure 6.2 presented similar concepts and precepts to those provided by Schultz and Hatch (1996), and provided a catalyst for the researcher to adopt two research paradigms in order to employ the best way of analysing the data and find deeper meanings and explanations for the things that took place and to help answer the research questions.

The researcher has developed a pragmatic view to research processes and research methods that asserts the importance for researchers to challenge conventional qualitative research paradigms with a view to determining what will best answer the research question, in association with what the research paradigm has to offer. In considering this, the researcher integrated two research paradigms into the research methods and addressed each within the analytical framework (See Figure 4.1) to ascertain a greater level of understanding and depth associated with the world of the research participants and what underpinned their worldviews and actions.

6.5 Recommendations for future research

This research has presented findings of an inquiry into the use of hazard profiling within SMEs. Its purpose was to determine whether hazard profiling can be useful in recording the SME's hazards and assist in aligning it to the OHSMS, in order to contribute to the management of OHS risks.

The approach taken by this research incorporates the context of the organisation within the research questions and explores the social construction of reality and its underlying causality. Recommendations for future research could target further studies in how SMEs engage in the sensemaking of OHSMS and its association with the context of the organisation in order to better explain how OHS is understood and used in SMEs. This research has identified a gap in the potential linkages made by SMEs between the hazard profile and the OHSMS. Further empirical research is required in this area on how OHS practices in SMEs are conceived, shaped and adopted within their own management systems, and how those systems emerge and are developed.

This may be also linked to the evolving maturity associated with the application of risk management within the SME's OHSMS. Some research has identified the need for further inquiry into the triggers and contributors to OHS risk management maturity of SMEs (Clusel et al. 2011; Kaassis & Badri 2018) and how persons within SMEs conceive risk and the sociological approaches that influence their decision-making process (Zanko & Dawson 2012).

These proposals for future research would feasibly accommodate an integration of the SME's internal context and incorporate a blend of research paradigms to explore socially constructed knowledge and the causality of the associated actions that arise from that knowledge.

6.6 Conclusion

An increase in the number of SMEs operating in many economies throughout the world has not been accompanied by sufficient investment in understanding and communicating how OHS hazards should be identified and managed by these businesses. An incident can impact severely on individuals and the organisation. Identifying and managing OHS hazards are central to how an SME operates. The SMEs participating in this research understood this need and demonstrated the desire to identify and manage their OHS hazards, but were confronted with inadequate resourcing requirements, confirming the findings of the literature review in this thesis (Harney & Nolan 2014; Legg et at. 2015; Masi & Cagno 2015).

What has emerged from this research is a new conceptual insight that culminates in a process that can be used as a guide to assemble a hazard profile. This may assist SMEs in preparing a hazard profile. The research has introduced another central tenet; that not enough is understood about SMEs by those who have the expertise to support them.

What has become central to this research is the search for understanding an SME's contexts and the worldviews of those working within it, and what underlies the decisions and the actions arising from those worldviews. This has led to a more informed determination of what can be done to improve their world in ways that make sense and are useful for them. For the researcher, this has been the most significant contribution of this research.

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Legislation

Work Health and Safety Act 2011 (Queensland)

8 Appendices

Appendix 1

Invitation Letter

8 November 2017

Dear Sir/Madam,

Central Queensland University is seeking a number of businesses to participate in a research project that may assist in the potential development of their safety system through the creation of a hazard profile. The research project forms part of a Master's thesis for the researcher and is titled 'Using a hazard profiling approach for developing an occupational health and safety management system in small to medium sized enterprises'.

We are seeking businesses having between 10-50 employees and operating in the Mackay area to participate in the project. The time investment required is a total of four to six sessions of two hours each, spanning a period of approximately eight weeks.

Please refer to the attached 'Information Brief' for further details relating to the project. To register your interest, please contact the researcher, Frank Bogna by telephone or email.

Yours sincerely,

[redacted]

Frank Bogna
Researcher
Transport, Emergency and Safety Sciences
School of Health, Medical and Applied Sciences

[redacted]

Geoff Dell
Principal Supervisor
Transport, Emergency and Safety Sciences
School of Health, Medical and Applied Sciences

Contact:
Frank Bogna
Transport, Emergency and Safety Sciences |
School of Health, Medical and Applied Sciences
CQUniversity Australia,
90-92 Sydney St, Mackay Qld 4740
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f.bogna@cqu.edu.au

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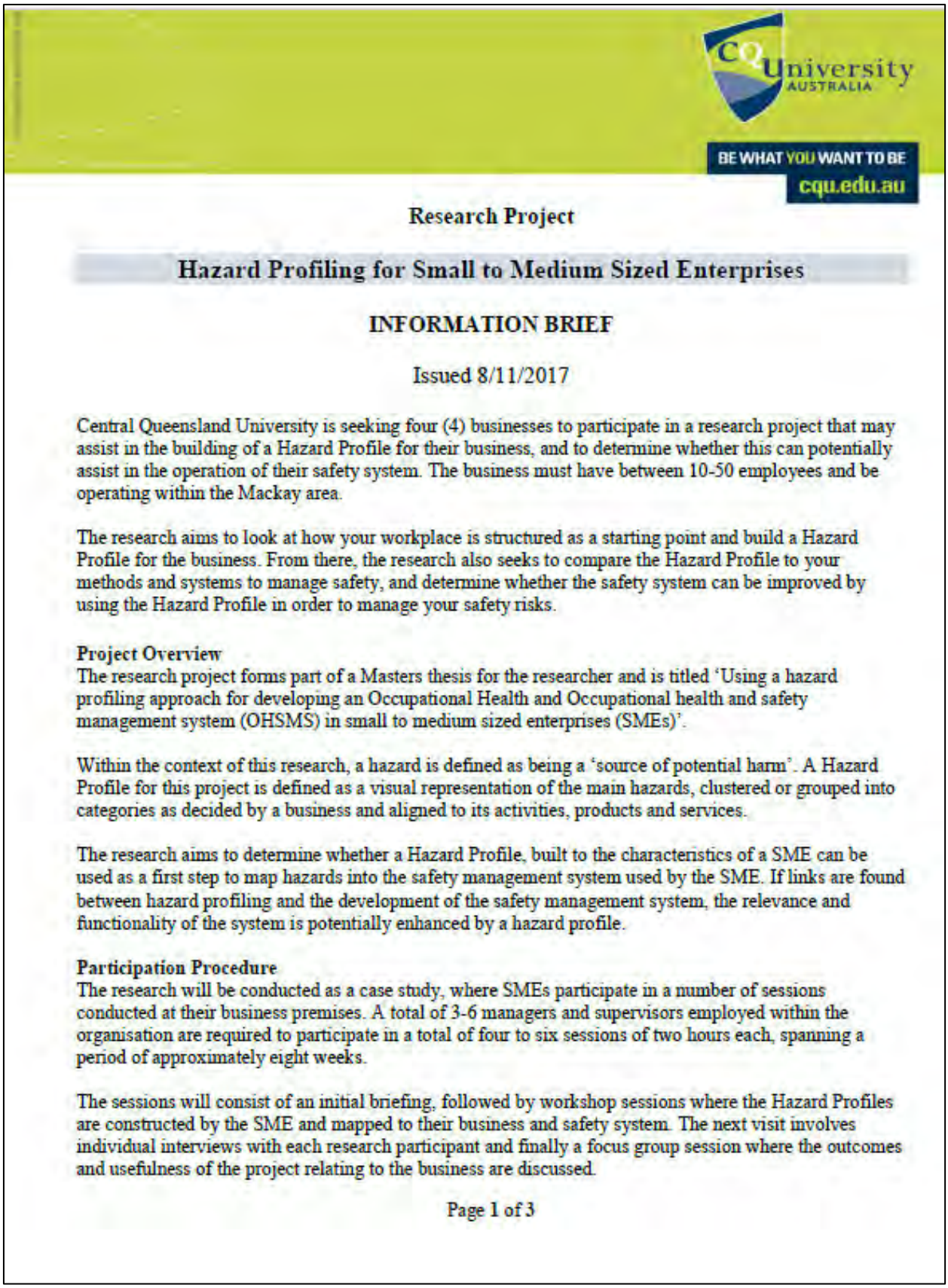
Appendix 2

Information Brief



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Research Project

Hazard Profiling for Small to Medium Sized Enterprises

INFORMATION BRIEF

Issued 8/11/2017

Central Queensland University is seeking four (4) businesses to participate in a research project that may assist in the building of a Hazard Profile for their business, and to determine whether this can potentially assist in the operation of their safety system. The business must have between 10-50 employees and be operating within the Mackay area.

The research aims to look at how your workplace is structured as a starting point and build a Hazard Profile for the business. From there, the research also seeks to compare the Hazard Profile to your methods and systems to manage safety, and determine whether the safety system can be improved by using the Hazard Profile in order to manage your safety risks.

Project Overview
The research project forms part of a Masters thesis for the researcher and is titled 'Using a hazard profiling approach for developing an Occupational Health and Occupational health and safety management system (OHSMS) in small to medium sized enterprises (SMEs)'.

Within the context of this research, a hazard is defined as being a 'source of potential harm'. A Hazard Profile for this project is defined as a visual representation of the main hazards, clustered or grouped into categories as decided by a business and aligned to its activities, products and services.

The research aims to determine whether a Hazard Profile, built to the characteristics of a SME can be used as a first step to map hazards into the safety management system used by the SME. If links are found between hazard profiling and the development of the safety management system, the relevance and functionality of the system is potentially enhanced by a hazard profile.

Participation Procedure
The research will be conducted as a case study, where SMEs participate in a number of sessions conducted at their business premises. A total of 3-6 managers and supervisors employed within the organisation are required to participate in a total of four to six sessions of two hours each, spanning a period of approximately eight weeks.

The sessions will consist of an initial briefing, followed by workshop sessions where the Hazard Profiles are constructed by the SME and mapped to their business and safety system. The next visit involves individual interviews with each research participant and finally a focus group session where the outcomes and usefulness of the project relating to the business are discussed.

Page 1 of 3

Benefits and Risks
The potential benefits to your organisation and the wider business community of SMEs are:

- An opportunity to review and revitalise your hazard database
- Potentially link your OHS hazards with where and how they are addressed in your safety plans
- Revisit how you are managing your safety risks, and perhaps adopt Hazard Profiling for future initiatives in your organisation
- Dissemination of findings from the research across the immediate footprint of the region through industry groups.

