

Occupational safety and health in networked organisations:

**Management of OSH in networked systems
of production or service delivery: studies in
healthcare, construction and logistics**

Report submitted to the IOSH Research Committee

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OCCUPATIONAL SAFETY AND HEALTH IN NETWORKED ORGANISATIONS:

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ABSTRACT

How do employees in large, networked organisations know how to work in a safe and healthy manner? Does occupational safety and health (OSH) knowledge flow, and, if so, how? This report presents findings from our research project entitled: *Management of OSH in networked systems of production or service delivery: comparisons between healthcare, construction and logistics*, funded by the Institution of Occupational Safety and Health (IOSH) and forming part of the IOSH research programme Health and Safety in a Changing World. We introduce the main concepts of OSH knowledge and organisational networks along with the interdisciplinary theoretical approaches from human factors, safety science, ethnography and organisation studies used as lenses to study the topic. Our findings cover sources and forms of OSH information; channels of communication; structure and flow across the network; filters or membranes affecting the translation of the OSH messages. We deal with conflicts, barriers and enablers for OSH messages, internal translation and enactment. We discuss the ethnographic lens in some detail. We develop a 'Third Way' model to aid understanding of the combination of, and interaction between, the bottom-up and top-down approaches. We propose responses to the reality of OSH as enacted along with OSH futures. We propose a Person-Centric OSH Knowledge (P-COK) flow model to improve understanding of how people take-in, translate and enact both explicit and tacit OSH messages from a network context. A further, practitioner-facing output is planned for the near future.

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EXECUTIVE SUMMARY

OUR AIMS, APPROACH AND METHODS

This research report presents our findings from the project entitled: Management of OSH in networked systems of production or service delivery: comparisons between healthcare, construction and logistics. This project was funded by the Institution of Occupational Safety and Health (IOSH) and formed part of the IOSH research programme Health and Safety in a Changing World. Networked organisations are large, complex organisations where significant relationships and connections exist across traditional hierarchical, business or functional boundaries.

We aimed to identify the types of OSH knowledge and evidence that circulate and work in relation to each other in organisations involved in networked delivery systems, how local actors in organisations interpret information and, in turn, the influences on OSH. In sharing good practice and insights from and across different sectors, organisations can learn more about the ways in which safe and healthy working is achieved in practice, as well as ways of improving their OSH knowledge flow, making it a better working environment for all staff.

We used an interdisciplinary research approach through the lenses of human factors, safety science, ethnography and organisation studies domains. The seven case study organisations that formed the basis of our study were from construction (2), healthcare (2) and logistics (3) as they all operated in complex organisational contexts but yet covered a spectrum of task and organisational environments. We had 150 face to face interactions in two phases through interviews and focus groups, developing data flow diagrams and using critical incidence techniques to focus interviewees on practical realities. Emergent themes from phase 1 were then investigated further at phase 2 and through qualitative ethnographic methods at case-study organisations from across the sectors, spending five weeks at each organisation working with and a broad community of practitioners (line managers and workers) - 'key informants': 16 healthcare, 7 construction and 10 logistics.

We selectively deploy the data and our analyses in complementary ways to answer the research questions, mobilising aspects of the data in concert to illustrate the complex ways in which tacit and explicit knowledge combine in both expected and unexpected ways. We also dedicate a standalone section to discuss ethnographic findings to avoid privileging one perspective over the other, and to put our datasets in dialogue with each other (both directly and indirectly) to present a more complete understanding of OSH practices within networked organisational and supply chain settings.

We have used complementary but distinctive methodological, theoretical, and interpretive approaches to explore the complex ecology of OSH-knowing in large organisations. By revealing insights and good practices from across different sectors, and using these as opportunities to learn more about how safe working is actually achieved in practice, the research has generated a set of applied conclusions to assist organisations to improve OSH-knowledge flows.

We position our findings against contemporary debates and emerging theoretical thinking, interpreting the findings from our fieldwork, drawing on our different disciplinary perspectives. We use this to formulate a pragmatic, person-centric account of knowledge and information flow, applicable to individuals in a network and the networks themselves. We highlight what we believe to be key implications for the OSH profession arising from the research.

CONTRIBUTION TO THE OSH RESEARCH FIELD - SUMMARY OF MAIN FINDINGS

OSH-knowledge at the case study organisations was generated from varied sources including both internal (e.g., responding to incidents) and external (e.g. HSE, governing bodies, other companies). Managers and supervisors perceived themselves to play a key role in ‘flowing’ – or selecting, translating, and distributing – OSH-knowledge to the workforce. Multiple communication channels were used, including textual, visual, digital, and electronic, but a preference for verbal ‘face-to-face’ communication was emphasised due to its perceived effectiveness for assisting the uptake of messages.

Common across the sectors was an emphasis on transmitting OSH-knowledge through the formalised spaces of training (induction) and the mechanisms of instruction (policy, guidelines). Workers were perceived to learn safe practice from a one-way ‘flow’ of knowledge between individuals (e.g. trainer to trainee); however initiatives across the sectors such as feedback card systems in construction did attempt to facilitate greater worker engagement in safety management and practice.

Despite novel approaches to greater worker engagement, an emphasis on formalised OSH-knowledge transmission may overlook the other ways that workers learn about and communicate safety in the workplace, and may not recognise the safe practices that workers have already developed in response to the contingencies of particular workplace scenarios and contexts. Workers were found to learn and communicate OSH-knowledge in informal, subtle, and less direct ways. A wide range of routine, taken-for-granted, or ‘quiet safety’ practices were devised by workers to ensure their own and other’s safety. These were developed from working with, talking to, and watching others, but also the embodied, sensory experience of undertaking practical tasks in specific organisational, social, material and temporal workplace environments.

By developing skills and abilities to anticipate and plan approaches to working safely, workers used varied sources of knowledge including personal and informal ways of knowing gained from non-work contexts. Embodied, sensory, affective, intuitive, and experiential ways of knowing were crucial to how workers made OSH ‘feel right’ or ‘work in practice’. These were not antagonistic to, but were brought together with (and used to supplement) institutional-OSH.

External agents - including patients (healthcare) or customers (logistics) - were also crucial sources of information that workers used in order to anticipate, plan, and manage approaches to safe working and thus actively involved in the co-production of OSH-knowledge.

Learning how to work safely was thus shown to be an incremental and ongoing process, as approaches were developed in response to specific features of workplace environments. In particular, the dynamic properties of diverse workplaces (building sites, organisational bases, and customer/patient homes) were foregrounded as workers were found to be responding to the uncertain and ongoingly changing features of these contexts by adapting, improvising, and innovating OSH knowledge and practice. OSH was found to be contingently situated and enacted in ways that were organisationally, individually, culturally, and socially appropriate.

OUR MORE DETAILED FINDINGS

Knowledge creation

Both our interviews and ethnography suggested that OSH knowledge is co-created and interpreted socially, both in informally and formally, often leading to workers 'picking up' knowledge either explicitly or tacitly. Our ethnography also revealed that knowledge is not static but is, at least partially, socially constructed in and through practice. Workers placed value of 'learning by doing' and more informal clusters of knowledge. Knowledge is produced both top-down and constructed by individuals and social networks from the bottom up.

Participants stated that they used both formal (in accordance with convention or standard practice in the organisation) and informal (a more relaxed, unofficial style) OSH knowledge to do their job safely. The extent to which individuals rely on formal and informal knowledge can be a function of experience, familiarity with the work environment and instruction from their organisation. Dynamic work environments require a level of flexibility in the interpretation of formal information as well as the use of more individually and/or socially constructed practices. These two types of knowledge are often used together to develop an approach appropriate for 'in the field' operations.

Knowledge sources

OSH information came from a number of sources across all of the study organisations and took several forms. However, more generally, sources may be described as external (coming from outside the organisation) or internal (coming from inside the organisation) and are both formal and informal. There is a lot of "know what" rather than "know how" to prevention of injury and ill health at work. There is also a need to identify the quality and trustworthiness of the source.

Formal external sources are used by managers and OSH professionals, but also many internal sources played an active part in knowledge production. External sources included professional education; Health and Safety Executive (HSE); other regulatory bodies ; insurers; professional bodies such as Institution of Occupational Safety & Health (IOSH); professional magazines; equipment / product suppliers; the media (news about workplace accidents etc); and personal networks. Sources Internal to the organisation were also crucial

sources of information used to anticipate, plan, and manage approaches to safe working - they included OSH committees; OSH managers; line managers; colleagues; and champions (keenies) – both acknowledged and unacknowledged.

Many respondents relied on social networks and colleagues as sources of information, alluding to the prevalence of strong social hierarchies in many work organisations and the natural development of ‘arenas’ for shared learning.

Tacit, informal, and ‘alternative’ (i.e. non-organisational) ‘ways of knowing’ play a significant role in maintaining worker health and safety. We provide empirical support for these statements and develop different perspectives from those dominant in safety research by exploring how worker OSH, the environment, perception, and practice interact to produce safe working. Informal knowledge tended to be socially constructed via colleagues, champions and external agents (including patients or customers).

Knowledge Channels

A channel describes the way information is transmitted from the source to the receivers. Over 40 different channels were identified including: training; verbal; meetings; internet (www); intranet (company-specific); emails; internet forums; notice boards; leaflets; posters; TV/Radio; newspapers/magazines; and real-life examples. Training included education at college, school and university; professional trade training; new site or location induction; and on-going CPD/Tool-box talks. Verbal communication was cited across the three sectors as one of the most efficient and effective means of conveying OSH messages.

Electronic communication has revolutionised society, with most people in the UK owning a smart phone capable of phone calls, emails and internet browsing. These technologies have also affected the way that business is done but such methods are currently problematic as many companies outlaw, or at least discourage access to the internet. Emails provide time-effective means of communication but can create significant backlogs if not carefully managed and also necessitate access to IT as well as suggesting a need for an immediate response which is not always necessary or helpful. Many industrial contexts ban the use of mobile phones on safety grounds and many smaller work locations do not provide access to work computers. However, this is an area that must be addressed by industry to maximise the benefits available.

Several feedback channels were identified including OSH committees and initiatives such as ‘close call’ or ‘near miss’ reporting or worker suggestion boxes.

It was considered important to use various alternative channels appropriate to the needs and circumstances of the receivers, especially those working in dynamic environments.

Knowledge Flow

OSH knowledge does not only (or always) ‘flow’, but sometimes emerges *through* practice. We argue that it is not only static, predefined ‘knowledge’ that is added to action and then moves around an organisation, but that ‘ways of knowing’ emerge incrementally from and through the practical, situated actions of workers. We have found that OSH knowledge is shaped and reshaped through the process of enactment; at times being

appropriated, at others times being augmented through its situated application and re-application elsewhere in the network. Knowledge is continually mutating as it moves through time and space.

The complexity of the networks within and across which knowledge travels and the nature of the hazard and regulatory environments affect how formal and informal OSH knowledge interact and shape one other. At times formal knowledge will collect tacit practices as it travels, growing in scale and complexity; at other times it will remain largely intact, shaping and determining processes and behaviours. The challenge for OSH practitioners is to comprehend the institutional context's role in shaping this knowledge pathway, learning when to accept localised contingent practice as equally valid to formalised knowledge; and learning how to harness the power of emergent practices alongside a more codified approach to achieve positive OSH outcomes.

Notwithstanding, it is clear that *something* flows around the network and that this *something* can be translated into knowledge leading to enactment at a group or individual level. However, large networks can be challenging, creating long complex communication paths and the knowledge was determined, to some extent, by the structure and characteristics of the workplace. All the case studies had some sort of hierarchical flow structure despite their networked nature. Data Flow Diagrams have been developed for OSH messages for the case studies in all three sectors.

Temporary, agency or bank workers were used in each of the sectors and the flow of OSH messages to these workers was found to be lacking on a number of occasions. There was considerable variation in training depending on whether workers were employed by the main organisation in the network or by a subcontractor or supplier.

The 'OSH hub' (an OSH manager, consultant or keen worker) was a key success factor for effective OSH message flow. As a 'political reflective navigator', whether acknowledged formally or not, pursues an agenda in a complex network tempering other agendas such as productivity, economics and quality. The OSH hub is political in pursuing a work environment agenda; and is reflective in being able to switch between different roles and mobilize different types of knowledge. The OSH hub is a navigator by knowing how to navigate in the complex network surrounding the technological change process.

Knowledge Filters - Enablers and obstructions

In a simple, ideal world, the OSH message would be transmitted from a reliable source through an effective channel to a receptive receiver who would accurately process it and enact it appropriately. However, there are many other aspects that affect how the receiver processes the main task-specific OSH message along with all the other related 'messages'. We describe these as filters, or membranes, through which the messages must pass and which will affect how the messages are translated and processed and eventually enacted. However, their intangible nature may be better described as a 'fog', rather than a filter, through which the messages must navigate.

These filters can be 'OSH-philic' (enhancing OSH messages) or 'OSH-phobic' (limiting or restricting OSH messages). Restricting filters include lack of stability (of structure or workforce make-up), varying work

environments, project-based structures, contract or agency workers, time pressures, priorities, social groups, or sub-cultures within organisations, bureaucracy, conflicting messages from different sources and the interface between organisational departments. Enabling conditions that facilitated knowledge flow included: stability and structure within organisations, as well as the creation of a culture of individual OSH ownership and responsibility.

We also addressed the tensions between apparently conflicting goals such as patient safety and occupational safety in healthcare or productivity and worker occupational safety in construction or logistics. These are caused or strongly influenced by either the situation or the individual and have implications for OSH enactment and behaviour. As such, all of them are, to some extent, personalised and internalised by the individual, either consciously or subconsciously.

Notwithstanding these external barriers and enablers, the responsibility of individuals to listen, appropriate, translate and enact OSH carefully, effectively and appropriately was also stressed. The culture and environment created in the networks and the individual workplaces was significant in encouraging or discouraging this.

Knowledge translation and enactment

Once through the fog, or filters, the OSH message must be translated internally by the individual which relies on their internal cognitive and intellectual abilities and the appropriateness of the message channel. This internal process is outside of the scope of our research. The enactment by most individuals in the network is to pass the message on to other individuals or groups, often after changing the channel to improve the chance of it being effectively understood and accepted by the next layer of receivers. The ultimate enactment is at the end of the network, by the people who are doing the tasks and are most likely to be hurt if something goes wrong. The enactment of OSH messages is rarely completely in line with the intention of the original source. Partial enactment may be because the individual does not understand the message; or because they consider, rightly or inadvisably, that the conditions and environment that they face makes the message inappropriate; or because the individual decides, consciously or subconsciously, not to follow the guidance or instruction of the message. Across all these categories is the reality where, to a lesser or greater extent, enactment is determined, based on contingent knowledge, created by the individual or group concerned. Different responses are required for each of these partial enactment categories.

Dynamic Risk Assessments and Workarounds

We know that dynamic risk assessments and workarounds are contentious topics, at least in the OSH domain. We acknowledge that there is a clear need to properly consider all tasks and to establish appropriate, safe and healthy methods to complete them. It is also important to ensure, as far as possible, that all tasks are completed in a safe and healthy manner.