Potential risks across areas relating to research integrity, engagement, ethics and information security have been addressed by the researcher and approved by the Human Research Ethics Committee, operating under the Ethics Office of the CQ University Research Division.

Confidentiality / Anonymity
Confidentiality and anonymity will be maintained by identifying participating organisations and research participants as numbers 1, 2 3 etc. under 'SME A', 'SME B' etc.

Data obtained from the research will be securely stored for seven (7) years after the publication date of the last publication based upon the data in accordance with the CQUniversity policy for Research Data Management.

Occupational Health and Safety
It will be a requirement under the Work Health and Safety Act 2011 (Qld) that the researcher will require an induction be provided to the worksite or that part of the worksite where the researcher will be located. The researcher will need to be provided with relevant information, instruction and supervision to safeguard the researcher from OHS risks that may arise at the workplace.

Outcome / Publication of Results
A major outcome of the research project will be the completion of a thesis submitted to CQ University. Other outcomes may include a publication of findings in academic journals, the presentation of the findings at conferences and the conduct of seminars or workshops with industry associations or work health and safety regulatory authorities.

Consent
Consent to participate in the research project will be sought through the use of a **Consent Form** accompanying this letter of invitation. Please read each item contained in the consent form. Questions regarding the research project should be directed to the researcher prior to signing the consent form. Please return the Consent for to the researcher when completed.

Right to Withdraw
As explained in the consent form, all participants have the right to withdraw at any time without penalty. Data provided by the participant may be withdrawn on request in these circumstances.

Feedback
Preliminary results can be provided to each SME at the conclusion of the data analysis, providing a preliminary summary based on the evidence collected and analysed for the SME during the research. The intent of the preliminary results is to provide some immediacy to SME's needs shortly after the conclusion of the data collection phase (approximately one month after the completion of the final visit to the SME).

Questions/ Further Information
Further questions and information can be obtained from the researcher and supervisor.

Researcher
Frank Bogna
OHS Lecturer – Transport, Emergency and Safety Sciences | School of Health, Medical and Applied Sciences
CQUniversity Australia, Building MKC003.2.06, 90-92 Sydney St, Mackay Qld 4740
P +61 07 49403390 | M +61 455 245 792| E f.bogna@cqu.edu.au

Supervisor
Assoc. Professor Geoff Dell, PhD
Head of Courses: Transport & Safety Sciences
Discipline Leader - Accident Forensics & Investigation
Transport, Emergency and Safety Sciences | School of Health, Medical & Applied Sciences
CQUniversity Australia, Building 77, Room 1.10, Rockhampton North, Qld 4702
P +61 (0)7 4923 2133 | M +61 (0)418 367 569 | E: g.dell@cqu.edu.au

Concerns / Complaints

Please contact CQUniversity's Office of Research (Tel: 07 4923 2603; E-mail: ethics@cqu.edu.au; Mailing address: Building 32, CQUniversity, Rockhampton QLD 4702) should there be any concerns about the nature and/or conduct of this research project.

This project has been approved by the CQUniversity Human Research Ethics Committee (approval number H17/09-171).

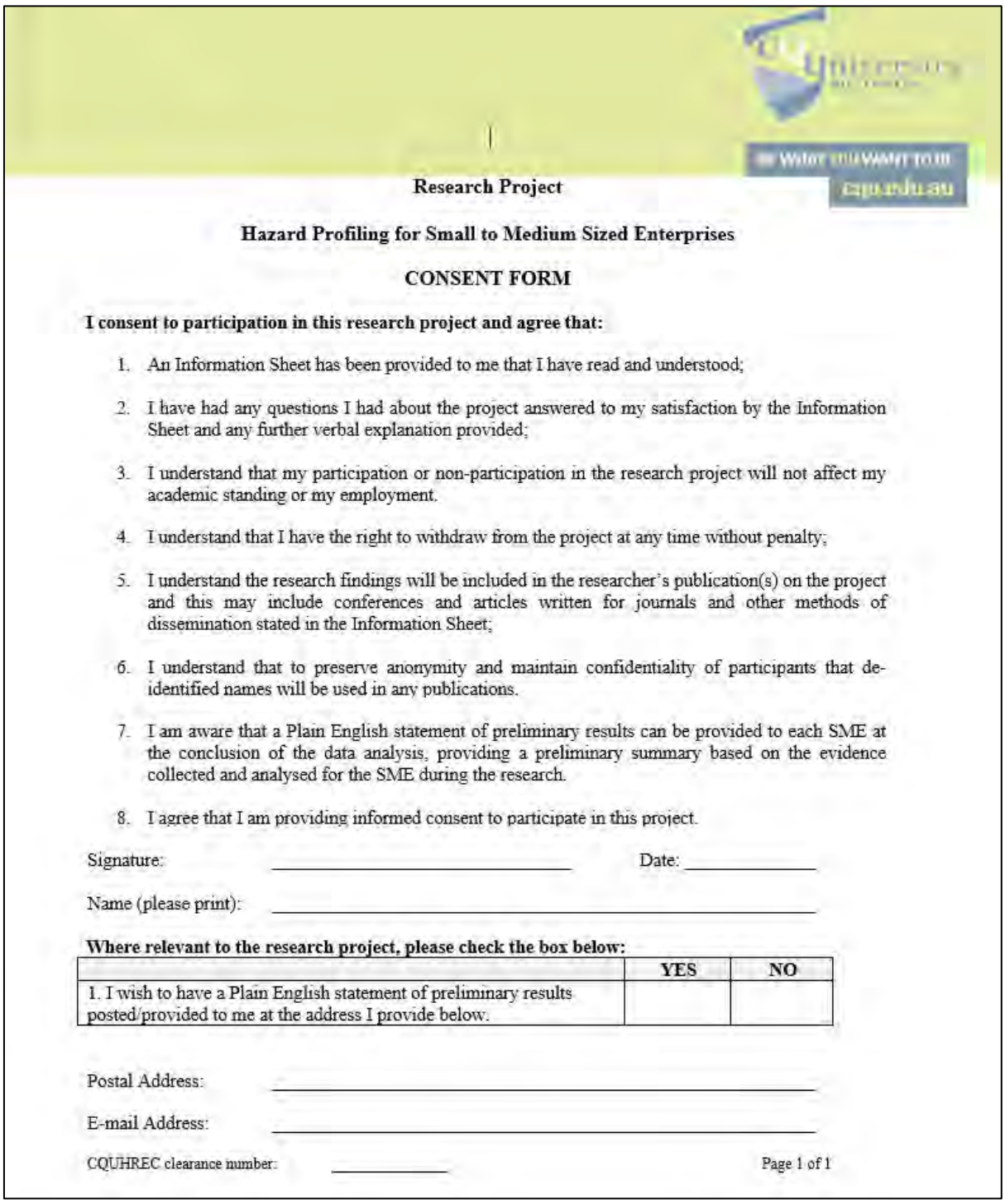
Register your interest to participate
Please contact the researcher, Frank Bogna by telephone or email to register your interest to participate.

Contact:

Frank Bogna
OHS Lecturer – Transport, Emergency and Safety Sciences | School of Health, Medical and Applied Sciences
CQUniversity Australia, Building MKC003.2.06, 90-92 Sydney St, Mackay Qld 4740
P +61 07 49403390 | M +61 455 245 792| E f.bogna@cqu.edu.au

Appendix 3

Consent Form



Research Project

Hazard Profiling for Small to Medium Sized Enterprises

CONSENT FORM

I consent to participation in this research project and agree that:

1. An Information Sheet has been provided to me that I have read and understood;
2. I have had any questions I had about the project answered to my satisfaction by the Information Sheet and any further verbal explanation provided;
3. I understand that my participation or non-participation in the research project will not affect my academic standing or my employment.
4. I understand that I have the right to withdraw from the project at any time without penalty;
5. I understand the research findings will be included in the researcher's publication(s) on the project and this may include conferences and articles written for journals and other methods of dissemination stated in the Information Sheet;
6. I understand that to preserve anonymity and maintain confidentiality of participants that de-identified names will be used in any publications.
7. I am aware that a Plain English statement of preliminary results can be provided to each SME at the conclusion of the data analysis, providing a preliminary summary based on the evidence collected and analysed for the SME during the research.
8. I agree that I am providing informed consent to participate in this project.

Signature: _____ Date: _____

Name (please print): _____

Where relevant to the research project, please check the box below:

	YES	NO
1. I wish to have a Plain English statement of preliminary results posted/provided to me at the address I provide below.		

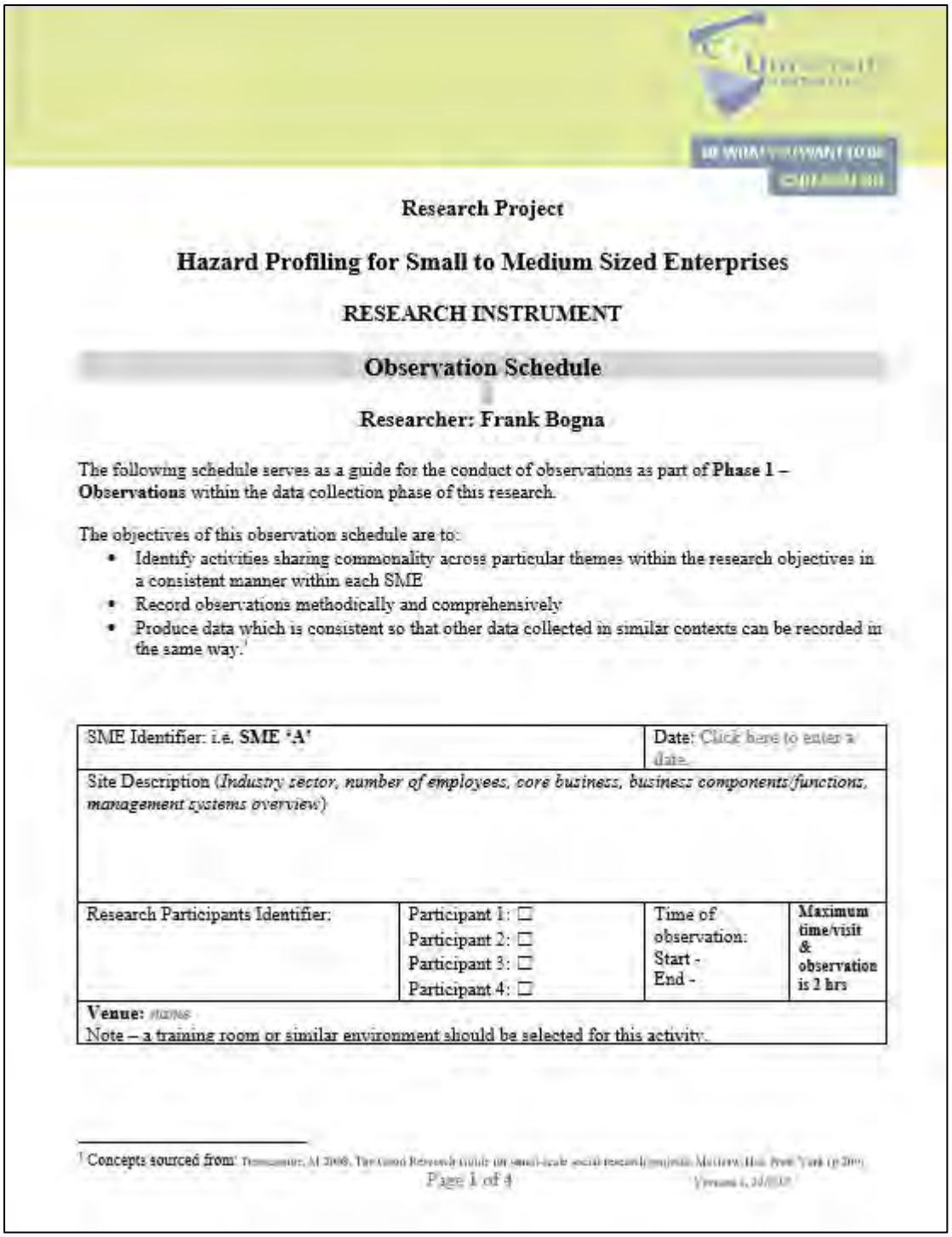
Postal Address: _____

E-mail Address: _____

CQUHREC clearance number: _____ Page 1 of 1

Appendix 4

Research Instrument: Observation Schedule



Research Project

Hazard Profiling for Small to Medium Sized Enterprises

RESEARCH INSTRUMENT

Observation Schedule

Researcher: Frank Bogna

The following schedule serves as a guide for the conduct of observations as part of **Phase 1 – Observations** within the data collection phase of this research.

The objectives of this observation schedule are to:

- Identify activities sharing commonality across particular themes within the research objectives in a consistent manner within each SME
- Record observations methodically and comprehensively
- Produce data which is consistent so that other data collected in similar contexts can be recorded in the same way.[1]

SME Identifier: i.e. **SME 'A'**		Date: Click here to enter a date.	
Site Description (*Industry sector, number of employees, core business, business components/functions, management systems overview*)			
Research Participants Identifier:	Participant 1: ☐ Participant 2: ☐ Participant 3: ☐ Participant 4: ☐	Time of observation: Start - End -	**Maximum time/visit & observation is 2 hrs**
Venue: *name* Note – a training room or similar environment should be selected for this activity.			

[1] Concepts sourced from: [illegible]

Page 1 of 4

INSTRUCTIONS: The following is a checklist to be used to record notes whilst the research activity of hazard profiling is in progress. The researcher is required to be unobtrusive in the research environment and allow the research participants to undertake the task as prescribed to them.

Directions provided to the research participants is as follows:

A format for the hazard profiling framework that uses activities, products and services will be introduced as the initial starting point. This format can be represented in a visual display (i.e. using a whiteboard) in any way that will be useful to the group.

This will be the starting point for mapping out the structure of a hazard profile. Once the business has been mapped out to the group's satisfaction, hazard groups relating to the business can be allocated to the visual display. That point marks the commencement of the hazard profile.
A second observation sheet will be used, designed in an identical way to the first, when the activity progresses to the alignment of the hazard profile to the safety management system. This may not occur until the second or third visit.

You are free to alter the design at any time if you see a more useful way of organising the information.

The main role of the researcher in this phase is to observe and record how the group undertakes this task

Standardised criteria will used for the observations, based on verbal exchanges, observed practices relating to how the research participants become involved in the activity and develop the hazard profile.

The design of the hazard profile will be visually captured by photographs at the conclusion of the first visit, and thereafter for each consecutive visit.

The main role of the researcher is to collect data. The elements and criteria prescribed in the list below are to be used to record the research participants' activities and interactions.

ESTABLISHMENT OF HAZARD PROFILE				
Element to be observed	**Required Action, Interaction or Behaviour**	**Comments/observations made by researcher (to self)**		
		THEMES		
		Hazard Profile	**Alignment through business parameters**	**OHSMS**
Space:	The physical place or places where the research activity takes place			
Actor:	The persons involved (research participants)			
Activity:	A set of actions the research participants engage in (i.e. use of visual mapping)			
Object:	The physical artefacts which are present within the research activity setting			
Act:	Single actions that research participants undertake of their own volition or perform as part of the group's function.			
Event:	A set of related activities that are carried out by research participants.			
Time:	The sequencing of activities or actions that takes place over time.			
Goal:	The things research participants identify as needing to accomplish.			
Feelings:	The emotions felt or expressed by the research participants.			
Key Informant/s	Persons wanting to talk and/or those with specialist knowledge.			
Reflection	Researcher's personal response to any of the elements above.			

Source: Adapted from; Spradley, J 1980, *Participant Observation*, New York, Holt, Rinehart and Winston.
Further additions incorporated from:
Berg, B & Lune, H 2012, *Qualitative Research Methods for the Social Sciences*, Pearson Education, New Jersey.
Fox, N 1998, *How to Use Observations in a Research Project*, Trent Focus Group, Sheffield.
Wilkinson, D & Birmingham, P 2003, *Using Research Instruments – A guide for Researchers*, Taylor & Francis, London.

Researcher: Frank Bogna
Signed by researcher:
Date:

DETERMINATION OF HAZARD PROFILE ALIGNMENT TO OHSMS STRUCTURE				
Element to be observed	Required Action, Interaction or Behaviour	Comments/observations made by researcher (to self)		
		THEMES		
		Hazard Profile	Alignment through business parameters	OHSMS
Space:	The physical place or places where the research activity takes place			
Actor:	The persons involved (research participants)			
Activity:	A set of actions the research participants engage in (i.e. use of visual mapping)			
Object:	The physical artefacts which are present within the research activity setting			
Act:	Single actions that research participants undertake of their own volition or perform as part of the group's function.			
Event:	A set of related activities that are carried out by research participants.			
Time:	The sequencing of activities or actions that takes place over time.			
Goal:	The things research participants identify as needing to accomplish.			
Feelings:	The emotions felt or expressed by the research participants.			
Key Informant/s	Persons wanting to talk and/or those with specialist knowledge.			
Reflection	Researcher's personal response to any of the elements above			

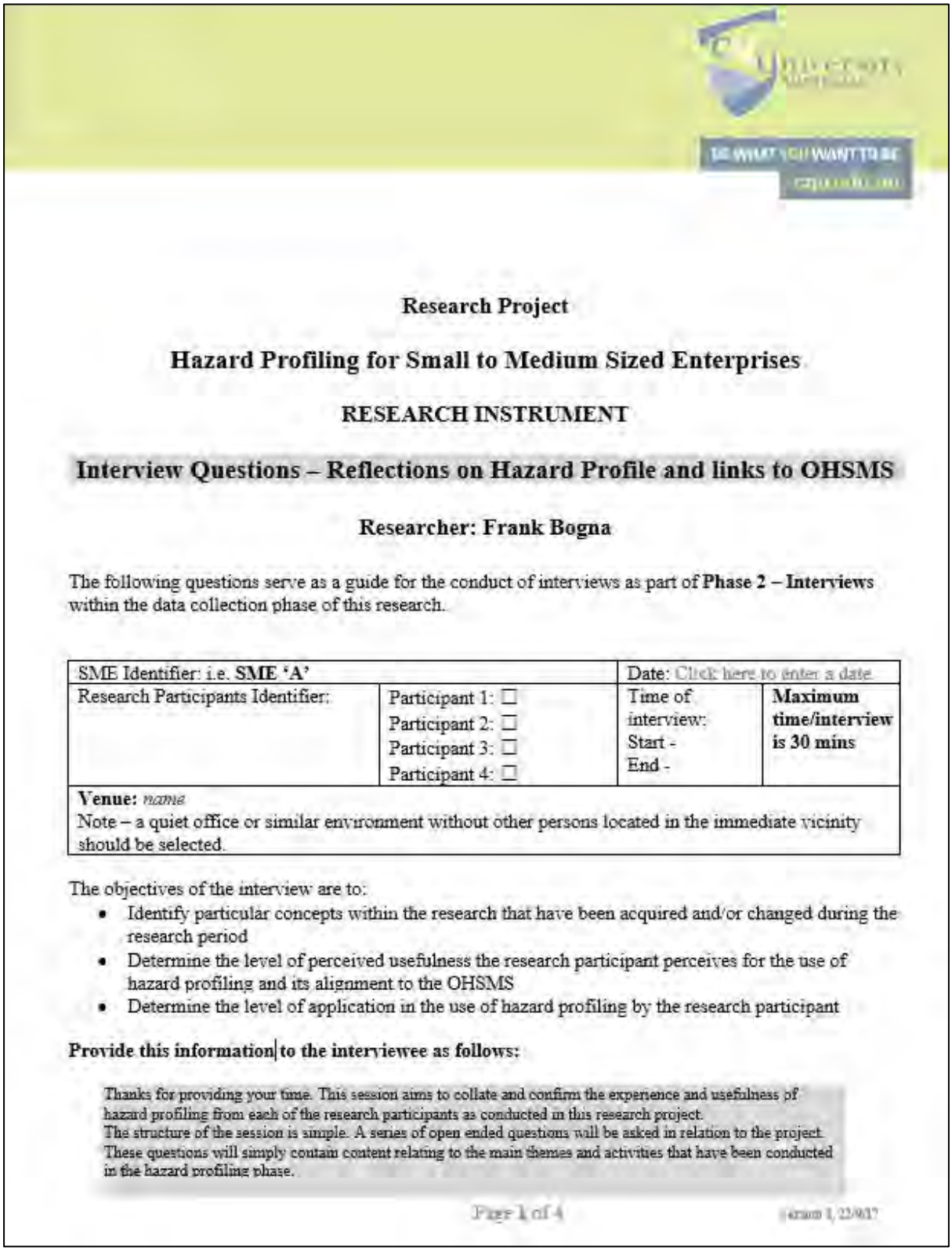
Researcher: Frank Bogna

Signed by researcher:

Date:

Appendix 5

Research Instrument: Interview Questions – Reflections on Hazard Profile and links to OHSMS



Research Project

Hazard Profiling for Small to Medium Sized Enterprises

RESEARCH INSTRUMENT

Interview Questions – Reflections on Hazard Profile and links to OHSMS

Researcher: Frank Bogna

The following questions serve as a guide for the conduct of interviews as part of **Phase 2 – Interviews** within the data collection phase of this research.