For high risk tasks, great care should be taken to avoid inappropriate alteration of the agreed method, although, in dynamic high-risk situations, it is essential that those involved are able to assess the risk 'in the

field’ and to take appropriate action. Many contemporary OSH management systems stress the need for workers to be empowered to stop any task or process that they consider is not safe.

We also acknowledge that, for a small number of situations or tasks, there could be a need for action to be taken immediately to prevent a catastrophe. Where such tasks are envisaged, individuals should be properly trained to be able to make good decisions under extreme pressure, for example using scenario-based training.

Notwithstanding, in the majority of cases, particularly for lower-risk tasks, although safe working methods may have been agreed, there may be several alternative methods to do the task safely. Furthermore, the task environment may change such that the previously planned method is inappropriate. It is in such cases that acknowledging that the enactment of OSH messages is rarely completely in line with the intention of the original source can actually improve OSH management and increase the likelihood of unwanted consequences.

Our research found that dynamic risk assessments were a common response to partial enactment of the message because the individual considers, rightly or inadvisably, that the conditions and environment that they face makes the message inappropriate. There was a difference between the environments faced in static, relatively unchanging work environments and those where the situation was constantly changing or more unpredictable.

Where the work situation was such that it would regularly change beyond the boundaries envisaged when the task was planned, alternative ways of establishing agreed methods and appropriate training are required. Respondents considered that dynamic risk assessments were inevitable and successful, at least where management systems acknowledged them and managed the process, particularly by ensuring that a team decision was made rather than just an individual one. However, insitu assessment of risk should not be used as an excuse not to plan or assess the risk in advance.

Scenario- or simulation-based training (e.g. in healthcare) was considered to be an effective way of equipping individuals and teams to appropriately assess risk in the field. Improving workers’ and work team’s abilities to adequately assess risk as they face tasks in the field is an essential aspect of improving their OSH competence.

There are some tasks that have legally prescribed restrictions but we suggest that managers are advised not to try to control things that don’t need to be controlled. Our evidence suggests the best solution would be to minimise the situations where managers try to control the risk by setting prescriptive rules and to maximise training based on contingent, scenario-based approaches where possible.

Dynamic risk assessments often lead to ‘workarounds’ and there is an assumption by some that workarounds are always wrong and always less safe than the prescribed method. The term ‘shortcut’ was also used frequently, although often in a more negative way, suggesting that the shortcut was less safe than the official method. The reasons why people used workarounds or shortcuts included lack of necessary equipment, the situation being different to the one assumed in the instruction/method statement or perceived time pressure. Sometimes it was seen as the only way in order to do the job and was deemed the safest way to ‘bend the rules’, thus mitigating the risk.

Our findings suggest that managers could be more sophisticated in managing these insitu assessments and workarounds. There is not a 'one size fits all' approach for all sectors, all network types, all individuals and all situations. People will assess the risk for themselves and make decisions on that basis but still need to be held accountable for their decisions and actions. This situation needs to be managed rather than ignored, hoping it will go away. We need to stimulate people to understand the consequences of their actions, both for themselves and others. If we take a narrow, directive, procedural approach we should not be surprised when it does not work – people will adapt and stretch the boundaries – we need to understand this and manage it accordingly.

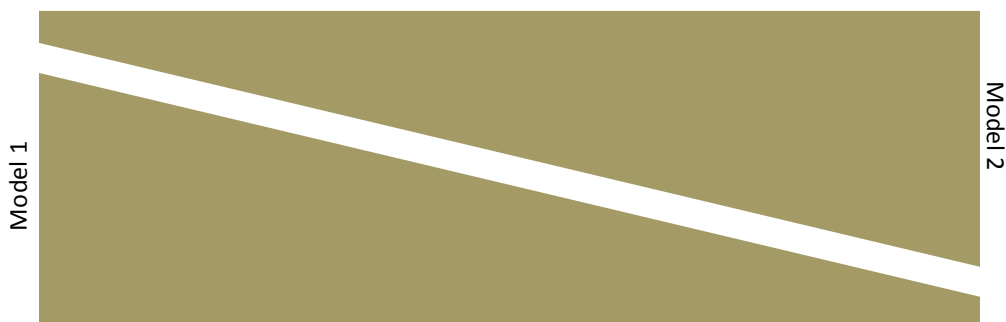
There is a difference between OSH as imagined and OSH as actually done.

OUR MODELS

The Third Way Continuum

In our discussion, we have developed a number of models to improve the understanding of how knowledge is created and transferred through complex networks.

The main types of knowledge we found are model 1 (formal, top-down) and model 2 (social, bottom-up) (after Hale & Borys (2013)). These interact and combine with social knowledge as the network becomes more and



more complex. We propose a third way continuum with model 1 and model 2 at the extremes and a model 3 alternative inclusive perspective through which each situation can be better understood.

We have found this continuum to be a helpful way to increase understanding of the contingent interplay between the individual, the task and the environment. Furthermore, it was a desire to explore this interplay between individual decision-making, practice and environmental features that informed and united the distinct disciplinary perspectives framing our research.

The Third Way Continuum

A more experienced and competent individual would tend to be able to operate in a more flexible way towards model 2 and be better able to make appropriate dynamic assessments of the risks and required behaviour. A less experienced or less competent individual would tend towards model 1, needing more certainty and clarity of the rules. They are likely to be less able to assess risks insitu or know the appropriate behavioural response. An experienced person who has not been well trained may veer towards model 2 which

could be problematic if the missed training is germane to the message and task, unless they had found a safer or more appropriate way of doing the task in the particular circumstances than the rules suggest.

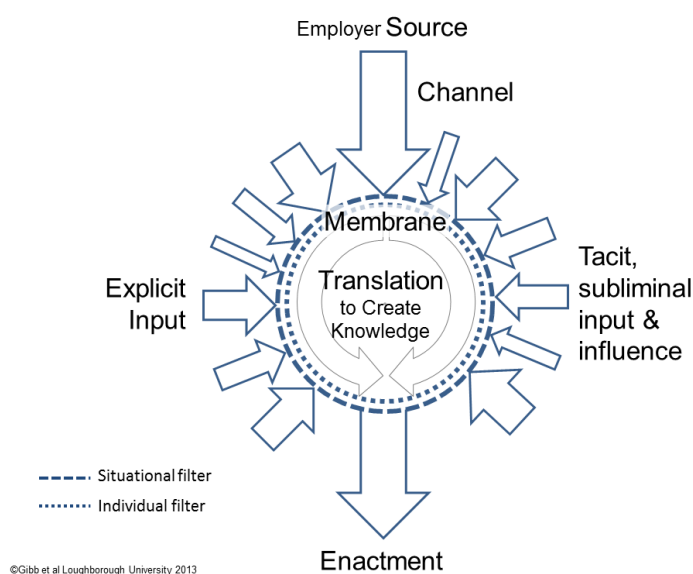
A more controlled and consistent environment would enable a more rule-based approach to work, whereas the more varied and unpredictable the environment the more contingent the necessary behaviour to maximise OSH and a successful task. Where the negative consequences of an incident are very significant appropriate behaviour should tend towards model 1. The criticality of precise and accurate completion of the task is likely to encourage protocols tending towards model 1. However, where the task is very complex then model 2 behaviour may be necessary to achieve a positive outcome.

We also recognise that there may also be situations where a model 3 approach would be appropriate. People can add their own practice to rules to create new ways of working. In this case these are not workarounds or compromises, but rule-informed, practice-based ways of knowing.

The Person-Centre OSH Knowledge Flow (P-COK) Model

We also propose the Person-Centric OSH Knowledge (P-COK) Flow model, interpreting our findings from the perspective of each individual in the network. This should be considered in tandem with the Third-Way Continuum which provides more of a holistic perspective.

This idealised model considers each individual and the specific task-related message that they receive, along with the many other explicit and tacit inputs that are presented to them. The way that the situation, or the person's individual characteristics, either help or hinder them interpreting the OSH message along with the other 'noise' are described as filters. The individual then translates the message internally to form knowledge which is affected considerably by their cognitive and other personal skills and competencies. The enactment then may be the passing on of the message to the next person or group in the network or, in the case of frontline workers, their behaviour in doing the task.



The Person-Centric OSH Knowledge (P-COK) Flow Model

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OCCUPATIONAL SAFETY AND HEALTH IN NETWORKED ORGANISATIONS:

Management of OSH in networked systems of production or service delivery: Studies in construction, healthcare and logistics

1 INTRODUCTION AND BACKGROUND

This research report presents our findings from the project entitled: *Management of OSH in networked systems of production or service delivery: comparisons between healthcare, construction and logistics*. This project was funded by the Institution of Occupational Safety and Health (IOSH) and formed part of the IOSH research programme *Health and Safety in a Changing World*.

The report introduces the main concepts of occupational safety and health (OSH) knowledge and organisational networks along with the interdisciplinary theoretical basis for our research. We used research approaches from human factors, safety science, ethnography and organisation studies as lenses to study the topic. Two of the models developed from the findings are introduced early to help the reader understand the structure and context of the report. We used a combination of methods including interviews and focus groups with individuals involved in the networks of several case studies taken from each industry sector, along with participant ethnographic observation. The findings are presented as sources and forms of OSH information; channels of communication; structure and flow across the network; filters or membranes affecting the translation of the OSH messages. The sections that follow the findings deal with conflicts, barriers and enablers for OSH messages. We present our findings on internal translation and then enactment before the ethnographic research is discussed in more detail. The discussion sections present a model to help understanding of a 'third way' for OSH research, responses to the reality of OSH as enacted; OSH futures and a person-centric OSH knowledge flow model. A further, practitioner-facing output is planned for the near future.

1.1 Introduction into the programme and project

The work detailed in this report was funded by IOSH as part of a larger research programme - Health and safety in a changing world. The call invited proposals on occupational safety and health (OSH) knowledge and its management, the balance between public and private sources of regulation and the local impact of the changing health and safety system.

Our research outlined here is the result of a multi-disciplinary project, which brought together engineers, ergonomists, anthropologists, sociologists and psychologists, entitled 'Management of OSH in networked systems of production or service delivery: comparisons between healthcare, construction and logistics'.

Our study aimed to identify the types of OSH knowledge and evidence that circulate and work in relation to each other in organisations involved in networked delivery systems, how local actors in organisations interpret information and, in turn, the influences on OSH.

Our ultimate aim was to ensure all staff in large complex organisations have access to and an understanding of occupational health and safety. In sharing good practice and insights from and across different sectors, organisations can learn more about the ways in which safe working is achieved in practice, as well as ways of improving their health and safety knowledge flow, making it a better working environment for all staff.

There were particular links with another project in the IOSH programme by the Institute of Medicine which looked at the OSH knowledge base. Some of the content of this introduction has been taken, with permission, from their work.

1.2 Introduction to the main concepts

The following sections outline the main areas of interest of our project. We explore OSH in networks as the overarching context for the investigation. We then consider the main concept of knowledge, including issues of definition and typology, and how knowledge might be shared or transferred.

1.2.1 Networks and Supply chains

The Business Dictionary¹ defines a network organisation as “a group of legally independent companies or subsidiary business units that use various methods of coordinating and controlling their interaction in order to appear like a larger entity.” The Dictionary¹ also defines the three main types of network organization in a business context as: “(1) internal where a large company has separate units acting as profit centres, (2) stable where a central company outsources some work to others, and (3) dynamic where a network integrator outsources heavily to other companies.”

We are using the phrase networked organisations to describe large, complex organisations where significant relationships and connections exist across traditional hierarchical, business or functional boundaries. Such companies have been described as “increasingly collaborative and knowledge-intensive” (Cross et al, 2007). Networks have a number of sub-networks which may be departments, divisions, functions, levels of hierarchy or locations of parts of the business. Often they also include different companies, acting together in some sort of consortium or as part of an integrated supply chain. For example, Davies and Mackenzie (2013) describe graphically the sub-networks involved in the construction of the London 2012 Olympic Park as a form of systems integration (Figure 1.1).

¹ www.businessdictionary.com/definition/network-organization

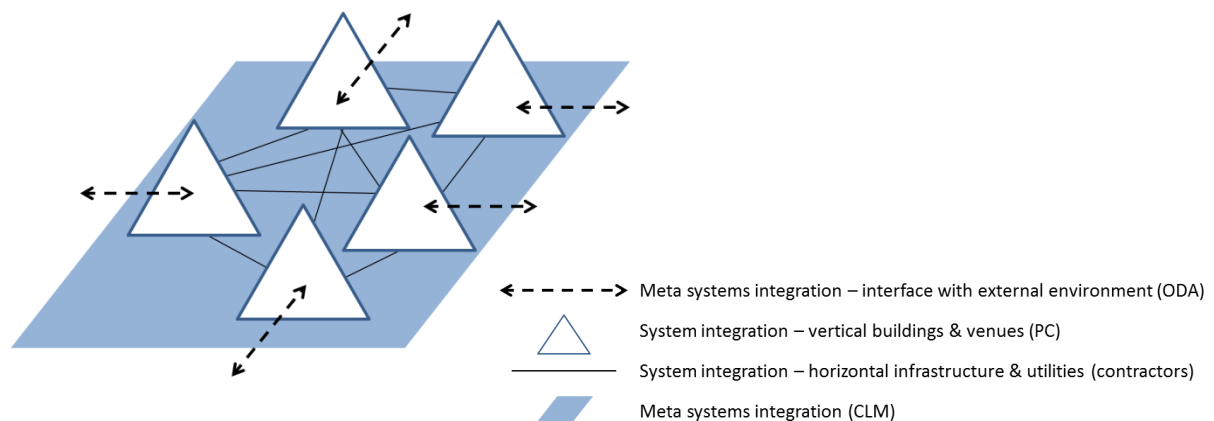


Figure 1.1 Sub-networks for the construction of the London 2012 Olympic Park
(adapted from Davies & Mackenzie, 2013)

Cross et al (2007) describe the interaction between different parts of the networks and identify key players. The “central connectors” are those who are frequently consulted for “information, expertise or decision-making help.” “Brokers” are those who connect different subgroups in the network.

The Business Dictionary² defines a supply chain as the “entire network of entities, directly or indirectly interlinked and interdependent in serving the same consumer or customer.” The term ‘chain’ suggests something of a linear relationship which is often not the case and ‘supply network’ may be a more appropriate descriptor.

Safety across networked supply chains is key towards understanding system safety (Buckle et al. 2006), but interrelationships between supply chain processes often remain disconnected, causing disruptions to overall safety efficiency. Benjamin & White (2003), Walker (2005) and Winkler (2006) investigated the effect of fragmented supply chains on employee safety but have not explicitly compared industrial sectors in a way that maps onto systematic differences in supply chain configuration. This analysis is important because promising practice in one sector may not fully apply in other sectors given the complex and dynamic nature of networks.

A review by Walters and James (2009) to investigate the role of supply chains in influencing health and safety at work found that the internal dynamics of supply chains frequently lead to adverse effects for OSH. “These effects are intimately connected to the way in which such dynamics serve to exert downward cost pressures on suppliers, therefore leading them to adopt more intensified and casualised employment regimes, and more generally act to engender poorer quality and more fragmented health and safety arrangements.” However, we did find some examples where supply chains were used positively to influence health and safety. For example, where there were external pressures of wider social, political and regulatory sources that create reputational risks. Also, the precise effects of supply chains on OSH can vary considerably even within the same sector. This can be as a result of the differences in such factors as the attitudes and objectives of buyers and suppliers as well as balance of power that exists between actors in the in the supply chain.

² www.businessdictionary.com/definition/supply-chain

1.2.2 Knowledge

The interdisciplinary context of our project made it difficult to define or differentiate between knowledge, information and data. However, in another project in this programme, the Institute of Medicine (Crawford et al., forthcoming) have investigated the definition of knowledge, knowledge transfer/flow and networks in a large amount of detail. Parts of this sub-section have relied heavily on findings from the IOM project.

A dictionary definition of knowledge is: “understanding of or information about a subject that you get by experience or study... the state of knowing about or being familiar with something...”, whereas information is defined as “facts about a situation, person, event etc”³. There is a sense that it is information that ‘flows’ and it only becomes ‘knowledge’ when it is understood and appropriated by an individual or group. However, this differentiation is not absolute and is certainly not understood by most people. Therefore, in the interviews and interactions for this project, we have talked about the ways that people ‘know how’ or ‘know why’ they work in a certain way. This has avoided the need to differentiate between knowledge flow and information flow. The research team also acknowledge the complexity of how people ‘know how’ and ‘know why’ and the multiplicity of ways that knowledge is created and diffused between people and across networks. Illustrating this multiplicity the ethnographic work (detailed in Section 3.9) also talks about ‘ways of knowing’ to support the argument that OSH knowledge does not only (or always) ‘flow’, but sometimes emerges *through* practice. This perspective argues that it is not only static, predefined ‘knowledge’ that is added to action and then moves around an organisation, but that ‘ways of knowing’ emerge incrementally from and through the practical, situated actions of workers. Definitions about knowledge are many and varied. Foskett (1982) proposes a definition of knowledge by making a distinction between knowledge and information. He claims “*knowledge* is what **I** know, *information* is what **we** know and knowledge is a subset of that which is both true and believed” (Refer Figure 1.2).

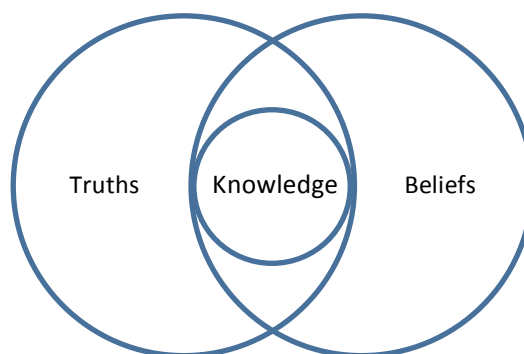


Figure 1.2 From Foskett's (1982) proposition of knowledge as a combination of truths and beliefs

It is clear that there is a large amount of OSH information available both in the public and industrial domain. Close examination is needed to ensure the quality and trustworthiness of the source so that it is useful to the average user. With this in mind we begin to understand that, while knowledge and information are linked, they are also different. In fact the knowledge of a firm can be categorised as both information and knowledge

³ <http://dictionary.cambridge.org/>

(Zander and Kogut, 1995). However, Reber (1996) extends this definition and states that knowledge is a collection of information blended with the culture and competence of an individual and their interactions within and between groups. Taking this approach, it would appear that information remains information until it is useful to or can be entwined into the values and beliefs of a person or the culture of an organisation when it becomes knowledge. In this context, Senapathi (2011) states that knowledge may be defined as information whose validity has been established. Knowledge is also thought to exist in many forms, for example tacit or explicit. Tacit knowledge is thought to have a personal quality and is accumulated through knowledge and skill that allows someone to do something more efficiently. It is however, difficult to formalise and to communicate because it involves both cognitive and technical elements and is not easy to write down (Murray & Peyrefitte, 2007).

Collins (1993) cited five knowledge types, four of which are tacit, ranging from embezzled (dependent on conceptual skills and cognitive abilities) to embedded (part of normal practice and routines). Knowledge is dynamic; when new knowledge is created it exists in a tacit form. It is then transformed into codified and explicit knowledge by social coordination processes (Kang et al., 2010). This can be beneficial as a common lexicon is developed between teams and knowledge is transferred. Knowledge in its purest form may not be useful as it cannot create value and add competitive advantage until it is shared and transferred within the organisation (Kang et al., 2010). However, knowledge is also contextual, it is a fluid mix of framed experience, contextual information, values and expert insight that provides a framework for evaluating and incorporating new experiences and information (Davenport & Prusak, 1998) in other words the context itself is part of the content of knowledge (Yakhelf, 2007).

Other authors have cited this perception, for example Neisser's (1978) perceptual cycle originates from cognitive psychology and foregrounds the role of the environment in the creation and search for new knowledge. This is also linked to schema theory from early in the last century (Head, 1920; Piaget, 1926). Schema theory describes how individuals possess mental templates of past experiences which are mapped with information in the world to produce appropriate behaviour. Barlett (1932) introduced the concept of schema as active organisations of past reactions and past experiences which are combined with information in the world in order to produce behaviour. In essence, a schema is rather like a cognitive form of best practice template.

Knowledge transfer or diffusion

There are several models of knowledge transfer and diffusion of innovations present in the literature. Rogers (1983) for example, argues that the diffusion of innovations involves five main stages: knowledge, persuasion, decision, implementation and confirmation. In contrast, those working within science and technology studies have stressed the malleability of new technologies and processes, showing how these evolve and mutate through the process of adoption (Bijker 1995). However, diffusion of innovations and knowledge transfer are not necessarily the same thing, simply because innovations and knowledge are in any case contextually situated. Estabrooks et al. (2006) propose several other models which may also be appropriate for knowledge transfer. For example, the 'bandwagon' model where organisations are driven to adopt OSH knowledge

through fear not obtaining benefit or avoiding putative measures. In the 'dual core' model, OSH innovations originate from internal cores and serve internal purposes. In the model of 'territorial rights' and boundaries OSH knowledge is perceived as a threat to existing organisational practices. In the 'desperation reaction' model OSH knowledge arises in the desperation to address adverse situations, such as the aftermath of an accident. In the 'ambidextrous model' organisation types that facilitate innovative OSH practices may not be best matched to diffusing or implementing such knowledge, in this case high formalisation and high centralisation are required.

It is interesting that knowledge transfer is comparable to communication flow as per the C-HIP model (Conzola and Wogalter, 2001) where knowledge and/or communication travels from a source, through a medium, to a user, the message should also have some form of content.

Within knowledge transfer, a source is defined as the origin of dissemination, whether that be an agency, an organisation or an individual. Transfer may come as a push, with the source pushing the content to the user. However, in some instances, there is knowledge pull where the knowledge user themselves is the driving force behind the transfer. The content is the actual message that is disseminated and can take many forms, from tacit to explicit. The medium refers to the way in which knowledge is described or packaged. The user is the intended user of the information or the product to be disseminated. Senapathi (2011) highlights several factors that may affect the dissemination of knowledge which range from competence and credibility of the source to perceived relevance to the user. Media richness or the ability of information to change understanding within a time interval may also affect knowledge transfer. Lean media is more appropriate than rich media in certain circumstances. For example, if a message is ambiguous or open to interpretation then it will need richer media with immediate feedback such as face-to-face contact. The opposite is true for messages that are less ambiguous.

Knowledge is viewed as produced and transferred by social interactions or social networks. As such, organisational structure may affect the propagation of knowledge along these networks. In social network analysis the points of interaction are represented as nodes or agents that can be made up of both human and non-human agents or actors that form part of the interacting knowledge producing/transferring network. The shape of these networks often determines knowledge flow and uptake. For example, a highly centralised, hierarchical organisational network is very effective at knowledge implementation as there are clear pathways for "knowledge amplification." However, a hierarchical network may be detrimental for new knowledge creation, in this instance a peer-to-peer network in which decision making is devolved is a preferred network configuration. Taking this into consideration, a more agile firm or department with autonomy may be best placed for knowledge creation; however it may not be the best network formation to implement knowledge on a larger scale.

The use of informal network clusters and/or communities of practice remain a strong theme in the OSH community. These networks may evolve from personal contacts or social media. These types of networks are referred to as small scale or small world networks and consist of sparse communication networks with more

densely connected clusters. These networks can increase in size dramatically, however the number of communication points in the network increases very slowly.

1.3 Interdisciplinary theoretical basis for our research

Changes in working conditions and practices, government policy and the occupational safety and health (OSH) landscape have created a contemporary context where OSH issues have become increasingly scrutinized. Health and safety legislation has enforced a regulatory regime where employers, workers and suppliers are afforded distinct roles to ensure people in work are protected from harm. Practice-based approaches to researching workplaces have provided new and rigorous ways of understanding workplaces as contexts where a culture of healthy and safe working is possible and practiced (Gherardi and Nicolini 2002), although often in ways that are generated by workers themselves, not safety and health regulations (Pink et al., 2010, Tutt et al., 2013). The contemporary context in which institutional and worker-innovated OSH plays out is shaped by a range of changing factors including: increasing complexity within and between technological and organisational networks; the shift from public regulation to private advisors; performance metrics; and the pivotal responsibility and opportunity of OSH professionals. Yet, within this context little is known about the detail of how OSH knowledge flows, is learned, shared, engaged in practice, appropriated and implicated in innovation. Consequently there are a number of gaps in our understanding as they relate to who does what about OSH issues in networked systems; with what evidence; OSH knowledge translation; and, the generation of OSH outcomes.

We aimed to construct a fresh, interdisciplinary perspective on OSH knowledge within highly networked workplaces involving a complex mesh of organisations and groupings within organisations, where there are blurred lines of communication and accountability. Our approach was designed to respond to the following questions: Who deals with OSH issues in networked systems? What types of evidence do they draw from? What are the processes through which OSH knowledge flows, transforms and is appropriated through organisations and what OSH outcomes are generated?

OSH is already a multi- or interdisciplinary field of research, but, neither the nature of its interdisciplinarity nor its implications for this field have been fully explored. This should be a first step in considering how disciplines might work in combination with each other. However, in the case of OSH research there are already existing, established approaches, which have demonstrable forms of success in addressing specific OSH issues. This is an advantage when asking how we might build on their respective capacities and, in validating the need, to develop a relationship between them. Yet it also creates a challenge in that these existing approaches are not necessarily theoretically or methodologically aligned with each other.

We compared the approaches taken by four interrelated disciplines and approaches as they apply to OSH knowledge: human factors and ergonomics; organisation studies; safety science; and applied ethnographic practice. We used these different approaches to act as 'lenses' through which OSH knowledge can be

interpreted, through examples of their application within a range of networked OSH working environments including construction, healthcare and logistics. This is coupled with the issue of what you look for is what you find (Lundberg et al, 2009) which exacerbates the limitations of examining OSH from the perspective of a single discipline, compared to an interdisciplinary perspective.

Given our aims to build the research and expertise of different disciplines together, in order to fill gaps in knowledge and create new spaces for knowledge, our starting point for growing a form of interdisciplinarity perhaps comes closest to 'intra- or supra-disciplinarity' as "the sustained effort of integrating knowledge originating from various disciplines" (Krishan, 2009). It corresponds with the '*agonistic-antagonistic mode*' (Barry et al, 2008) in which as they argue that "interdisciplinary collaborations spring from a self-conscious dialogue with criticism of, or opposition to, the limits of established disciplines, or the status of academic research in general". They suggest that such antagonism involves a critique of the "given epistemological and ontological assumptions of historical disciplines" and is thus "manifest in attempts to propose a new ontology" (Barry et al, 2008). In the case of understanding OSH knowledge from an interdisciplinary perspective, as pointed out above, our research has emerged in relation to perceived gaps in knowledge, that are due to the limits of existing disciplinary approaches. It was our intention that, by approaching our research 'problem' from different perspectives, we might produce new types of knowledge, along with new types of problems. Thus, we aimed to not simply fill gaps in knowledge but produce new spaces for knowledge. Yet we acknowledge that this might not necessarily lead to a new ontology, but rather to an appreciation of ontological and epistemological pluralism. In saying this, our aim is not to argue for a new post-disciplinary view of the world, but rather to suggest that the ontologies of the different disciplines we work with need to be viewed critically, reflectively and relationally. This, we propose, can be best achieved by engaging interdisciplinarity as a research design tool not an outcome.

Within management science, and especially management and organisation studies, this position reflects the principles of 'multimethodology' research design (cf. Mingers and Gill, 1997; Mingers, 2001). As Mingers (1997) explains, multimethodology can be seen as form of methodological pluralism, or combining together methodologies (either in whole or in part) to tackle problematic situations. Within the organisational studies field there has been considerable debate around the merits and demerits of methodological pluralism largely stemming from Burrell and Morgan's (1979) seminal work. Although theoretical pluralism has been criticized as a research strategy (e.g. Alvesson et al. 2008) others see it as an aid to critical thinking (e.g. Bohman, 1999). In Minger's terms, combining methodologies from different paradigms (known as 'strong' pluralism) enables the full richness of the real world to be examined (Mingers, 1997). Lewis and Keleman (2002) go further in suggesting that pluralism can act as an aid to generating more relevant theory. In this way pluralism offers understandings that align with the diversity and complexity of organisational life, albeit in ways which demand intense reflexivity on behalf of the researcher.

To begin to develop the foundations of an interdisciplinary research design we turn to what different disciplinary perspectives might bring to the analysis of these sectors through a discussion of how these approaches have conventionally developed in relation to OSH research and intervention. We emphasize that,

while these approaches offer fundamentally different ways of ordering the world by assembling these within an overarching meta-level framework, points where they map onto one another are identifiable. An emphasis on understanding the practical activity of people as they work in organisations, and accounting for the worker's knowledge, experience, and perspective, is common to each of the approaches. We also draw attention to the types of applied knowledge and practical interventions that these have generated; albeit in diverse ways.

1.3.1 Human factors and ergonomics (HFE)

The primary concern of the HFE discipline is the design of products and systems that are fit for human use (Noyes, 2001). HFE is concerned with understanding the interactions among humans and other elements of a system and applying theory, principles, data and methods to design in order to optimize human well-being and overall system performance (IEA, 2000). One of the most important components of HFE research and practice is the application of the systems approach to the study of work environments and contexts (Wilson, 2012). The systems approach aims to understand the individual, social and organisational factors that increase the likelihood of human error occurring. A wide range of domains have been investigated as part of applying the systems approach within HFE. Recent examples include the Ladbroke Grove rail accident (Lawton and Ward, 2005) and the 2010 Deepwater Horizon oil spill (Flin, 2014). In recent years a number of researchers have examined the degree to which HFE research has addressed human error across a range of system levels (e.g., individual, team, organisational). Waterson's (2009) review of the coverage of system levels within HFE research on patient safety for example, found that most work had so far only addressed a narrow range of system variables, namely individual factors. Waring (2007) also criticised the coverage of HFE work within patient safety research. In particular, he argues that HFE tends to focus on interventions centred on the individual worker such as safety checks, warning systems and attempts to standardise tasks.