SME Identifier: i.e. **SME 'A'**		Date: Click here to enter a date.	
Research Participants Identifier:	Participant 1: ☐ Participant 2: ☐ Participant 3: ☐ Participant 4: ☐	Time of interview: Start - End -	**Maximum time/interview is 30 mins**
Venue: *name* Note – a quiet office or similar environment without other persons located in the immediate vicinity should be selected.			

The objectives of the interview are to:

- Identify particular concepts within the research that have been acquired and/or changed during the research period
- Determine the level of perceived usefulness the research participant perceives for the use of hazard profiling and its alignment to the OHSMS
- Determine the level of application in the use of hazard profiling by the research participant

Provide this information to the interviewee as follows:

Thanks for providing your time. This session aims to collate and confirm the experience and usefulness of hazard profiling from each of the research participants as conducted in this research project.
The structure of the session is simple. A series of open ended questions will be asked in relation to the project. These questions will simply contain content relating to the main themes and activities that have been conducted in the hazard profiling phase.

Page 1 of 4 Version 1, 22/9/17

Responses from the participant are to be recorded and read back to participant in order to verify the accuracy of all recorded responses. All responses will remain confidential and will not be divulged to other research participants.
A time limit of up to thirty minutes is set for this these sessions. Do you have any questions before we start?

INTERVIEW – REFLECTIONS ON HAZARD PROFILING AND ALIGNMENT TO OHSMS		
Questions	**Recorded Responses**	**Comments/observations made by researcher (to self)**
Note: Use probes where possible and/or needed. For example; *'Can you please tell me more about ..'* *'Could you explain what you mean by...'* *'Can you tell me anything else about.... ?'*		
Please describe your thoughts on the hazard profiling exercises you had participated in. For example *(introduce each separately)* - The idea of a hazard profile itself, what it is and how it looks. - The use of visual mapping. What are your thoughts on using that as a way of creating the profile? - What are your thoughts on using a group approach to develop the profile? - What are your thoughts on the suitability of group participants for that task (based on who was in the group)?		
What have you learned (if anything) from the activities?		
What are your thoughts as to the design of hazard profiles? How should they be designed in order to be useful to the business?		
Is there any connection between the hazard profile and its alignment to your business' OHSMS?		

Please explain the connection, if any.		
Can the hazard profile assist in managing OHS risks? Please explain your answer.		
Additional questions provided below may need to be asked if the material is not addressed by the interviewee in the preceding questions (source = baseline questions from initial briefing session)		
1. What is your understanding of a hazard profile now compared to the time prior to the start of the hazard profiling activities?		
2. Does the activity of hazard profiling assist the business in identifying and managing its hazards? If so, in what ways?		
3. Describe your occupational health and safety management system.		
4. What do you see as the essential features of an occupational health and safety management system? In other words, what are the most important parts that should be included in the occupational health and safety management system?		

Concluding remarks to interviewee.

Thank you for participating in this interview. Your opinions are valued.
If there is anything you disagree with or wish to complain about, please advise me once the session has concluded.

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As a reminder, any comments recorded in this interview will be confidential.
A Preliminary Results Report will be provided to each SME at the conclusion of the data analysis, which will include data analysed from all of the hazard profiling sessions, interviews and this focus group session.

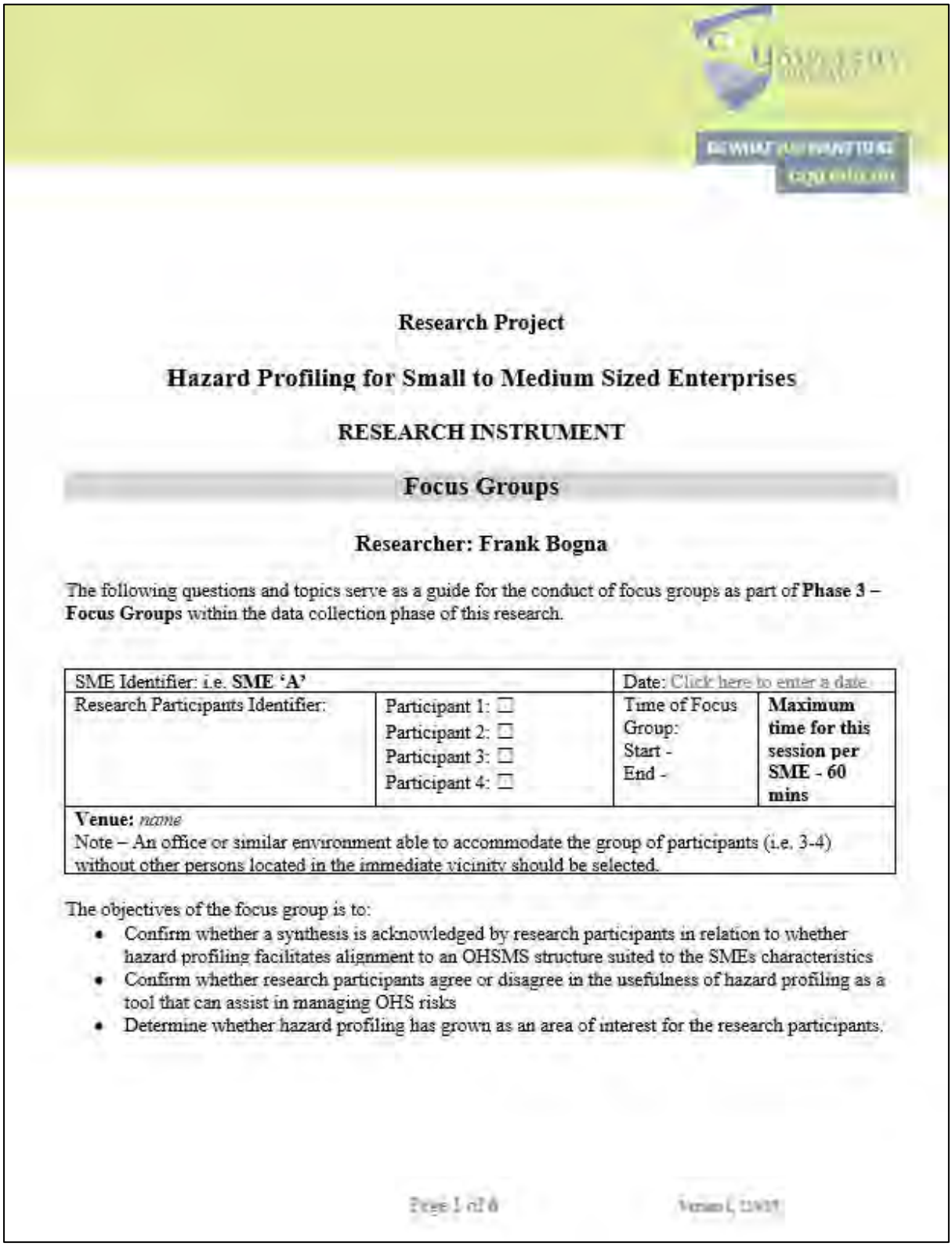
Researcher: Frank Bogna

Signed by researcher:

Date:

Appendix 6

Research Instrument: Focus Groups



Research Project

Hazard Profiling for Small to Medium Sized Enterprises

RESEARCH INSTRUMENT

Focus Groups

Researcher: Frank Bogna

The following questions and topics serve as a guide for the conduct of focus groups as part of **Phase 3 – Focus Groups** within the data collection phase of this research.

SME Identifier: i.e. **SME 'A'**		Date: Click here to enter a date.	
Research Participants Identifier:	Participant 1: ☐ Participant 2: ☐ Participant 3: ☐ Participant 4: ☐	Time of Focus Group: Start - End -	**Maximum time for this session per SME - 60 mins**
Venue: *name* Note – An office or similar environment able to accommodate the group of participants (i.e. 3-4) without other persons located in the immediate vicinity should be selected.			

The objectives of the focus group is to:

- Confirm whether a synthesis is acknowledged by research participants in relation to whether hazard profiling facilitates alignment to an OHSMS structure suited to the SMEs characteristics
- Confirm whether research participants agree or disagree in the usefulness of hazard profiling as a tool that can assist in managing OHS risks
- Determine whether hazard profiling has grown as an area of interest for the research participants.

Moderator's Guide

Moderator hints:

- Keep the participants talking
- Do not interrupt
- Do not participate in the session
- Consider the response from their perspective
- Use probes (links) for participants to elaborate on responses ('…for example', '…can you provide more details/')
- Check responses for clarity (paraphrase)
- Don't rush participants
- Control dominant individuals to enable equal opportunity to participate. Ensure all participant types are provided with opportunities to contribute, but not at the expense of others.
  - Expert
  - Dominant talkers
  - Disruptors
  - Ramblers
  - Incorrect advisors
  - Quiet/shy participants.

Directions provide to the interviewee are as follows:

Thanks for providing your time. This session aims to collate and confirm the experience and usefulness, if any from all of the research participants as a whole of hazard profiling, as conducted in this research project. The structure of the session is simple. A series of open ended questions and prompts will be asked in relation to the project. These questions will simply contain content relating to the main themes and activities that have been conducted in the hazard profiling phase.

Ground rules are as follows:

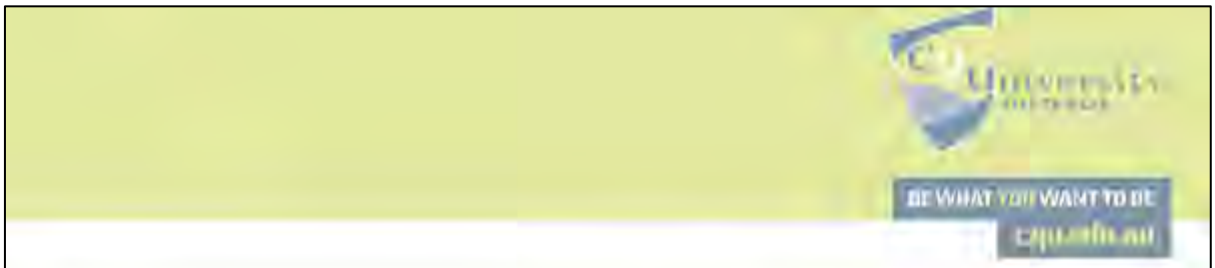
- Only one person talks at a time
- There are no right or wrong answers
- Everyone's ideas and opinions are valued
- All sides of an issue need to be heard. No interruptions when two differing opinions are presented.