Other HFE research on UK patient safety has focused on developing tools and instruments to benchmark aspects of safety performance and safety culture within hospitals and primary care (Vincent, 2006), with interventions often based on these measurements. Researchers have begun to question the validity of some instruments to measure OSH (Waterson et al., 2010) and to investigate problems with this type of 'measure and manage' approach. Waring (2009) and Waring and Bishop (2010) argue that safety knowledge is not objective, but socially constructed by professionals and embedded in social practice. This social construction takes many forms (e.g. 'stories' or 'narratives' related to patient safety events or incidents). The literature on organisational learning within healthcare also points to a variety of mechanisms through which knowledge, including OSH-related knowledge, is transferred and translated. Carroll and Edmondson (2002) for example, argue that action reviews, audits, problem investigations and performance appraisals provide 'arenas' in which shared learning between team members can be facilitated. Other work within the NHS likewise demonstrates that safety knowledge is often embedded within work routines and procedures (e.g. Davies and Nutley, 2000).

HFE's person-centred, systems approach to OSH has also been illustrated in the construction sector by Haslam et al (2005). Work examining the wide range of causal influences in construction accidents identified

knowledge as a shaping factor, affecting the dynamic interaction between work teams, operations, equipment and materials in the construction work place. Elsewhere in Haslam et al's hierarchy of causal influences, design, project management, construction processes, safety culture and risk management are important knowledge bound influencers of the construction tasks that have to be undertaken and the risks these present. It is interesting now how the influences model developed by Haslam et al, rooted in HFE systems thinking, has reached into and been adopted by researchers from a construction engineering and management tradition (e.g. Cooke & Lingard, 2011; Behm and Schneller, 2012). Thus we begin to see how at a meta-level there are already linkages between the disciplines we are working with.

1.3.2 Organisation studies

The practice-based and situated nature of learning is well established within the organisation and management studies (OMS) field (e.g. Scarborough et al., 2004; Orlikowski 2002). For example, within complex project based environments (such as construction), the literature on learning reveals the difficulties inherent in capturing, diffusing and sharing knowledge across the network of actors that constitute projects (Bresnen et al., 2004). In particular, it is the shared 'know *how*' that emerges from interaction within communities of practice that enables 'know *that*' knowledge to be shared (Brown and Duguid, 2001). Within the specific context of safety and health practice, Gherardi and Nicolini (2002) have revealed how actors within hazardous site environments enter a community of practice (cf. Lave and Wenger 1991). They reveal how safety is not "property 'added' to action; rather it is a characteristic of action". Safe and healthy working requires integration of multiple modes of appropriate working and understanding from workers with different perspectives. This acknowledges that the ecology and interrelationships of groups within the OSH system is also populated and shaped by materials and knowledge from outside. In other words, both formalised structures and informal 'webs' of OSH knowledge co-exist in practice, and both must be accounted for if knowledge flows are to be understood. Furthermore, there is a need to establish what actually flows. Is it knowledge that flows or is it actually information in some form or another that flows between actors? Can knowledge exist outside of an individual or does what flows only become knowledge when it is understood, contextualised and appropriated by each individual?

Understanding how OSH knowledge (including the strategies that shape knowledge practices) is enacted within and across highly networked sectors requires a grounded perspective on practice. The 'strategy-as-practice' perspective as developed in organisation studies arguably offers an effective starting point as a way of seeing strategy as something that people *do* rather than something that a firm possesses (Whittington, 2006). In other words, strategizing can be understood by examining the specific socialized practices through which strategy is identified, constructed, translated and transformed. Recent key contributions within the strategy as practice literature (Jarzabkowski and Spee, 2009; see also Jarzabkowski *et al.* 2007; Whittington, 2006) have pointed to three objects of analysis as being vitally important: the *practitioners* ("those doing strategy"), the *practices* ("the social, material and symbolic tools of strategy") and *praxis* ("the flow of activity through which strategy is accomplished"). By engaging with all three dimensions, the attendant focus

becomes one of understanding the “situated social practices that are enacted and re-enacted in the ‘doing’ of strategy” (Rasche and Chia, 2009).

1.3.3 Anthropology and Ethnography

As Pink et al. show (2010), the anthropological literature about informal or ‘local’ (indigenous) knowledge (Bricker et al., 2003) has shown for other contexts that gaps between institutional knowledge and process and the embodied everyday practical knowledge of the people can differ significantly. A pertinent example for the discussion here is Arce and Fisher’s work where they “note how for employees of an oil company in Wales the knowledge of their job provided men with the experience to devise practical ways to achieve the task at hand without necessarily following the safety regulations designed to avoid them hurting themselves” – in this case by not wearing the required gloves when working in the “paraffin shed” (Arce and Fisher, 2003). Such scenarios are part of the everyday working life of many people and also, we assume, part of the unspoken layer of institutional knowledge about how processes *really* work. Some of our other work supports this point, as, for example, Pink et al (2010) quote a large construction contractor’s OSH manager’s discussion of the ambiguity around the ubiquitous use of mobile phones on construction sites, as he put it:

“If you’re using your mobile phone on site we tell people not to do it, but then we’re not above doing it ourselves, to be honest. If there’s an incident onsite then, you kind of, you want people to do it, so. I don’t think we’re 100% straight on whether it’s right or wrong yet” (quoted in Pink et al 2010: 651).

Yet much of this practice-based knowledge remains undocumented, informal, unspoken and thus unaccounted for in our understandings of how OSH knowledge is learned, enacted and communicated to others. In making such knowledge visible, these studies do not seek to privilege the local and practical over the institutional, but to explore interrelationships and interdependencies between different ways of knowing. Like the HFE approach outlined earlier, practice-focused organisation studies approach assumes that knowledge or ways of knowing are embedded in practice and routine and should not be separated from the actors that reproduce them.

1.3.4 Safety Science

The focus of safety science is on the reduction of accidents and incidents, paying special attention to their precursors. The production and dissemination of knowledge and learning are considered as systematic attempts to improve behaviours and reduce incidents and have traditionally focussed on safety rather than health. While written procedures and guidelines might attempt to control behaviour, an expanded perspective acknowledges the part played by individual differences, and focuses on psychological issues and factors that influence behaviour, akin to approaches that have been referred to as the ‘third’ age of safety (Hale & Hovden, 1998).

Central to the examination of psychological factors in OSH has been the study of climates and cultures for safety; forming one of the more influential approaches to understanding the development of safe and healthy

behaviours. Psychological OSH climate has been investigated to determine the relationships between individual and shared employee attitudes and perceptions, and broader outcome measures, including accident rates and safe behaviours, in an attempt to provide explicative models of safe behaviour. For example, Zohar's (1980) study found some relationship between his safety climate measure and safety performance. Mohamed (2002) likewise found significant relationships between safety climate, and its components, and self-reported safe behaviour in construction workers. Several researchers have also examined the relationship between climate variables and accident outcomes, for example, Hofman and Stetzer (1996) found their measure of safety climate related to accident rates.

Climate in organisations can be viewed as a collective subjective construct in which there are multiple subsystem climates that can be referenced to criteria such as structure, effectiveness, and safety, and can be analysed across levels over time (Falcione, Sussman & Herden, 1987). Examining definitions of climate allows us to identify a number of common attributes; climate refers to shared perceptions among members of an organisation regarding its conditions (Reichers & Schneider, 1990) and embodies members' collective perceptions about their organisation with respect to a number of dimensions (Moran & Volkwein; 1992). Effective attempts to improve OSH would, therefore, consider both individual psychosocial and collective organisational issues, as much as more technical issues. The shared perceptions of the organisational environment for OSH have implications for how individuals develop and enact OSH-specific knowledge, for example the perceived knowledge of colleagues in a work group may have a direct impact on the behaviour of workers (Jiang et al., 2010).

Collaborative efforts, from across industry sectors, researchers, regulatory authorities and others, has seen considerable progress being made in an attempt to understand safety culture and safety climate in 'real' working environments (Davies et al., 2001). Use of assessment tools have been shown to be one effective way of encouraging and maintaining employee involvement in their safety, if views are sought and they are then actively involved in implementing improvement actions based on the information obtained.

1.3.5 Mapping and Applying Knowledge

These brief outlines of the four approaches, the types of applied knowledge they produce and the types of interventions they inform and develop creates a strong argument for seeing each of these ways of understanding the OSH world as viable and productive. The approaches come from different starting points. Two of the more obvious ones, practice and behaviour, are different types of category in which individual agency and motivation are differently conceived. Whereas psychological approaches to behaviour might take the individual, motivations and rational choice as their focus, a practice approach would enter the analytical field through the prism of practical activity. Such approaches thus take the causal influences that determine what people do and how they know if it is safe or not as deriving from different sources.

Yet, in common, we see that each of these different approaches, albeit in different ways, focuses on trying to understand and explain the actual practical activity of people as they work in organisations. Indeed the growing body of research increasingly calls on researchers to pay close attention to informal and non-

standardised routes for safety knowledge learning, communication, translation, appropriation and innovation - alongside 'codified' or formalised mechanisms such as organisational rules, guidelines and training. The research we have reviewed earlier shows that such knowledge includes not only what is said and seen, but the unspoken, the embodied and perceptual, and sometimes the invisible layers and flows of knowledge and ways of knowing that we need to probe deeper and engage empathetically with workers to access. Ethnographic approaches, as yet little used in OSH research, offer us an important route through which to access these types of research understandings. To fully represent the novel perspectives that ethnographic methodologies can offer to safety research, and consider how these differ from dominant approaches, we take the purposeful stance of elaborating on the ethnography elsewhere in this report (section 3.9).

Relevant research involving our team (Finneran et al., 2012 and Bolt et al., 2012) has examined outcomes from OSH activity and evidence for interventions that begin to demonstrate the benefits of an approach that takes account of worker's knowledge and experiences. A previous IOSH study investigating the impact of OSH management on organisations and staff (Ward et al, 2008) found benefits from a proactive approach to OSH both on worker's health and wellbeing and profit margins. Key to this payback is access to and effective deployment of OSH knowledge. Other work found OSH interventions to improve worker musculoskeletal health must take into account prevailing attitudes, beliefs and readiness to change (Shaw et al, 2007). Yet while this need has been acknowledged in some areas, an international Cochrane review of interventions' effectiveness for preventing construction worker injuries (van der Molen et al, 2007) found a poor evidence base and an absence of rigorous published studies stressing an urgent need to address this evidence gap. An HSE review by Clemen et al. (2010) examined the knowledge base for manual handling training guidance, concluding that exercise training promoted strength and flexibility, but manual handling training limited to handling technique alone was ineffective in reducing back pain and injury. Thus again indicating that 'knowledge' and 'evidence' is far from being straightforwardly transferred into practice. Such interdisciplinary understandings should begin to inform the development of OSH interventions.

1.4 The case study sectors: healthcare, logistics and construction

The case study sectors chosen for our study were construction, healthcare and logistics as they all operated in complex organisational contexts but yet covered a spectrum of task and organisational environments. In this section we briefly introduce something of the complexity of these environments. Generic organograms are also provided illustrating the types of organisations in each sector.

It is worth noting that these organograms represent only simplified versions of organisations and only the 'formalised' structure of the organisation, in other words, one that is documented in the company's organisational chart and used to demonstrate reporting relationships for workers at all levels of the organisation. We also stress that there is a need to understand that, within this 'formalised structure', there is also the inevitability of an 'informal structure' whereby workers and managers develop their own levels of

communication between one another and this will ultimately affect how information flows across organisations as 'official' reporting lines may not be taken in all instances of seeking or sharing information. Therefore, we agree with Cross et al (2007) that "the boxes and lines of formal organizational charts mask myriad relationships in networks that crisscross the borders of functions, hierarchies, and business units. These networks define the way work actually gets done in today's increasingly collaborative, knowledge-intensive companies.

1.4.1. Construction

The construction sector

The construction sector is almost exclusively a project-based sector, whereby temporary organisations are created and disbanded for each project. Typically, these temporary project organisations are formed from a combination of client/owner/funder; designers (usually several independent firms); principal contractor; subcontractors and suppliers along with a plethora of specialists and advisors. In particular, the use of subcontractors has increased over the last few decades.

The overall project organisation will only usually last for a few years whilst the project is being designed and built and many of the individual firms may only have an active role for a number of weeks or months. Even when construction projects are delivered using a form of partnering or alliancing, the partnerships developed still only have a limited life, and conform to single organisational cultures only in as much as necessary to deliver the project. Often the success of such enterprises, such as the London 2012 Olympic Park, is heavily dependent on the degree of integration of the different parts of the networks (Bolt et al, 2012). Furthermore, even when one organisation is dominant, for instance in the case of a large design-build contractor, the tendency is still to operate in discrete departments, almost mimicking the subcontract mentality endemic in construction. As such, construction has habitually seen itself as 'different' and not able to implement practices from other sectors and thus has failed to learn from other good practice – this has militated against efforts towards a more pluralistic approach.

Organisation and structure of construction organisations

The following generic organograms (Figures 1.3 & 1.4) show simplified typical organisation structures for the civil engineering and building construction sectors. We developed these figures using the organograms from the original case studies. They were further augmented using interview data and a reviewed to validate a generic structure. In both structures there is a clear linear arrangement for the supply chain. The client is situated at the top as is common for the client-centric style of management used on construction projects. Subsequently, the likelihood of client OSH messages reaching the workers is dependent upon the strength of the message and the commitment to it at the managerial and supervisory levels it has to pass through. Although the organograms show a clear division between the construction and supply chain members and the 'professional' elements (architect, designers etc.) there are opportunities for sharing of information at various

times through projects during the periodic design and progress meetings that take place, along with more regular informal interactions.