Is everyone in agreeance with these ground rules (researcher makes a note if there is disagreement or challenge)

Responses and discussion topics are to be recorded. All recorded information will remain confidential.

A time limit of up to sixty minutes is set for this these sessions. Do you have any questions before we start?

Source: Adapted from: Berg & Lune 2012, *Qualitative Research methods for the Social Sciences*, Pearson Education Inc, New Jersey. (p. 179)



FOCUS GROUP REFLECTIONS ON HAZARD PROFILING AND ALIGNMENT TO OHSMS *GUIDING QUESTIONS*		
Questions	**Recorded Responses**	**Comments/observations made by researcher (to self)**
Note: Use probes where possible and/or needed. For example; *'Can you please tell me more about...'* *'Could you explain what you mean by ...'* *'Can you tell me anything else about...'*		
Opening questions		
Please describe your thoughts on the hazard profiling exercises you had participated in. For example *(introduce each separately)* - The idea of a hazard profile itself, what it is and how it looks.		
- The use of visual mapping. What are your thoughts on using that as a way of creating the profile?		
- What are your thoughts on using a group approach to develop the profile?		
- What are your thoughts on the suitability of group participants for that task (based on who was in the group)?		
What have you learned (if anything) from the activities?		
What are your thoughts as to the design of hazard profiles?		

How should they be designed in order to be useful to the business?		
Is there any connection between the hazard profile and its alignment to your business' OHSMS?		
Please explain the connection, if any.		
Can the hazard profile assist in managing OHS risks? Please explain your answer.		
What do you see as the essential features of an occupational health and safety management system? In other words, what are the most important parts that should be included in the occupational health and safety management system?		
Transition questions		
1. How has your understanding of a hazard profile changed, if at all compared to the time prior to the start of the hazard profiling activities?		
2. Does the activity of hazard profiling assist the business in identifying and managing its hazards?		
If so, in what ways?		
3. Describe any actual or potential changes made to your occupational health and safety management system that were triggered by the hazard profiling exercise.		

Ending questions		
Has anything been missed from the questions posed today, or the points that were raised and discussed.		
If so, what do you wish to raise?		

Refer to these questions if they have not been addressed earlier on in the focus group session.

Baseline Questions (specified in methodology for revisit with research participants in Phase 3)

Question posed to group	Recorded response (Focus group phase)	Comments - observed change from baseline responses at commencement of research
1. What is your understanding of hazards?		
2. What do you see as your needs in regards to the hazards in your business and how to manage them?		
3. What is your understanding of a hazard profile?		
4. What do you understand an OHSMS to be?		
5. What do you perceive as the state of your OHSMS?		

Conclusion:

1. Summarise points covered with confirmation of collated responses
2. Review objectives and ask if anything has been missed
3. Thank the groups (as per instructions below).

Concluding remarks to group:

> Thank you for participating in this focus group. This has been a useful discussion.
> Your opinions are valued.
> I hope you have found the discussion interesting
> If there is anything you disagree with or wish to complain about, please advise me once the session has concluded.
> As a reminder, any comments featuring in this report will be anonymous.
> A Preliminary Results Report will be provided to each SME at the conclusion of the data analysis, which will include data analysed from all of the hazard profiling sessions, interviews and this focus group session.

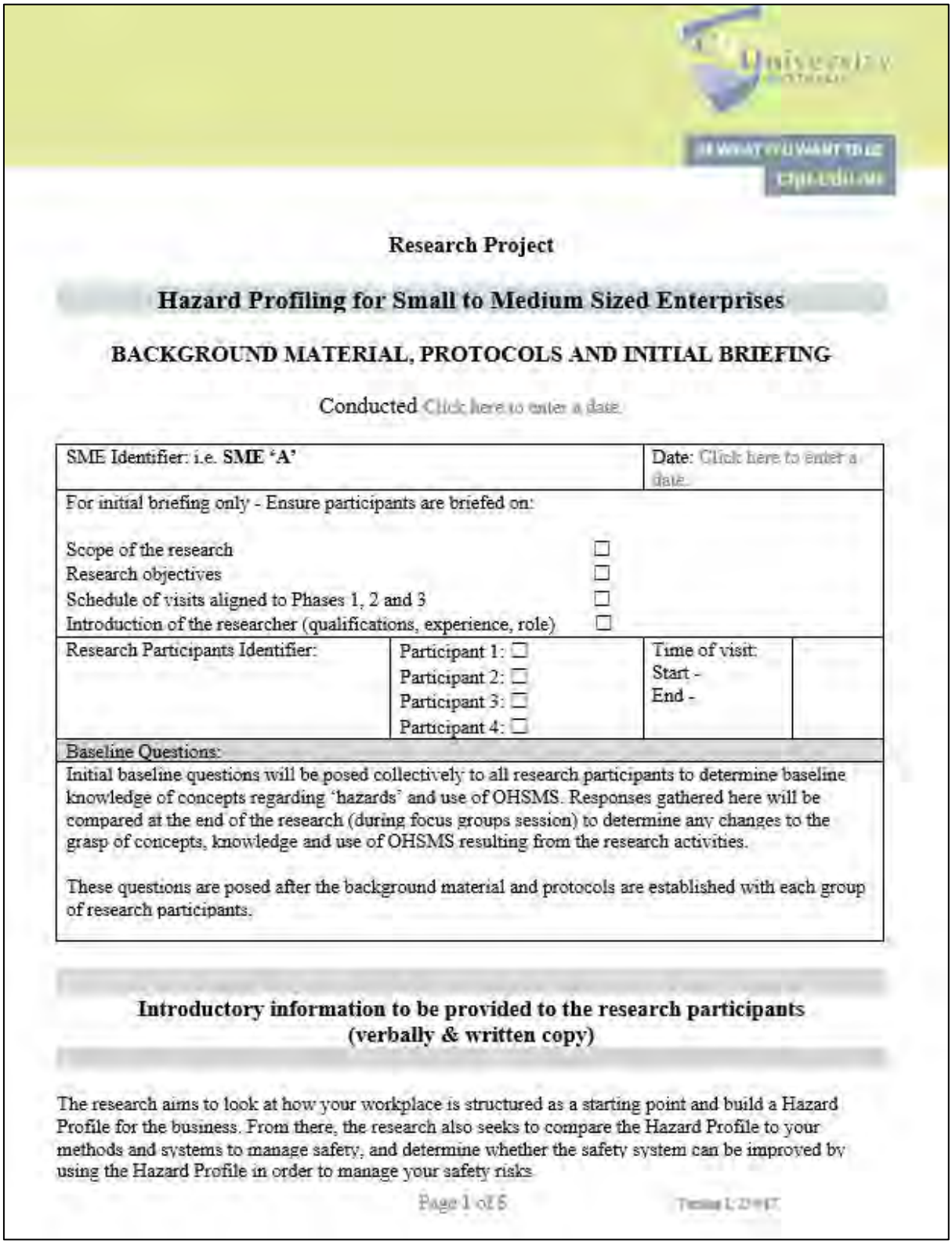
Researcher: Frank Bogna

Signed by researcher:

Date:

Appendix 7

Background material, protocols and initial briefing



Research Project

Hazard Profiling for Small to Medium Sized Enterprises

BACKGROUND MATERIAL, PROTOCOLS AND INITIAL BRIEFING

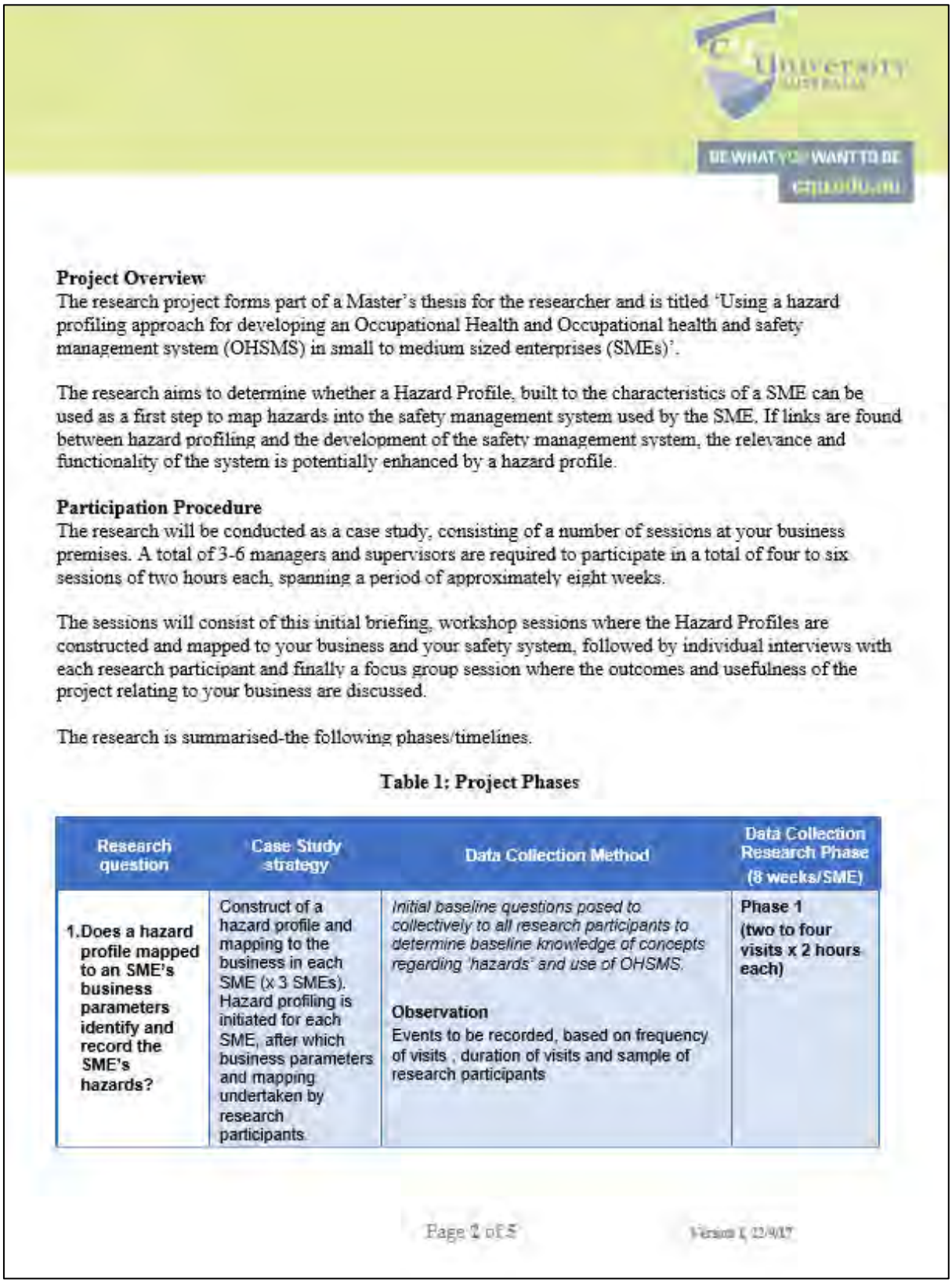
Conducted Click here to enter a date.