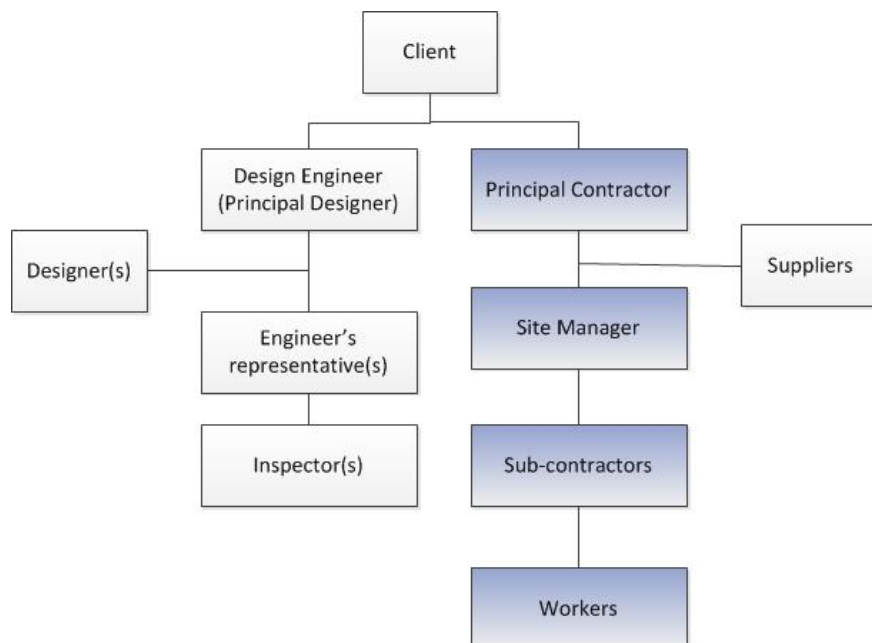


Figure 1.3 Simplified generic organisation structure for Civil Engineering projects

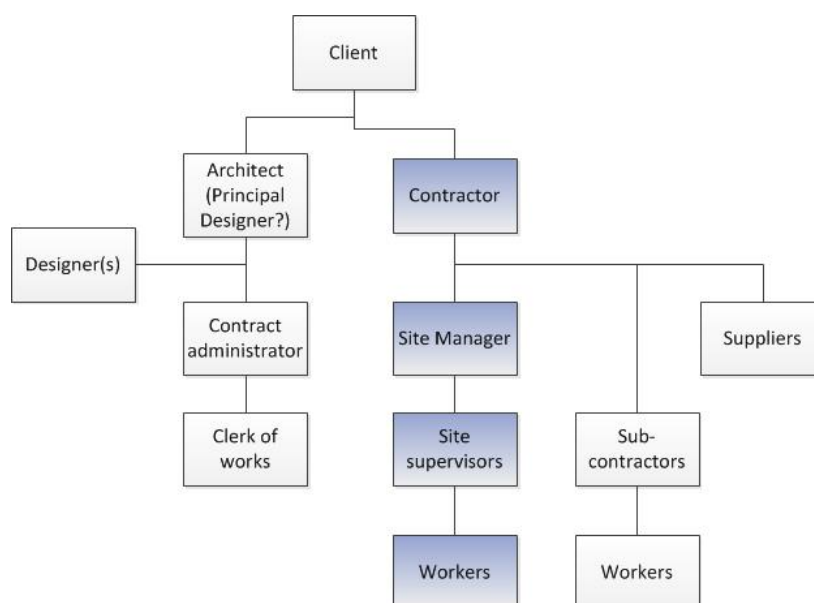


Figure 1.4 Simplified generic organisation structure for Building projects

Construction case study organisations

Construction 1

This organisation is an established property developer with in-house experience to see a project through from start to finish. Operating from regional offices but with a national presence, they manage both small and large developments including private housing, partnership development and mixed-use projects. The organisation employs more than 500 staff, many of whom are specialists from a broad range of professions.

This organisation is a Public Limited Company (PLC) with a board of directors and executive committee. One of the main board directors has direct responsibility for OSH and Environment. However, day to day running of OSH management and companywide initiatives is delegated to the Group Health, Safety and Environment Director. Regional managers are responsible for a designated region and report to the Board. Regions are further segregated into build areas for which there are build area managers. Finally at site level there is a site manager who manages the site and the workers on site. Some sites also have an assistant site manager, and a trainee site manager.

On smaller sites, if the managers are not available, typically the fork lift truck driver, as the only directly employed member of staff, takes on the site management role. External OSH knowledge and information comes mainly from the House Builders Federation (HBF), a consortium of national house builders and the Health and Safety Executive (HSE). The National House Building Council (NHBC) provides a compliance role in terms of technical site function and health and safety.

Construction 2

This organisation is a leading international engineering and construction group constructing some of the country's major infrastructure and environmental projects. It has operations in the United Kingdom, Europe, the Middle East, Asia, the Pacific Rim and Africa working in natural resources (water, waste, nuclear process and oil & gas) and infrastructure (highways, rail, power and airports), with land development activity in Europe. It provides front-end engineering consultancy, construction and ongoing care and maintenance services across market sectors with over 3000 employees most of whom work in the UK. The company's services include advisory and concept development, specialist design, program management, complex project delivery, technology integration, and asset optimization and support. The civil and building engineering group's customers include businesses in the construction, marine, transport, retail, hotel and utilities sectors.

1.4.2 Healthcare

The healthcare sector

One of the defining characteristics of the healthcare sector could be the diverse, and at times bewildering, range of organisations, professional groups, technological systems, regulatory and governmental bodies aimed at delivering safe, efficient, cost-effective and timely care to patients. As a consequence of this diversity, healthcare is often seen as one of the most complex sociotechnical systems and prone to failure in terms of

safety as it applies not only to patients, but also to staff within hospitals and other healthcare settings (Kohn et al., 1999 and Carayon, 2012). For example, within the course of a few months, a patient with diabetes may ‘move’ through several parts of the healthcare system (e.g. primary and secondary care, specialist centres) and be treated by a range of people (e.g. general practitioners, social workers, nursing staff, specialists in diabetes). Moreover, information relating to this patient may be stored in a variety of formats and technologies (e.g. paper-based records, electronic systems and images). Not surprisingly, information may be lost or ‘fall through the cracks’ along the way as it crosses organisational boundaries involving both people and technology (Vincent, 2010). Even within one setting (e.g. a hospital) the handover of information may be problematic (e.g. from one hospital ward to another). In contrast to many other sectors (e.g. construction), the implications of these ‘networks’ of knowledge, information and data for OSH are only really starting to be appreciated for researchers, policy-makers and healthcare professionals.

Organisation and structure of healthcare organisations

The following generic organograms (Figures 1.5 & 1.6) show simplified typical organisation structures for the typical NHS Trusts. We developed these figures using the organograms from the original case study trusts.

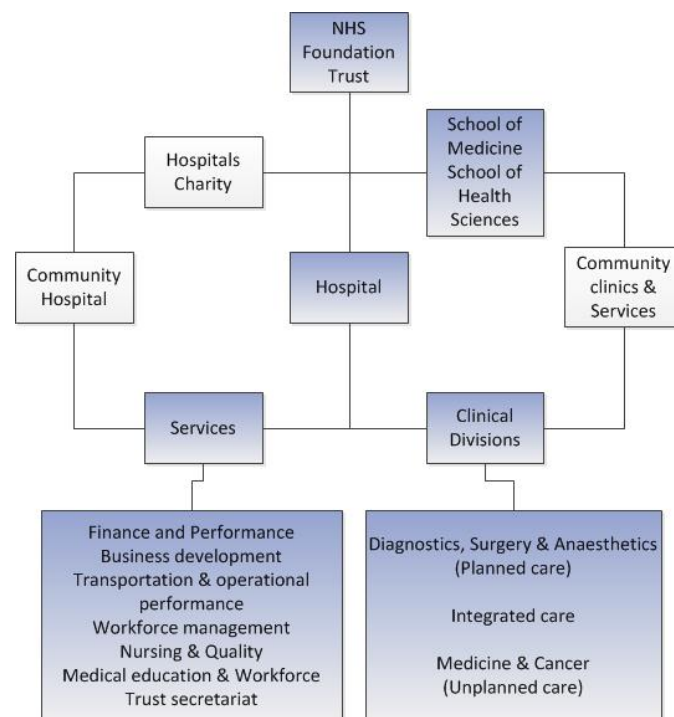


Figure 1.5 Simplified generic NHS Trust network structure

They were further augmented using interview data and a review to validate a common NHS Trust structure. In both structures there is a clear division between clinical and non-clinical staff. This is because, typically, services staff were sub-contracted and clinical staff were directly employed. This meant that, in the majority of cases, services staff had their own company safety management system. Healthcare staff were generally distinguished according to their OSH needs with laboratory staff having more regulated needs given their

conditions of work (e.g. dealing with biohazards). Typically, the occupational health department was separate to the safety department. Interviewees felt that this was because in many cases occupational health was run as a separate business unit and was self-funding and that there were several pertinent occupational health risks (e.g. manual handling). Notwithstanding this separation, there were formal connections with the safety department where staff could be referred if they were at risk.

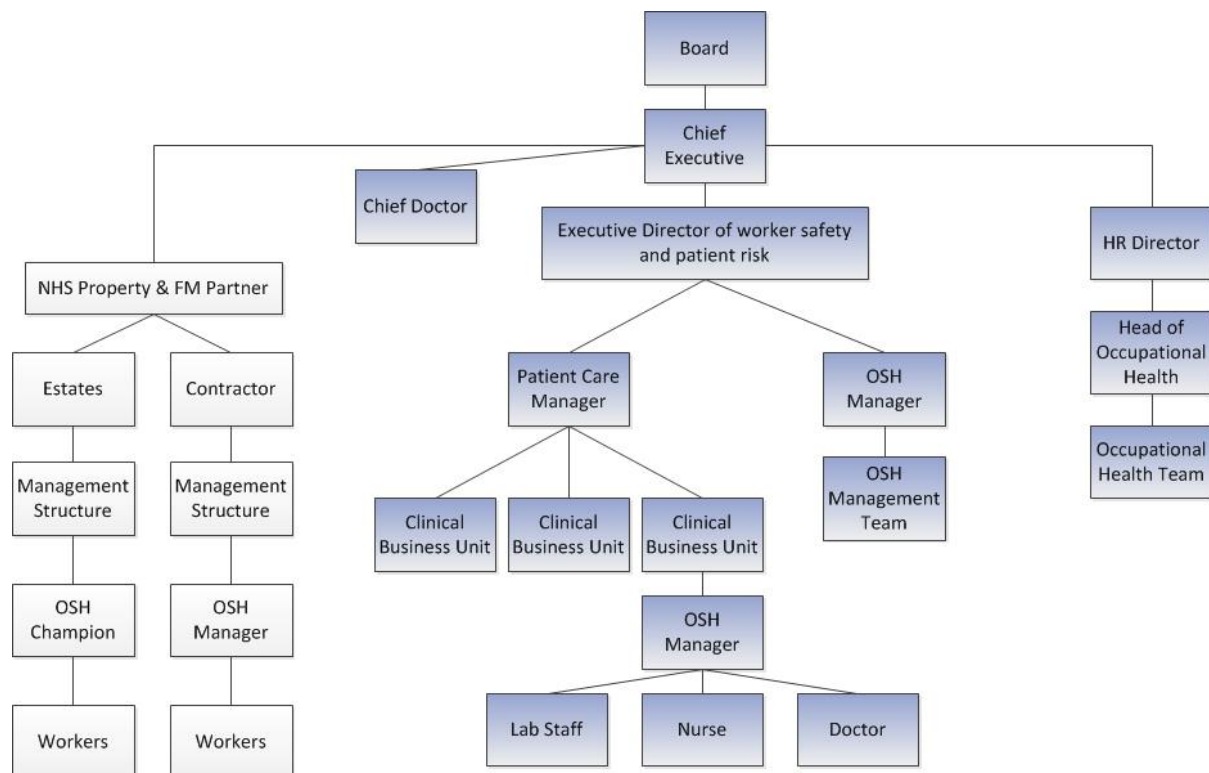


Figure 1.6 Simplified generic NHS Trust network structure (alternative)

Healthcare case study organisations

Healthcare 1

This organisation is one of the biggest and busiest NHS trusts in the country, employing more than 10,000 staff across several large hospital sites, serving a populous of more than one million people.

The management of OSH in this organisation is complex. A five-person dedicated OSH management team sits within the risk management function, operationalising the Trust's overall responsibility for all directly-employed workers. Given the nature of healthcare work, the OSH team works closely with the occupational health team. Specific teams and groups are often developed to deal with common health risks such as musculoskeletal disorders (MSDs), skin disorders, stress, and immunisation. While occupational health is

provided as standard for NHS employees (directly employed by the organisation) it is a bought-in service for subcontractors.

There are several sub-structures within the overall management structure including healthcare staff (distinguished based on varying OSH needs as doctors, other in-house healthcare staff, community staff, contracted health staff), hard and soft facilities management (FM) staff (domestic and maintenance), Trust and management staff. FM services (hard and soft) are contracted-out to third parties. This Trust has employed a separate “client arm” or management structure to oversee and assess work that is completed by subcontractors and report back to the Trust management. However, day to day running of subcontractor OSH is largely left to management structures within the subcontractor organisations which tend to have company-specific OSH standards tailored to meet Trust standards and recommendations.

Healthcare 2

This organisation is the one of the largest in its region and consists of two large hospitals providing a range of services including general medical, surgical, maternity, rehabilitation care and accident and emergency services, with more than 1000 beds. The Trust was developed as part of the Private Finance Initiative (PFI), a procurement method which uses private sector capacity and public resources in order to deliver public sector infrastructure and/or services according to a specification defined by the public sector. This has created an interesting management structure where the contractors who built the facilities are technically the Trust’s landlords with the Trust having to fulfil certain criteria of the rental agreement. However, while the contractors are providing maintenance work they are under contractual obligation to follow approved Trust and NHS standards of conduct, including OSH-related policies. A further management structure sits between the PFI contractors and the Trust in the form of a privately contracted litigation service to oversee the legal status of directives.

The Trust has overall responsibility for the OSH of everyone who works at the Trust, including subcontractors, and has a dedicated OSH team of two safety professionals and six occupational health professionals. In terms of OSH management, the Trust can be split into two halves: clinically-based and facilities management staff. Clinical staff are managed directly through the Trust management structure which includes several divisions and sub-divisions. Each division has a Quality Improvement Lead (QIL) to ensure that directives and initiatives implemented by the Trust follow a set of strict standards to improve the overall quality of the service, including any OSH initiatives. Periodical OSH meetings bring together representatives from each of the divisions to discuss OSH initiatives, policies or issues.

The flow of OSH to facilities management contractors (hard and soft) is overseen by the OSH and occupational health teams. However, this is mediated by the on-site facilities management team who are employed to manage the relationship between the Trust and its subcontractors. Directly employed Trust staff have direct access to occupational health facilities but subcontractors have a separate bought-in service. Subcontractors typically have company-specific OSH standards tailored to meet Trust standards and recommendations.

1.4.3 Logistics

The logistics sector

As with the construction and healthcare sectors, the logistics area presents its own complex organisational issues. A more traditional view of firms with a focus on internal efficiency is no longer appropriate in today's business environment (Lai & Cheng, 2003). Accordingly, distribution management within and between organisations needs to recognise the integrated and intertwined nature of organisational relationships (Mentzer et al, 2001). The effective management of such a supply chain has been increasingly recognised as a key factor in providing a competitive advantage for firms (Christopher, 1998), but demands close integration of a number of internal functions and, in many cases, successful links with external organisations (Lai & Cheng, 2003). Within organisations the flow of information can be problematic, involving functions such as research, engineering, sales, and production. This complexity may be intensified when considering elements external to the organisation. For many organisations, road transport forms an integral part of their logistics operations. In Australia, North America and Western Europe road freight is the dominant mode of internal transport logistics (Mayhew & Quinlan, 2006). The interaction with the external transport environment, external organisations and ultimately customers points to the importance of clear information flow. Indeed Singh (1996) suggests that responsiveness to customer demand, and overall customer satisfaction, cannot be achieved without proper management of both the goods movement and information flow throughout the supply chain. The same is true of OSH performance in such a networked environment.