SME Identifier: i.e. **SME 'A'**		Date: Click here to enter a date.	
For initial briefing only - Ensure participants are briefed on: Scope of the research ☐ Research objectives ☐ Schedule of visits aligned to Phases 1, 2 and 3 ☐ Introduction of the researcher (qualifications, experience, role) ☐			
Research Participants Identifier:	Participant 1: ☐ Participant 2: ☐ Participant 3: ☐ Participant 4: ☐	Time of visit: Start - End -	
Baseline Questions: Initial baseline questions will be posed collectively to all research participants to determine baseline knowledge of concepts regarding 'hazards' and use of OHSMS. Responses gathered here will be compared at the end of the research (during focus groups session) to determine any changes to the grasp of concepts, knowledge and use of OHSMS resulting from the research activities. These questions are posed after the background material and protocols are established with each group of research participants.			

Introductory information to be provided to the research participants (verbally & written copy)

The research aims to look at how your workplace is structured as a starting point and build a Hazard Profile for the business. From there, the research also seeks to compare the Hazard Profile to your methods and systems to manage safety, and determine whether the safety system can be improved by using the Hazard Profile in order to manage your safety risks.

Page 1 of 5



Project Overview
The research project forms part of a Master's thesis for the researcher and is titled 'Using a hazard profiling approach for developing an Occupational Health and Occupational health and safety management system (OHSMS) in small to medium sized enterprises (SMEs)'.

The research aims to determine whether a Hazard Profile, built to the characteristics of a SME can be used as a first step to map hazards into the safety management system used by the SME. If links are found between hazard profiling and the development of the safety management system, the relevance and functionality of the system is potentially enhanced by a hazard profile.

Participation Procedure
The research will be conducted as a case study, consisting of a number of sessions at your business premises. A total of 3-6 managers and supervisors are required to participate in a total of four to six sessions of two hours each, spanning a period of approximately eight weeks.

The sessions will consist of this initial briefing, workshop sessions where the Hazard Profiles are constructed and mapped to your business and your safety system, followed by individual interviews with each research participant and finally a focus group session where the outcomes and usefulness of the project relating to your business are discussed.

The research is summarised-the following phases/timelines.

Table 1: Project Phases

Research question	Case Study strategy	Data Collection Method	Data Collection Research Phase (8 weeks/SME)
1. Does a hazard profile mapped to an SME's business parameters identify and record the SME's hazards?	Construct of a hazard profile and mapping to the business in each SME (x 3 SMEs). Hazard profiling is initiated for each SME, after which business parameters and mapping undertaken by research participants.	*Initial baseline questions posed to collectively to all research participants to determine baseline knowledge of concepts regarding 'hazards' and use of OHSMS.* **Observation** Events to be recorded, based on frequency of visits , duration of visits and sample of research participants	**Phase 1 (two to four visits x 2 hours each)**

Page 2 of 5 Version 1, 22/9/17

2. Does hazard profiling facilitate alignment to an OHSMS framework suited to the SMEs characteristics, and will this assist in managing OHS risks?	Determination of potential alignment/integration between hazard profile and OHSMS structure relevant for the SME.	**Observation** Events to be recorded, based on frequency of visits, duration of visits and sample of research participants	**Phase 1**
		Interview Questions posed to each research participant regarding concepts, design and usefulness of hazard profiles, alignment of hazard profile to OHSMS structure, and assistance in managing OHS risks	**Phase 2** **(one visit to interview each research participant – 30 minutes per interview)**
		Focus group Question bank used to trigger 'stimuli'. Content to include hazard profiling usefulness, mapping to business parameters, alignment of hazard profiles to OHSMS , suitability of process to SME's business	**Phase 3** **(one visit – 60 minute session)**

Confidentiality / Anonymity
Confidentiality and anonymity will be maintained by identifying participating organisations and research participants as numbers 1, 2 3 etc. under 'SME A', 'SME B' etc.

Data obtained from the research will be securely stored for five (5) years after the publication date of the last publication based upon the data in accordance with the CQUniversity policy.

Occupational Health and Safety
It is be a requirement under the Work Health and Safety Act 2011 (Qld) that the researcher will require that an induction be provided to the worksite or that part of the worksite where the researcher will be located. The researcher will need to be provided with relevant information, instruction and supervision to safeguard the researcher from OHS risks that may arise at the workplace.

Outcome / Publication of Results
A major outcome of the research project will be the completion of a thesis submitted to CQ University. Other outcomes may include a publication of findings in academic journals, the presentation of the findings at conferences and the conduct of seminars or workshops with industry associations or work health and safety regulatory authorities.

Consent
Consent to participate in the research project will be sought through the use of a Consent Form accompanying this letter of invitation. Please read each item contained in the consent form. Questions regarding the research project should be directed to the researcher prior to signing the consent form. Please return the Consent for to the researcher after

Right to Withdraw
As explained in the consent form, all participants have the right to withdraw at any time without penalty. Data provided by the participant may be withdrawn on request in these circumstances.

Feedback
Preliminary results can be provided to each SME at the conclusion of the data analysis, providing a preliminary summary based on the evidence collected and analysed for the SME during the research. The intent of the preliminary results is to provide some immediacy to SME's needs shortly after the conclusion of the data collection phase (approximately one month after the completion of the final visit to the SME).

Baseline Questions

Question posed to group	Recorded response
1. What is your understanding of hazards?	
2. What do you see as your needs in regards to the hazards in your business and how to manage them?	
3. What is your understanding of a hazard profile?	
4. What do you understand an OHSMS to be?	
5. What do you perceive as the state of your OHSMS?	
Responses will be recorded as a baseline record for the initial starting point for each SME, in terms of the knowledge and systems base currently existing within the SME.	

Questions/ Further Information
Further questions and information can be obtained from the researcher.

Researcher
Frank Bogna
OHS Lecturer – Transport, Emergency and Safety Sciences | School of Health, Medical and Applied Sciences
CQUniversity Australia, Building MKC003.2.06, 90-92 Sydney St, Mackay Qld 4740
P +61 07 49403390 | M +61 455 245 792| E f.bogna@cqu.edu.au

Checklist of items addressed/ completed

ITEM	Completed	Initialled (Researcher)
Project Overview (Scope & Schedule)	☐	
Participation Procedure	☐	
Confidentiality / Anonymity	☐	
Occupational Health and Safety	☐	
Outcome / Publication of Results	☐	
Consent	☐	
Right to Withdraw	☐	
Feedback	☐	
Baseline Questions	☐	
Questions/ Further Information	☐	

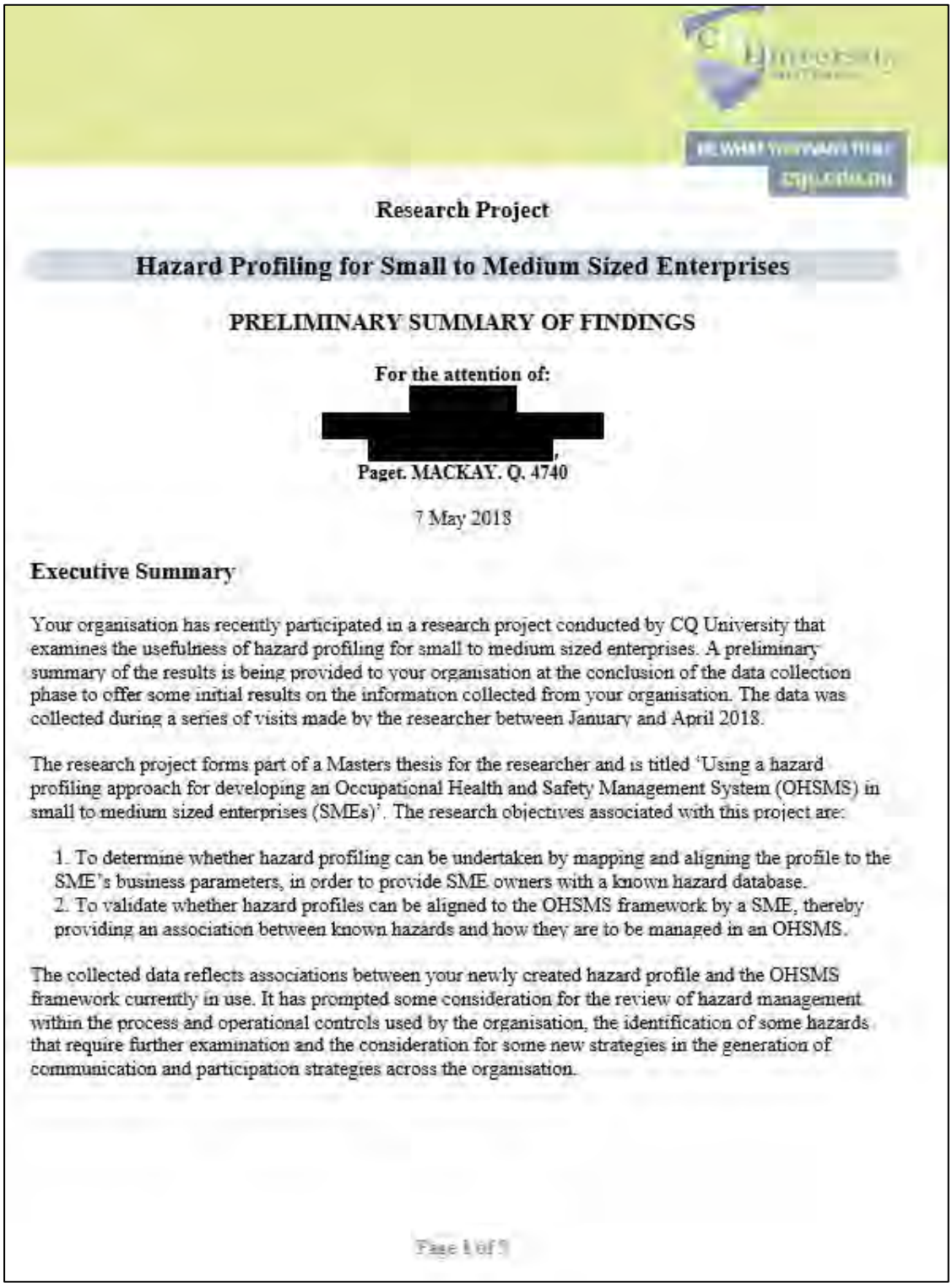
Researcher: Frank Bogna

Signed by researcher:

Date:

Appendix 8

Sample of a Preliminary Results Report



Research Project

Hazard Profiling for Small to Medium Sized Enterprises

PRELIMINARY SUMMARY OF FINDINGS

For the attention of:

[redacted]

Paget. MACKAY. Q. 4740

7 May 2018

Executive Summary

Your organisation has recently participated in a research project conducted by CQ University that examines the usefulness of hazard profiling for small to medium sized enterprises. A preliminary summary of the results is being provided to your organisation at the conclusion of the data collection phase to offer some initial results on the information collected from your organisation. The data was collected during a series of visits made by the researcher between January and April 2018.

The research project forms part of a Masters thesis for the researcher and is titled 'Using a hazard profiling approach for developing an Occupational Health and Safety Management System (OHSMS) in small to medium sized enterprises (SMEs)'. The research objectives associated with this project are:

1. To determine whether hazard profiling can be undertaken by mapping and aligning the profile to the SME's business parameters, in order to provide SME owners with a known hazard database.
2. To validate whether hazard profiles can be aligned to the OHSMS framework by a SME, thereby providing an association between known hazards and how they are to be managed in an OHSMS.

The collected data reflects associations between your newly created hazard profile and the OHSMS framework currently in use. It has prompted some consideration for the review of hazard management within the process and operational controls used by the organisation, the identification of some hazards that require further examination and the consideration for some new strategies in the generation of communication and participation strategies across the organisation.

Page 1 of 5

BE WHAT YOU WANT TO BE
cqu.edu.au

Research Method
The research was conducted as a case study, spanning a number of workshop sessions where a hazard profile was constructed by your organisation and mapped to its business and portions of the OHSMS to establish whether a hazard profile can assist with identifying and documenting hazards. The workshop sessions were followed by individual interviews with each research participant. A final focus group session was conducted, where the outcomes and usefulness of the project relating to the business were evaluated in order to confirm potential links between hazard profiling and the development of the safety management system.

Findings
The following preliminary observations have been made from the data collected.

- The hazard profile has acted as a 'trigger' for the determination of particular hazards and their controls.
- The hazard profile has identified a number of areas within the process and operational controls that research participants have suggested may require further attention regarding hazard management.
- The creation of a hazard profile has encouraged the use of greater communication regarding hazards and their management.
- The hazard profile may have assisted in the identification of particular hazards not previously captured, for example in relation to activities such as fuelling of vehicles, journeys, site visits and associated accommodation.
- Some degree of alignment has been found between the hazard profiles and the OHSMS framework, prompting some consideration for the redesign of the OHSMS and how portions of it may be communicated to supervisors and the workforce.
- The hazard profile may be used in the future to further identify and address particular hazards, potentially as a database or in association with the EHS Directory.

Conclusion
It is anticipated that the relevance and functionality of your organisation's OHSMS system has potentially been enhanced by the creation of a hazard profile as part of this research project. On behalf of CQ University, I would like to thank [redacted] for making their organisation and staff available for the conduct of this research.

Yours Sincerely,

[redacted]

Frank Bogna
OHS Lecturer – Transport, Emergency and Safety Sciences | School of Health, Medical and Applied Sciences
CQUniversity Australia

E f.bogna@cqu.edu.au

Appendix 9

Ethics Approval Letter

CELEBRATING
25 YEARS

Secretary, Human Research Ethics Committee
Ph: 07 4923 2603
Fax: 07 4923 2600
Email: ethics@cqu.edu.au

A/Prof Geoffrey Dell and
Mr Frank Bogna
School of Health, Medical and Applied Sciences
Central Queensland University

7 November 2017

Dear A/Prof Dell and Mr Bogna

HUMAN RESEARCH ETHICS COMMITTEE ETHICAL APPROVAL PROJECT: H17/09-171 USING A HAZARD PROFILING APPROACH FOR DEVELOPING AN OCCUPATIONAL HEALTH AND SAFETY MANAGEMENT SYSTEM (OHSMS) IN SMALL TO MEDIUM SIZED ENTERPRISES (SMES)

The Human Research Ethics Committee is an approved institutional ethics committee constituted in accord with guidelines formulated by the National Health and Medical Research Council (NHMRC) and governed by policies and procedures consistent with principles as contained in publications such as the joint Universities Australia and NHMRC *Australian Code for the Responsible Conduct of Research.* This is available at http://www.nhmrc.gov.au/publications/synopses/_files/r39.pdf.

On 7 November 2017, the Chair of the Human Research Ethics Committee considered your application under the Low Risk Review Process. This letter confirms that your project has been granted approval under this process, pending ratification by the full committee at its December 2017 meeting.

The period of ethics approval will be from 7 November 2017 to 31 July 2018. The approval number is H17/09-171; please quote this number in all dealings with the Committee. HREC wishes you well with the undertaking of the project and looks forward to receiving the final report. The standard conditions of approval for this research project are that:

(a) you conduct the research project strictly in accordance with the proposal submitted and granted ethics approval, including any amendments required to be made to the proposal by the Human Research Ethics Committee;

(b) you advise the Human Research Ethics Committee (email ethics@cqu.edu.au) immediately if any complaints are made, or expressions of concern are raised, or any other issue in relation to the project which may warrant review of ethics approval of the project. *(A written report detailing the adverse occurrence or unforeseen event must be submitted to the Committee Chair within one working day after the event.)*

CELEBRATING 25 YEARS AS A UNIVERSITY.

CQUniversity AUSTRALIA

(c) you make submission to the Human Research Ethics Committee for approval of any proposed variations or modifications to the approved project before making any such changes;

(d) you provide the Human Research Ethics Committee with a written "Annual Report" on each anniversary date of approval (for projects of greater than 12 months) and "Final Report" by no later than one (1) month after the approval expiry date; *(Forms may be downloaded from the Office of Research Moodle site - http://moodle.cqu.edu.au/mod/book/view.php?id=334905&chapterid=17791.)*

(e) you accept that the Human Research Ethics Committee reserves the right to conduct scheduled or random inspections to confirm that the project is being conducted in accordance to its approval. Inspections may include asking questions of the research team, inspecting all consent documents and records and being guided through any physical experiments associated with the project

(f) if the research project is discontinued, you advise the Committee in writing within five (5) working days of the discontinuation;

(g) A copy of the Statement of Findings is provided to the Human Research Ethics Committee when it is forwarded to participants.

Please note that failure to comply with the conditions of approval and the *National Statement on Ethical Conduct in Human Research* may result in withdrawal of approval for the project.

You are required to advise the Secretary in writing within five (5) working days if this project does not proceed for any reason. In the event that you require an extension of ethics approval for this project, please make written application in advance of the end-date of this approval. The research cannot continue beyond the end date of approval unless the Committee has granted an extension of ethics approval. Extensions of approval cannot be granted retrospectively. Should you need an extension but not apply for this before the end-date of the approval then a full new application for approval must be submitted to the Secretary for the Committee to consider.

The Human Research Ethics Committee wishes to support researchers in achieving positive research outcomes. If you have issues where the Human Research Ethics Committee may be of assistance or have any queries in relation to this approval please do not hesitate to contact the Secretary, Sue Evans or myself.

Yours sincerely,

A/Prof Tania Signal
Chair, Human Research Ethics Committee

Cc: Dr Aldo Raineri (co supervisor) Project file

Approved

Appendix 10

Thematic Conceptual Matrix (template and coding structure)

Thematic Conceptual Matrix
DATA COLLECTION TOOL: **OBSERVATIONS**

Research Question	Breakdown of criteria (phenomenological concept)	SME 'A'	SME 'B'	SME 'C'	SME 'D'	Codes	Categories	Themes (& description)	Significant observations	Events (analysed in critical realism framework)
		Collective analysis representing all research participants per SME								
Does a hazard profile mapped to an SMEs business parameters identify and record the SMEs hazards?	*Concept of a hazard profile*									
	Design features of a hazard profile									
	Usefulness of the hazard profile to managing hazards and consequent risks									
Does hazard profiling facilitate alignment to the OHSMS framework suited to the SME's characteristics, and will this assist in managing OHS risks?	*Alignment between the hazard profile and the SME's business contexts*									
	Knowledge on the OHSMS and its use									
	Links between hazard profiling and the OHSMS									
	Visual mapping as a tool used in the creation of the profile									
	Reflective learning arising from the research activity									

Legend: Evidence coding

Notes:

○ Not evident	✪ Partially evident	● Evident
Not evident (absence of notable event/comment that element is present)	Partially evident (at least one notable event/comment)	Evident (two or more notable events/comments)

Code list:

Deductive codes	
HPC	Hazard profile concept
HPDF	Hazard profile design features
HPUS	Usefulness of hazard profile
HPBC	Alignment of hazard profile to SME business contexts
SMSKN	Knowledge of OHSMS
SMSUSE	Use of OHSMS
HPSMSLNK	Links between hazard profiling and the OHSMS
VM4HP	Visual mapping as a tool for creating hazard profiles
RL	Reflective learning arising from the research activity
Inductive codes	
CA	Collaborative approach
CS	Communication strategies
NS	New strategies for development of hazard profile and links to OHSMS
TK	Tacit knowledge

Summary of findings:

Thematic Conceptual Matrix
DATA COLLECTION TOOL: INTERVIEWS

Research Question	Breakdown of question (phenomenol-ogical concept)	SME 'A'				SME 'B'			SME 'C'				SME 'D'				Codes	Categories	Themes	Significant statements	Events (analysed in critical realism framework)
		Research participants																			
		Do	Dw	Di	Me	Em	Br	Ma	Ma	We	Da	Tr	Ni	De	Ma	Mer					
Does a hazard profile mapped to an SMEs business parameters identify and record the SMEs hazards?	*Concept of a hazard profile*																				
	Design features of a hazard profile																				
	Usefulness of the hazard profile to managing hazards and consequent risks																				
Does hazard profiling facilitate alignment to the OHSMS framework suited to the SME' s characteristics, and will this assist in managing OHS risks?	*Alignment between the hazard profile and the SME's business contexts*																				
	Knowledge on the OHSMS and its use																				
	Links between hazard profiling and the OHSMS																				
	Visual mapping as a tool used in the creation of the profile																				
	Reflective learning arising from the research activity																				

Notes:	**Legend: Evidence coding**			**Code list:**	
	○ Not evident	✪ Partially evident	● Evident	**Deductive codes**	
				HPC	Hazard profile concept
'No entry' denotes no evidence or relevant data found.	Not evident (absence of notable event/comment that element is present)	Partially evident (at least one notable event/comment)	Evident (two or more notable events/comments)	HPDF	Hazard profile design features
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				Inductive codes	
				CA	Collaborative approach
				CS	Communication strategies
				NS	New strategies for development of hazard profile and links to OHSMS
				TK	Tacit knowledge

Summary of findings:

Thematic Conceptual Matrix
DATA COLLECTION TOOL: FOCUS GROUPS

Research Question	Breakdown of question (phenomenological concept)	SME 'A'	SME 'B'	SME 'C'	SME 'D'	Codes	Categories	Themes	Significant statements	Events (analysed in critical realism framework)
		Collective analysis representing all research participants per SME								
Does a hazard profile mapped to an SMEs business parameters identify and record the SMEs hazards?	*Concept of a hazard profile*									
	Design features of a hazard profile									
	Usefulness of the hazard profile to managing hazards and / consequent risks									
Does hazard profiling facilitate alignment to the OHSMS framework suited to the SME' s characteristics, and will this assist in managing OHS risks?	*Alignment between the hazard profile and the SME's business contexts*									
	Knowledge on the OHSMS and its use									
	Links between hazard profiling and the OHSMS									
	Visual mapping as a tool used in the creation of the profile									
	Reflective learning arising from the research activity									

Legend: Evidence coding

Notes:
'No entry' denotes no evidence or relevant data found.

○ Not evident	✪ Partially evident	● Evident
Not evident (absence of notable event/comment that element is present)	Partially evident (at least one notable event/comment)	Evident (two or more notable events/comments)

Code list:

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TK	Tacit knowledge

Summary of findings:

Thematic Conceptual Matrix

DATA COLLECTION TOOL: GRAPHICAL RECORDINGS

Research Question	Phenomenological concept	SME 'A'	SME 'B'	SME 'C'	SME 'D'	Codes	Categories	Themes	Significant observations	Events (analysed in critical realism framework)
		Collective analysis representing all research participants per SME								
Does a hazard profile mapped to an SMEs business parameters identify and record the SMEs hazards?	*Concept of a hazard profile*									
	Design features of a hazard profile									
	Usefulness of the hazard profile to managing hazards and consequent risks	Not applicable Usefulness of hazard profile not measured graphically								
Does hazard profiling facilitate alignment to the OHSMS framework suited to the SME's characteristics , and will this assist in managing OHS risks?	*Alignment between the hazard profile and the SME's business contexts*									
	Knowledge on the OHSMS and its use	Not applicable Knowledge of OHSMS not measured graphically								
	Links between hazard profiling and the OHSMS									
	Visual mapping as a tool used in the creation of the profile									
	Reflective learning arising from the research activity									

Legend:

Notes:
'No entry' denotes no evidence or relevant data found.

○ Not evident
Not evident (absence of notable event/comment that element is present)

✪ Partially evident
Partially evident (at least one notable event/comment)

● Evident
Evident (two or more notable events/comments)

Code list:

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NS	New strategies for development of hazard profile and links to OHSMS
TK	Tacit knowledge

Summary of findings:

CODING STRUCTURE - LIST OF CODES, CATEGORIES, THEMES AND EVENTS

CODES		CATEGORIES	THEMES	EVENTS
Deductive codes		Hazard profile Activities, Products, Services. People. Alternative categories for HP design Hazard identification and control Hazard-Risk association Element of OHSMS Systems knowledge dominated by key informant OHSMS Integration of safety Mapping of hazard profile to OHSMS Communication Collaboration Whiteboard Spreadsheet Obtaining implicit/unstated knowledge Breadth of hazards Alternative categories for HP design Availability of OHSMS Hazard profile alignment to the SME's business Allocation of tasks - development of profile Familiarity with OHSMS	*Hazard profile design* *Categorisation* *Hazard identification* *Hazard control* *Systems knowledge and use of systems* *Availability of OHSMS* *Integration of safety into the business* *Alignment of hazard profiling to systems* *Visual depiction* *Leadership by key informants* *Tacit and explicit knowledge* *Omission of risk from the hazard profile* *Interactive teamwork* *Operational controls* *Strategic planning*	E 1 - HP. Creation on whiteboard (SME A, B, C & D) E 2 - HP. Creation on spreadsheet (SME B & D) E 3 - Spreadsheet discontinued during group design of HP (SME A) E 4 - Additional hazards identified - fatigue, fitness for work, vehicle journeys, inadequate communication by supervisors and limited experience of supervisors (SME A & B) E 5 - OHSMS not used to create hazard profile (SME A, C & D) E 6 - OHSMS made available and used for HP (SME B) E 7 - Linked procedures to hazard profile (SME B) E 8 - New main category (redesign of profile) to activities, services and people (SME B) E 9 - Link HP to legislation (SME A) E 10 - Entry of additional columns in HP (SOP, Manual, Procedures, Doc) in spreadsheet to assist with mapping (SME B) E 11 - Use of HP to rectify hazards using a systems tool > Corrective actions register (SME B) E 12 - Planning of hazard communication methods (SME A) E 13 - Toolbox ta ks introduced, regarding hazards and their management (SME A) E 14 - Additions made to hazard profile independently of researcher and research activities (SME B, C & D)
HPC	Hazard profile concept			
HPDF	Hazard profile design features			
HPUS	Usefulness of hazard profile			
HPBC	Alignment of hazard profile to SME business contexts			
SMSKN	Knowledge of OHSMS			
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Inductive codes				
CA	Collaborative approach			
CS	Communication strategies			
NS	New strategies for development of hazard profile and links to OHSMS			
TK	Tacit knowledge			

Source: Structure adapted from Henderson & Segal (2013)

Appendix 11

Sample of a hazard profile (incomplete sample)

What is Done			Hazards	Controls	HSEQ (IMS) Management System (Documentation)				Risk Register	GAPS
Activities					Section of IMS Manual	Forms / Docs / Register	Procedure	SOP		
Administration	Office Work	Workstations	Poor ergonomic setup	HSEQ Induction Regular breaks encouraged Fitness for Work	6.1, 6.1.1, 6.1.2, 6.1.3, 7.1.3, 7.1.5, 7.2		Risk Mgt Pro			Add to Paget Facility Induction - ergonomics, manual handling
		Computing	Long periods in front of screen Repetitive movement / tasks							Add to Paget Facility Induction - ergonomics, manual handling
		Archiving	Manual handling				Manual Handling Pro			Add to Paget Facility Induction - ergonomics, manual handling
Restocking Containe	Replenish Equipment		Manual handling Hazardous substances Fall from any level Pinch Points	PPE Trained & competent operators JSEA's Fitness for Work SDS'	6.1, 6.1.1, 6.1.2, 6.1.3, 7.1.3, 7.1.5, 7.2	Chem RA, SDS, Approve Chem Reg	Manual Handling Haz Subst & DG Risk Management Pro's			
	Test & Tag / Calibra	Plant and Equipment	Manual handling Electrocution Lack of qualification / competency Cuts and abrasions Out of service / inspection dates	PPE Trained & competent operator Fit for purpose tools & equipment Fit for Work	6.1, 6.1.1, 6.1.2, 6.1.3, 7.1.3, 7.1.5, 7.2	Asset Reg, Test & Tag 4Ps - Qualified personnel Asset Reg, Test & Tag	Manual Handling Training			TNA, Matrix (Paget Facility)
LV & Truck Servicing	Repairs		Manual handling Hazardous substances Crush injury Lone worker Excessive noise Tools and equipment - contact injury Slips & Trips	Trained & competent operators HSEQ Induction PPE Risk assessment - JSEA Serviced & maintained equipment (Asset Register) Fit for Purpose SDS' Co workers (Buddy System)	6.1, 6.1.1, 6.1.2, 6.1.3, 7.1.3, 7.1.5, 7.2	Chemical RA, SDS 4Ps - Qualified personnel	Manual Handling Haz Sub & DG Risk Mgt - JSEA			TNA & Matrix (LV Workshop, Paget) VoC Isolation Procedure
	Tyre Change & Balance		Contact injury (entanglement) Manual handling Pinches / cuts / abrasion Tyre explosion Inexperienced operator	"Trained & competent operators HSEQ Induction PPE Risk assessment - JSEA Serviced & maintained equipment (Asset Register) Fit for Purpose SDS' Co workers (Buddy System) SOP's & JSEAs	6.1, 6.1.1, 6.1.2, 6.1.3, 7.1.3, 7.1.5, 7.2	4Ps - Qualified personnel	SOP Manual Handling Training & Dev; Recruit & Onboard	Tyre Changer, Vehicle Hoist, Wheel Aligner, Wheel Balancer		TNA & Matrix (LV Workshop, Paget) VoC Isolation Procedure
	Restocking		Hazardous substance Manual handling Pinch Points	PPE Trained & competent operators JSEA's SDS Fitness for Work	6.1, 6.1.1, 6.1.2, 6.1.3, 7.1.3, 7.1.5, 7.2	Chem RA, SDS, Approve Chem Reg	Haz Sub & DG Manual Handling			

Note: This is an incomplete sample of a hazard profile, as the research participants had transferred this developmental information in to other visual and enterprise specific formats.