Organisation and structure of logistics organisations

The following generic organograms (Figures 1.7-1.10) show simplified typical organisation structures for different types of logistics organisations. All of the organograms demonstrate a hybrid organisational structure; however they do lean towards a dominant structure which differentiates them from one another.

Figure 1.7 focuses on the distribution network of a generic retail organisation. This represents a more matrix type structure which would rely on excellent communication as information would travel across the organisation from top to bottom (and vice versa) across different functions and also across different sites. For example, direct customer deliveries would be separate to other retail deliveries each would have their own functional structure. Each retail site has its own management board and set functional management structure. Each warehouse also has its own management structure. These warehouse sites would be run by their management, which can impact on the efficiency of information flowing from the management board and lead to inconsistencies in the flow of information down to the worker level as each management level translates information.

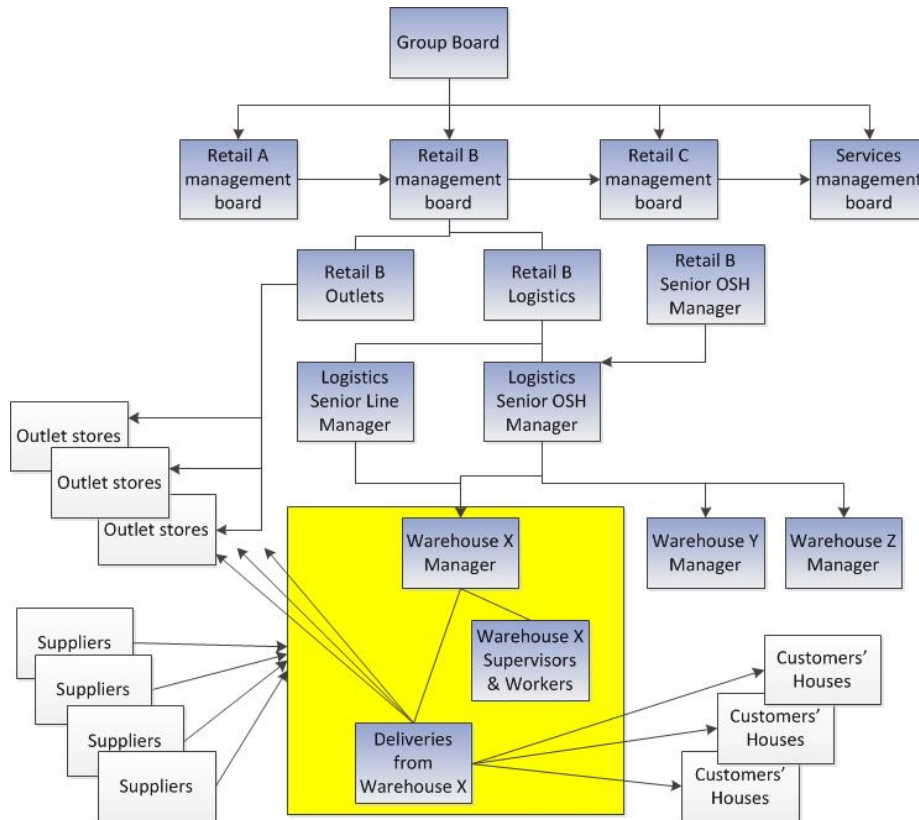


Figure 1.7 Simplified generic retail logistics network structure (focussing on warehouse operations)

Figure 1.8 is a simplified version of the network for a generic logistics organisation with a distributed structure. This represents a more functional structure whereby activities are grouped together by common functions e.g. logistics, human resources, manufacturing, marketing, technical and compliance and so on. Whilst this structure is useful for enabling worker specialisms within each function it can create an environment whereby it is difficult to communicate strategies across functions, For example, communicating changes in health and safety information from technical and compliance to human resources. This type of structure can also inhibit the flow of OSH information back to workers if there is poor horizontal communication between functions and this is likely to impact on the amount of information that flows down (and up) the hierarchical levels in the organisation (e.g. between workers and higher level management).

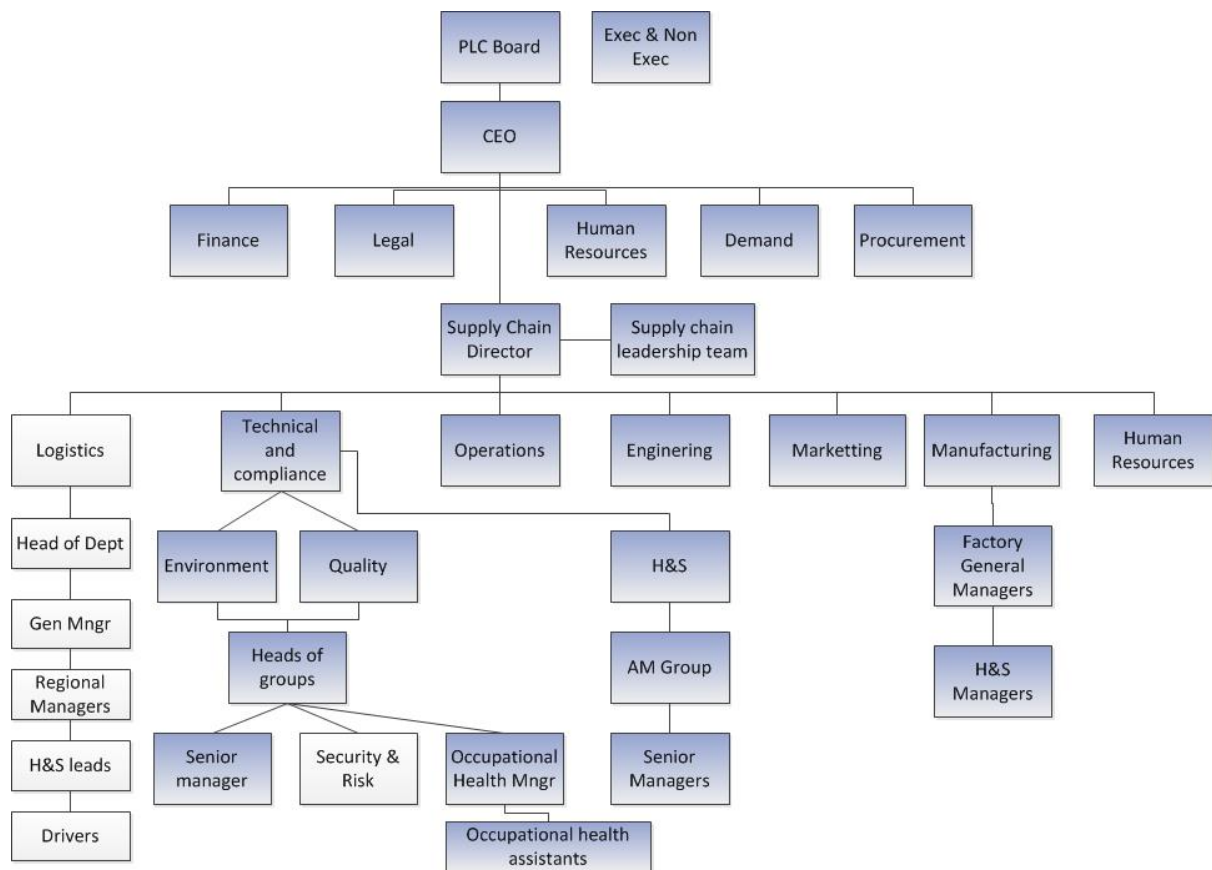


Figure 1.8 Simplified generic logistics organisation with a distributed structure

Figure 1.9 represents a divisional structure based on geographical locations both country and then region. These regions are then divided into functional structures. Divisional structures allow a global organisation the flexibility to respond to specific environmental changes (for example country-specific legislation which would include OSH legislation). By having divisions it also allows the organisation to adapt to customer needs which is important if the organisation has specific customer contracts. An important problem with divisions is that there may be a lack of centralised specialisms unlike more functional structures like figure 1.8.

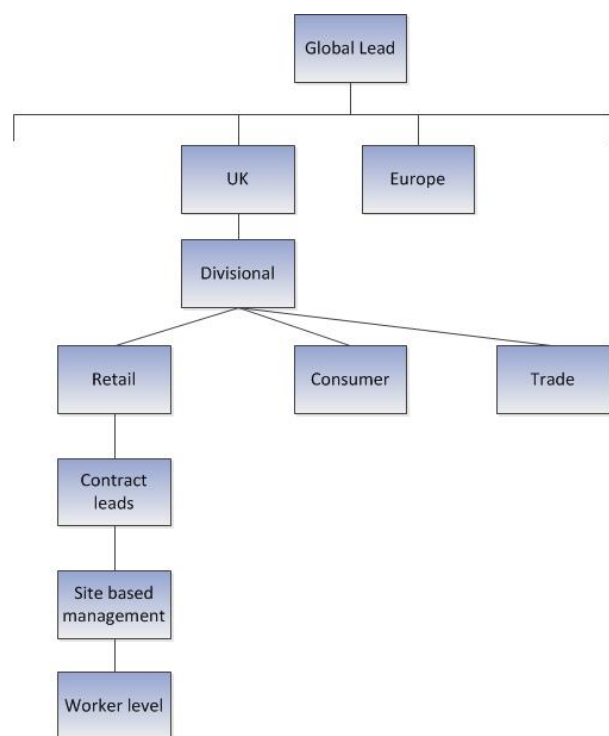


Figure 1.9 Simplified generic global logistics organisation focussing on retail

Figure 1.10 represents an organisation that has a very flat clear hierarchical structure based on functions. It can be described as a hybrid of the line and functional structure where authority has a very structured chain of command (hierarchy). In this organisation type, information should freely flow between the levels of management in each function as the structure is simplified and there is clear authority and responsibility therefore workers know what their responsibilities are and their accountability relationships. It can also facilitate fast decision making as there is also functional specialisms so specific staff can advise on specialist areas for example health and safety. Some of the disadvantages of this type of structure are potential conflict between line management and staff when managing specific problems. To alleviate some of these disadvantages committees can be developed to manage specific situations (e.g. particular issues with OSH incidences in a warehouse). Committee decisions engage more people but can delay responses.

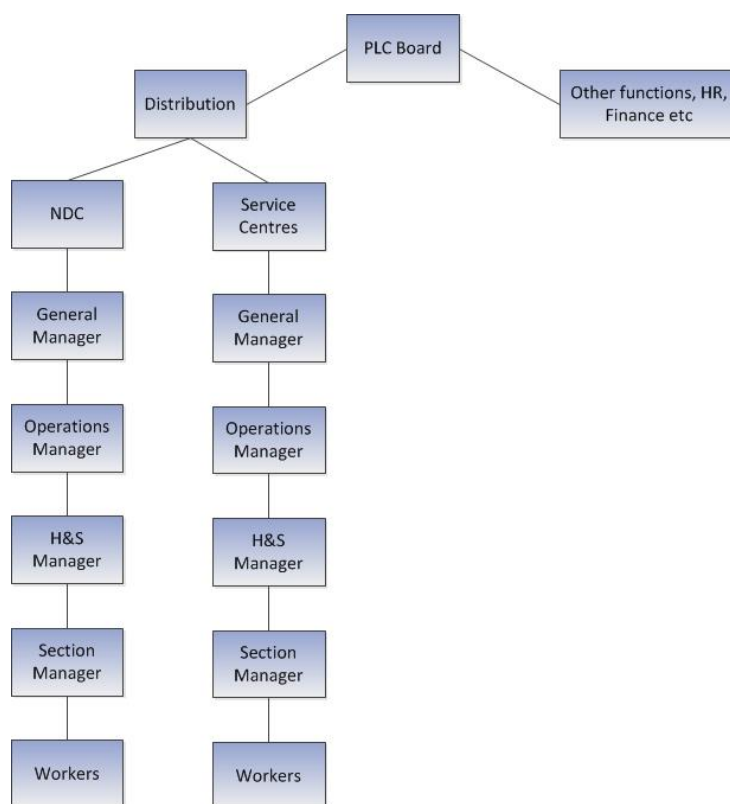


Figure 1.10 Simplified generic logistics organisation focussing on distribution

Logistics case study organisations

Logistics 1

This organisation has a hierarchical layered management structure. The logistics function consists of a number of warehouses of various sizes in different locations. A small number of large warehouses receive goods from suppliers and these are then distributed to smaller satellite warehouses, shops and a subcontracted courier organisation. The small satellite warehouses deal with deliveries to customers' homes and shops. Within each

warehouse, there is essentially a standard sequence of operations: a vehicle arrives with goods; the goods are then unloaded; stored; 'picked'; and finally loaded on to a vehicle for delivery elsewhere. The size and type of goods determines the type of storage used within the warehouse, equipment used and number of workers needed to perform tasks (e.g. one-person and two-person lifts). Non-management personnel can be roughly segregated into drivers/delivery and warehouse workers. Warehouse workers have varying levels of skill depending on the tasks they undertake e.g. forklift truck drivers are skilled and must have appropriate qualifications. In comparison to delivering goods to customers' homes, which is a complex and varied operation, the warehouses are standardised in terms of working environment and therefore operations.

The OSH department is a small, independent function overseeing the logistics and retail operations. The responsibility for OSH is devolved, with all personnel having responsibility for safe working practice.

Logistics 2

This organisation has a hierarchical management structure and operates as a logistics firm providing logistics services to a number of different clients, including supply chain solutions. It is a global enterprise which operates throughout the UK from a large number of different warehouses. Each site is customer contract-specific and runs according to the client's requirements and has its own middle level management. The company offers supply chain solutions, global logistics, warehousing and distribution, specific industry sector solutions, green logistics and freight transport. They offer a number of warehousing and distribution solutions including: ambient, temperature-controlled, bonded, raw materials, finished goods and automated. In terms of warehousing and distribution, non-management personnel are made up of warehouse workers and drivers. Warehouse workers will have varying skills dependant on their role e.g. pickers, forklift truck drivers and so on. Drivers also have varied roles and challenges based on the fact that they can be delivering to a range of retail outlets, customers' homes, and other services. The OSH department operates from the board level and runs down throughout the organisation there is an overarching health and safety manager who is responsible for all aspects of OSH within organisation. Each site then has an OSH manager who is responsible for that particular site and communicates with the board level OSH manager.

Logistics 3

This organisation has a hierarchical structure but board level management do not have the same level of power over the organisation's various sites as the other two logistics organisations. In this case, people working at different sites are accountable to the local site manager. Warehousing and distribution only forms part of the organisation and is not the organisation's main function. Each site has a warehousing and distribution function as an in-house operation and delivers to retailers and wholesalers. In terms of warehousing and distribution, non-management personnel are made up of warehouse workers and drivers. Warehouse workers have varying skills dependant on their role e.g. pickers, forklift truck drivers and so on. Drivers also have varied roles and challenges based on the fact that they can be delivering to a range of retail outlets, customers' homes, and wholesalers. Whilst an OSH manager sits on the board, site level OSH managers report to site managers and OSH is site-specific rather than standard across the organisation.

1.5 Models and concepts used in this research

1.5.1 The 'third way' continuum

This is an unusual section for a research report in that we are presenting here, in summary, two of the conceptual models that we have adopted through the research. The purpose is to help the reader understand the data as we have presented it. These models are discussed in detail and justified from the research findings in section 4.

The first model seeks to provide a pragmatic view of a third way, between the extremes of a rule-based approach and an experientially constructed approach to OSH (Figure 1.11). These two extremes are described by Hale & Borys (2013) as model 1 and model 2. Our work provides evidence to expand this thinking and presents a continuum through which each situation can be better understood. We acknowledge that, in reality, the way that OSH plays out is not straight forward and we have described it as a 'fog' (Hartley et al, 2014), dependent on things such as circumstance, hazard context, governance, and culture of practice. However, we have found this continuum to be a helpful way to increase understanding of the contingent interplay between the individual, the task and the environment. Furthermore, it was a desire to explore this interplay between individual decision-making, practice and environmental features that informed and united the distinct disciplinary perspectives framing our research.



Figure 1.11 The Third Way Continuum

Put simplistically, a more experienced and competent individual would tend to be able to operate in a more flexible way towards model 2 and be better able to make appropriate dynamic assessments of the risks and required behaviour. A less experienced or less competent individual would tend towards model 1, needing more certainty and clarity of what was allowed and what was not. They are likely to be less able to assess risks insitu or know the appropriate behavioural response. An experienced person who has not been well trained may veer towards model 2 which could be problematic if the missed training is germane to the message and task, unless they had found a safer or more appropriate way of doing the task in the particular circumstances than the rules suggest.

A more controlled and consistent environment would enable a more rule-based approach to work, whereas the more varied and unpredictable the environment the more contingent the necessary behaviour to

maximise OSH and a successful task. Where the negative consequences of an incident are very significant appropriate behaviour should tend towards model 1. The criticality of precise and accurate completion of the task is likely to encourage protocols tending towards model 1. However, where the task is very complex then model 2 behaviour may be necessary to achieve a positive outcome.

1.5.2 Model 3 rule- and practice-based knowledge

We also recognise that there may also be situations where a model 3 approach would be appropriate. People can add their own practice to rules to create new ways of working. In this case these are not workarounds or compromises, but rule-informed, practice-based ways of knowing.

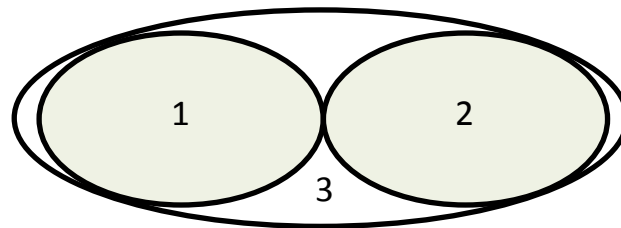


Figure 1.12 Model 3 combination of rule- and practice-based knowledge

1.5.3 The Person-Centre OSH Knowledge Flow (P-COK) Model

In a similar way we introduce the person-centric OSH knowledge (P-COK) Flow model (Figure 1.13). This looks at the findings from this research from the perspective of each individual in the network and has built on Konzola and Wogalter's (2001) C-HIP communications model. It should be considered in tandem with the Third-Way Continuum which provides more of a holistic perspective and is discussed at length in section 4.

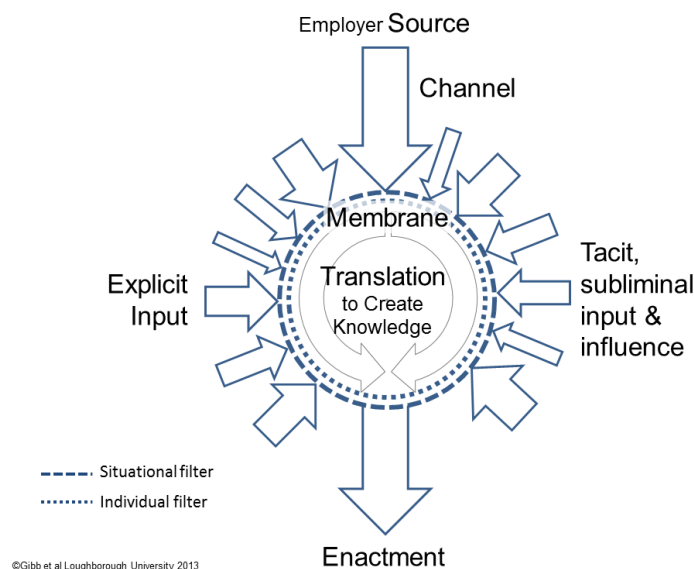


Figure 1.13 The Person-Centric OSH Knowledge (P-COK) Flow Model

This idealised model considers each individual and the specific task-related message that they receive, along with the many other explicit and tacit inputs that are presented to them. The way that the situation, or the

person's individual characteristics either help or hinder them interpreting the OSH message along with the other 'noise' are described as filters. The individual then translates the message internally to form knowledge which is affected considerably by their cognitive and other personal skills and competencies. The enactment then may be the passing on of the message to the next person or group in the network or, in the case of frontline workers, their behaviour in doing the task.

The extent to which knowledge flows around the network is discussed at length in this report. We argue especially (but not only) through the ethnographic research (see section 3.9) that much knowledge is situated and emerges insitu. However, OSH messages do flow though the network despite being often mutated as each player translates the message before passing it on. Figure 1.14 shows an idealised construction project network with the various message flows marked as primary (solid line) and secondary (dashed line). As before these aspects are explored at length in section 4, but the model is used to guide the reader through the empirical findings in section 3.

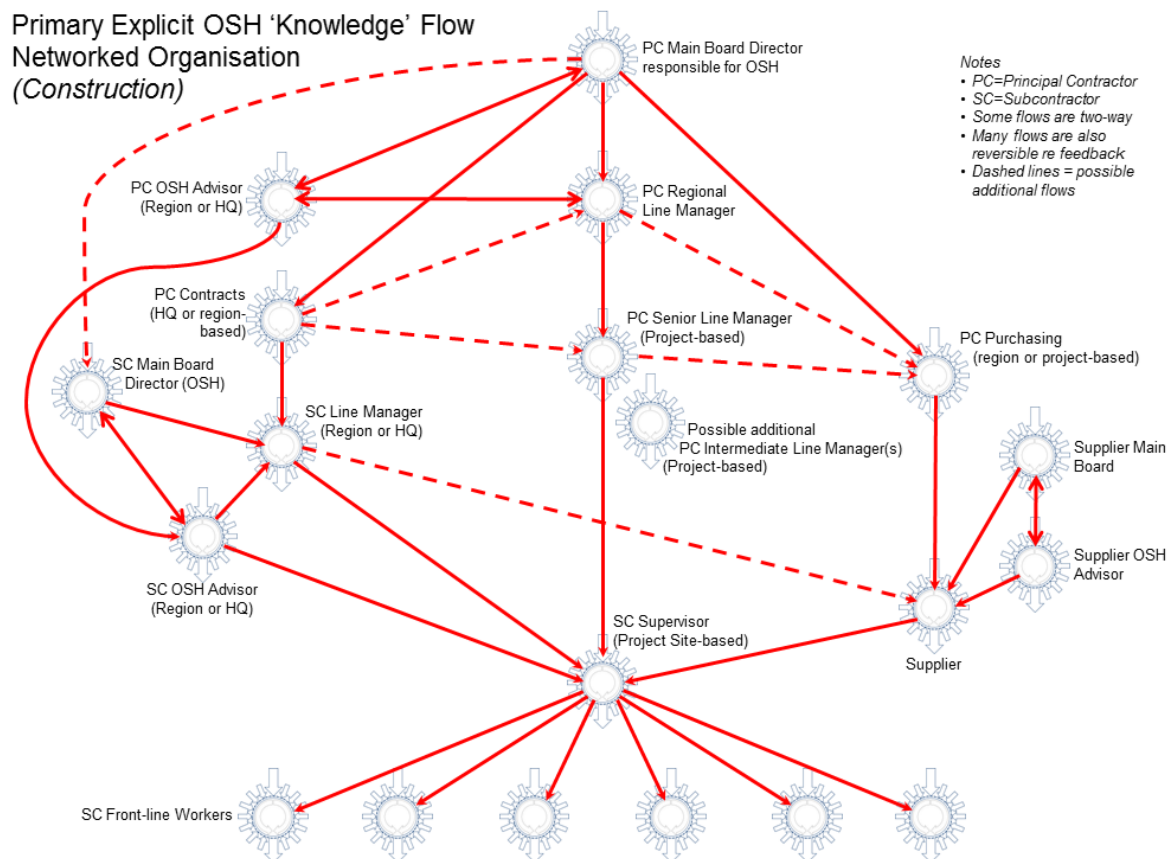


Figure 1.14 Networked representation of the Person-Centric Model (construction)

2 METHODOLOGY

2.1 Study Design and Methodology

2.1.1 Research Overview and points for investigation

In this study we aimed to identify the types of occupational safety and health (OSH) knowledge and evidence that circulate and work in relation to each other in organisations involved in networked delivery systems in the healthcare, logistics and construction sectors (For further information about the case studies see section 1.4). Our second aim was to establish how local actors in organisations interpret information and, in turn, the influences on OSH. Finally, our last aim was to develop grounded recommendations regarding the best ways to improve knowledge and evidence flows and impetus to act on.

In the empirical work we sought to address the following:

- To establish the ways in which OSH knowledge, evidence and practices are produced, engaged and navigated to address OSH issues in the context of differing organisational contexts and power relations. We also aimed to address the tensions between apparently conflicting project goals such as enterprise success or profitability with OSH improvements and the appropriateness of professionalising strategies in OSH systems and the relevance of traditional models of professions.
- To observe how an organisation's response to how formalised OSH policy is enacted in differing institutional contexts and plays out in real time. It was hoped that this would reveal the ways in which different types of knowledge combine within complex social settings as part of the ecology of the OSH system and assess the relevance of traditional models of professions and the balance between technical expertise and generalised authority. We used cross-sectoral comparisons to broaden the insights and ensure that they are firmly situated within particular network and accountability contexts. We considered professionalising strategies and the contribution of OSH practitioners and non-professional actors in developing new knowledge, facilitating its use and exercising professional influence in the restructured work environment.
- To construct ethnographies of verbalised, textual and embodied knowledge (ways of knowing that are unspoken, tacit and embedded across actors, processes and artefacts) within the construction, healthcare and transport and logistics sectors (as examples of decentralised workplaces with international chains of accountability). Through these narrative accounts (detailed in section 3.9) we sought to reveal the 'communities of practice' within which OSH activities reside and how the practices of the different participants in the OSH system coproduce OSH outcomes.
- To identify the effective channels for the movement of OSH knowledge, motivators and practices. We studied how these are then transmitted, translated and enacted in ways which overcome the

obstructions to knowledge flows within distributed, highly networked environments. This considered facilitators and obstructions to knowledge flow across the networks.

In this section we outline the justification for choosing particular data collection methods, the techniques and methods of data collection, the development of inventories, data analysis, ethical considerations and limitations of the research.

2.1.2 Methodology and study design – Framework

Our aims preserved the epistemic significance of the particular without losing sight of the general. In other words, it allowed the different parts of our team to ensure generic understanding of the results without alienating theoretical and epistemic ideologies. To achieve this, we used a mixed method framework, engaging both non-ethnographic and ethnographic methods (specific methods are addressed in the following sections).

The work was completed in two phases (phase one and two) with the data emerging from one phase feeding into the next. For logistics and construction the non-ethnographic work commenced before the ethnographic work in each phase so that the non-ethnographic work informed the ethnographic work for these sectors. Finally results from each phase were brought together to provide final results and recommendations.

Figure 2.1 provides a comprehensive overview of the data collection methods and scheduling of the work.

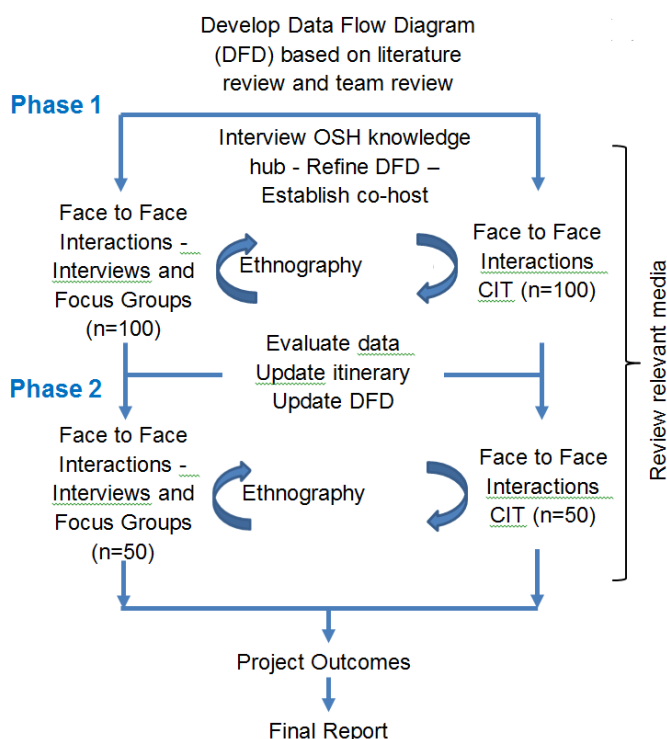


Figure 2.1 Project Methodology

Table 2.1 highlights the methods and the knowledge data types that were collected.

Table 2.1 Overview of the methods and data collected

No	Method	Knowledge purpose/type
1	Data Flow Diagram	Identify cohort for interview/focus groups/Critical Incident Technique. Visual representation of data / information/knowledge flow embellished with data and theoretical prospective.
2	Interviews/Focus groups	Capture verbalised knowledge
3	Critical Incident Technique	Capture tacit knowledge
4	Ethnography Participant observation, re-enactments, visual methodologies', 'interviews', and 'elicitation/feedback methods'	Capture tacit /embodied knowledge/emplaced knowledge

2.2 Non-Ethnographic data collection

The use of a variety of methods and samples to look at an issue is recommended as a way of checking findings against each other (Langdridge and Hagger-Johnson, 2009). Therefore, the use of a variety of techniques for collecting data in this data allows for more confidence in the research findings. Our choice of qualitative methods, in the form of interviews and focus groups, was determined by the complex nature of the environments being investigated.

We had 150 face to face interactions (across the three sectors) forming the non-ethnographic stage of data collection. We had 80 interactions at stage one, selected based on initial interviews with "OSH knowledge hubs" to identify key actors in the knowledge transfer process and piloting of the research instruments. However, because of the difficulty of gaining access in the healthcare sector we reached an agreement with the funders and reduced the sample size for healthcare (n=20), construction (30) and logistics (30). Following preliminary analysis of the data from stage one; we augmented inventories to include developing themes and probe key themes in more depth. In stage two, we used the remaining 70 interactions to investigate issues raised through the ethnographic fieldwork and isolate the key actors in the OSH knowledge flow process. We then augmented the data to address the research aims and objectives.

2.2.1 Data collection techniques

Data Flow Diagrams (DFDs) and Relevant Media

Data Flow Diagrams (DFDs) are a visual representation of the flow of data through an information system and allow the analyst to understand and specify a system at the logical process level (Avison and Fitzgerald, 1995)

and can be translated into a more complex design or embellished using theoretical perspectives and data at a later stage. We produced initial DFDs to illustrate OSH knowledge/information flow graphically based on results from the literature review and analysis and review by team members. We then developed these diagrams further as fresh sources of knowledge, new flows and modes of interaction of different types of knowledge were induced from the qualitative data (These are shown in Section 3.4). At this stage we used the DFDs in the following ways:

1. DFDs were developed for each sector (logistics, construction and healthcare) based on the literature and review by team members.
2. The DFDs were discussed with the 'OSH knowledge hubs' or those that understand the pragmatic flow of OSH knowledge/information in each organisation as a means of initial verification and selection of participants for the in-depth semi-structured interviews/focus group/critical incident technique phase of data collection. At this stage knowledge hubs were asked about the relevant media.
3. DFDs were developed based on information gathered from OSH knowledge hubs.
4. Cohorts in each sector were identified for data collection for interview/focus group/critical incident technique phase 1 data collection based on feedback from OSH knowledge hubs.
5. DFDs were developed based on feedback from interviews and theoretical perspectives.

2.2.2 Face to Face interactions

Interviews and Focus Groups – Phase 1

There are several types of interviews and focus groups with varying degrees of structure. The choice of approach is determined by the philosophical and epistemological position of the researcher (King, 2004). In this instance we took a position which draws on the realist and phenomenological approach (King, 2004). In practice this meant that the inventories developed were semi-structured, thus providing a structure for the interviews (based on existing theory) while allowing emerging themes to be probed in more detail (Pidgeon & Henwood, 1997).

We held interviews and focus groups at company sites, meeting rooms, or participants' offices. All interviews and focus groups were recorded digitally and transcribed following ethical consent by participants. The length of the interviews and focus groups varied, but typically lasted one hour (max 2hr, min 30 minutes). The interview / focus group introduction covered, amongst other things, the aims of the interview, confidentiality, and permission to record and take notes. All interactions were conducted in line with recommendations for best practice (Robson and Hedges, 1993) and in line with our ethics submission. The format consisted of:

- A 'warm up' to put people at ease.
- The main interview questions/development of DFDs
- Scenario-based questions using the critical incident technique method and

- A 'cool down' which will give people the opportunity to ask questions and raise any issues or concerns.
- We designed the interview questions using recommendations made by Langdridge and Hagger-Johnson (2009) for good interview practice and focused on the aims and objectives of the study. (The interview questions are provided in the appendix)

2.2.3 Critical Incident Technique

Malhotra (2001) estimated that over forty percent of knowledge is tacit or personal and gained from the workers own personal experience. Personal knowledge is notoriously difficult to investigate and unlock which is also why we used mixed methods for this project, and in particular ethnography, which was intended to explore tacit knowing. Participants may act in a particular way because of previous experience unrelated to their current job. The exploits of personal knowledge may not be easily identified at the general interview/focus group stage. In other words, it may be difficult for participants to describe how they solved or appropriated knowledge for a particular OSH issue. The Critical Incident Technique (CIT) (Flanagan, 1954; Lewis, 1992) is a job analysis technique that focuses participants on a particular scenario (Cowie et al., 2002). Studying phenomenon using methods such as CIT, it is possible to gain access to personal and organisational meanings of the phenomenon as well as critical factors that assist or inhibit the phenomenon. In this case we developed and investigated two discrete scenarios:

1. A normal day to day appropriation of OSH knowledge by the participant.
2. An emergency-based scenario.

Our initial analysis of phase 1 data revealed that manual handling, personal protective equipment, working in the home, and equipment were among the most prominent issues. Therefore, we explored these aspects in more detail in phase 2.

2.2.4 Quality, Reliability and Validity – Non-Ethnographic work

As per Healy and Perry (2000) the following quality criteria for validity and reliability in qualitative research within the realism specific paradigm was the basis the phase one, non-ethnographic work (Table 2.2).

Table 2.2 **Quality criteria for validity and reliability in qualitative research within the realism specific paradigm (Healy and Perry 2000)**

Criteria	Brief description of criteria	How criteria is met in this study
Ontological appropriateness	Research problem deals with complex social science phenomena involving reflective people.	A study of the flow/transfer and translation of knowledge is clearly of this type
Contingent Validity	Open “fuzzy boundary” systems (Yin, 1994) involving generative mechanisms rather than direct cause and effect.	We focussed on why things happen and not just what happened. We described the context of cases such as the size of firms, dates of interviews and the position or role of the interviewee.
Epistemology	Neither value-free nor value-laden rather value-aware.	Our itinerary was semi-structured, including both interviews and focus groups. Participants answered questions as they saw fit and themes were developed based on their responses.
Methodological trustworthiness	The research can be audited.	We developed case study databases. Summarised findings and quotations from the work are included in this final report.
Analytic generalization	Analytic generalization(that is, theory building) rather than statistical generalization (that is, theory-testing).	Based on the literature review and evaluation and review by team members, we developed IDEF0 diagrams of information flows for each sector which provided an initial theorised information flow. We then developed these diagrams based on data from the empirical work.

2.2.5 Bias and internal validity – Non-Ethnographic work

Four researchers (two for logistics due to staff changes and one for each of the other sectors) conducted the interview/focus groups and critical incident technique face to face interactions. There was a potential for bias as a realism approach (where the researcher can probe and alter questioning based on the current situation) was used. In order to alleviate the potential effects of bias, pilot interviews/focus groups/Critical Incident Technique) were conducted in each of the sectors. We followed van Teijlingen and Hundley’s (2002) procedure for the pilot in an effort to improve internal validity of the main study. We used the following protocol in the pilot interviews:

- 1) N = 6 (2 interview/focus groups/CIT per sector).
- 2) The interviews were led by one researcher with the pre-defined semi-structured itinerary.
- 3) All of the researchers sat in on the session taking notes for discussion.

- 4) Following completion of the pilot study the itinerary was altered to reflect researcher style and general findings.
- 5) As the research developed meetings were held at regular intervals with the field workers and the whole research team to update and augment the inventory with new and emerging themes.
- 6) Regular meetings were held with the new logistics researcher to allow all researchers to discuss and ensure the validity of the research data.

Scientific advisory panel/steering group

We used a scientific advisory panel comprising senior academics and industrialists in each of the specialist areas and sectors, meeting periodically throughout the project, to identify and validate themes in the data analysis.

2.2.6 Interim analysis (Non-Ethnographic data)

We completed a preliminary analysis following phase 1 data collection. From this we identified emergent themes that were then investigated further at phase 2 and during the ethnographic data collection. We also developed DFD diagrams following initial analysis by the researchers and consultation with the wider project team. Once a preliminary list of emerging themes and DFD diagrams had been established, they were checked with the project steering group and “gate keepers” for completeness and accuracy. We then augmented and modified inventories to adjust for emerging themes and to fill gaps in the data from phase 1 data collection.

2.3 Ethnographic research

In the ethnographic element of the research, we sought to identify different types of OSH-knowledge (textual, verbal, embodied, affective, sensory) engaged in networked organisations, and to explore how OSH-knowledge is acquired, shared, and *actually used* by workers in their everyday work practices. We used qualitative ethnographic methods at case-study organisations from across the sectors of healthcare, logistics, and construction. Because it was not practicable to undertake the research with the same participants as the interviews and focus groups, we did this research at different locations with (in some cases) different kinds of participants. Specifically, the perspectives, experiences, and day-to-day activities of managers/supervisors, *but especially* workers, were examined in-situ to produce in-depth understanding and rich detail on how OSH-knowledge ‘flows’, as well as how it is accepted, rejected, appropriated, and modified. By taking a comparative cross-sector approach, we identified shared principles of how OSH-knowledge is learned, communicated, and enacted in different workplace environments, while also investigating the specificities of these processes. The empirical insights challenge the idea that knowledge is always something that ‘flows’ into and around an organisation by providing an alternative perspective by illustrating how OSH emerges from practical activity situated in specific institutional, social, material, and temporal contexts. Moreover, the ethnographic materials reveal how OSH is enacted through intersections with personal and biographically

learned and other ways of knowing which might originate in other contexts. So as to maintain the integrity of this distinct argument, we have used the ethnographic insights in this report to broadly inform analysis of the interview and focus group findings (sections 3.2-3.8) while also enabling a specific stand-alone discussion of the ethnographic research (section 3.9).

Ethnography is an intensive research method and sustained immersion in the context under study is central to this approach. For the fieldwork, we selected individual case-study organisations located across the UK including: a NHS healthcare trust, a logistics warehouse depot, and two construction sites run by different contractors (a residential building project and a civil engineering project). We obtained permission to conduct research from key organisational 'gate keepers' (e.g. OSH-managers), and negotiated further consent with individual participants who were selected in terms of their willingness to participate and role they played in relation to OSH-knowledge. A broad community of practitioners (line managers and workers) from across the sites participated in the research. This included 16 healthcare, 7 construction and 10 logistics 'key informants' who signed written consent forms. The ethnographic researcher spent five weeks at each organisation; splitting this time in the construction sector between the two different sites. We developed methods in response to the sites' contingencies, the opportunities fieldwork presented, and what was perceived to be emerging through the research process as important to follow-up. Working across organisations and sectors meant adaptability was key, yet methods were applied systematically in response to the guiding questions using a combination of: formal recorded interviews (with workers explicitly responsible for OSH); informal discussion (with workers carrying out tasks insitu); 'shadowing' participants as they moved through different contexts (including from the organisational base, into a vehicle, and the home of patients or customers); participant observation of work and non-work spaces (meetings, training, breaks); document analysis (of organisationally defined OSH); visual methods using photography and video, and structured research encounters using re-enactment and feedback/elicitation techniques.

Visual methodologies were particularly useful for revealing tacit OSH-knowledge, or experiences, perspectives, and practices beyond what was directly said or observed. For example, video re-enactment with healthcare professionals and photo elicitation with construction workers revealed the ways they used embodied, sensory, and affective knowledge in their everyday tasks to keep themselves (and others) safe. These details, which are more difficult to access through interviews or focus groups, provide a compelling basis for building similar methods into future research. We developed our methodologies through 'intense [ethnographic] encounters' (Pink and Morgan 2013). While these were short-term engagements compared to traditional ethnographic methods (where researchers conventionally spend (at least) a year doing 'fieldwork') these encounters used the kinds of techniques outlined above to elicit rich insight on the actualities of OSH-practice at our case-study organisations. Central to this approach was spending periods of time (hours and days) with specific groups of workers to gain a first-hand understanding of their activities and perspectives.

Analysis began during the fieldwork as we reviewed research materials together, discussed emerging and (as is typical of ethnography) unexpected insights, and sought feedback from our industry and academic advisory

panels. After fieldwork we spent a more sustained period in analysis to interrogate materials for repeated themes (e.g. local phrases, values, meanings, actions) relevant to the topics of learning, communicating, and enacting OSH. We have brought these together in this report with selected vignettes, quotes, and images to illustrate some of the practical ways through which these processes occur.

It was envisaged that the ethnographic research materials would be collected in a sequential order in line with the non-ethnographic data. However, due to timetabling issues and availability of case studies in healthcare, the healthcare ethnographic materials were collected at the same time as the non-ethnographic healthcare data. However, as with the other case studies, researchers kept in constant contact to validate and investigate emerging themes.

2.4 Presentation of the results

In this report we selectively deploy the data and our analyses in various complementary ways in order to answer the research questions set out earlier in the report. Where appropriate, we mobilise aspects of the data in concert to illustrate the complex ways in which tacit and explicit knowledge combine in both expected and unexpected ways. Additionally, for reasons we have flagged above, we also dedicate a standalone section (3.9) to discuss ethnographic findings in more detail. The approach here is to avoid privileging one perspective over the other, but to put our datasets in dialogue with each other (both directly and indirectly) in order to present a more complete understanding of OSH practices within these networked organisational and supply chain settings.

3 FINDINGS

3.1 Introduction

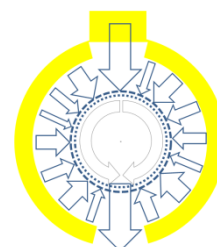
In this chapter we present our main findings from the fieldwork. Some are applicable to networked organisations across the three industry sectors and some are peculiar to the each sector, and we acknowledge that some may be unique to the individual case studies considered.

These findings provide an overview of what we have discovered in relation to research aims, objectives and key emergent themes overlapping across the three industries. This chapter is organised into the main themes of the interview inventory (sources, channels, flow, translation and enactment) and overlapping themes including conflicts with OSH, and OSH barriers and enablers. We studied several practical scenarios to provide a focus for the interviewees to describe how they knew what to do and why. The scenarios include: manual handling, personal protective equipment and working in the home. Insights generated from the ethnographic research informed analysis of the interview and focus group study and, where appropriate, significant relevant aspects have been explicitly incorporated, while distinct ethnographic perspectives and details are further developed below (section 3.9).

We use the person-centric OSH knowledge (P-COK) flow model in this section as a way of structuring the main aspects.

3.2 Sources and forms of OSH information

In the translation section of the inventory, we asked participants: What are the best and least effective ways of finding out about OSH? We also asked what OSH source they trusted the most and why? Across all of the study organisations OSH information came from a number of sources and took several forms. However, more generally, sources may be described as external (coming from outside the organisation) or internal (coming from inside the organisation).



Following our team's IOSH-funded work on communication on the London 2012 Olympic Park (Cheyne et al, 2011 & 2012; Finneran et al, 2012) we use the term 'source' in this report as the originator or transmitter of information. The source can be a person (e.g. a manager or supervisor) or an organisation (e.g. a company or government). Conzola and Wogalter (2001) suggest that given the same information, differences in the perceived characteristics of the source can influence the receiver's beliefs about the relevance of the information. In effect, information from a positive, familiar, credible, expert source is given greater attention. In the case of complex networked organisations there will be a primary, initial source (perhaps the HSE), but also secondary sources as the knowledge flows around the network. Most actors in the network are both receivers of knowledge and sources of the translated knowledge to other actors who the influence or for whom they have responsibility. This is also explored from a network perspective in section 4.6.

3.2.1 Sources External to the Organisation (both formal and informal)

In logistics, with a few exceptions, only OSH managers and senior management used external sources of OSH. In construction, formal external information was normally only used by company directors, the OSH director and managers. However, in healthcare, management level ward-based staff also had access to external OSH knowledge as part of their everyday work arrangements. Respondents felt that this was due to the networked, complexity of healthcare and the difficulty of facilitating training where time off from clinical tasks was a concern, particularly for contracted staff. The ward staff were given OSH training and certification to train their colleagues.

The Institute of Medicine's linked work for ISOH mentioned earlier (Crawford et al, forthcoming) identified the following main OSH knowledge sources: Academic Journal; Employers Organisation; Government (including HSE); Magazine; Not for profit / charitable; Other OSH info provider; Private company; Professional Association; Trade Association; University / Research Organisations; Voluntary.

Various external sources of information were mentioned by interviewees across all sectors. Table 3.1 provides a summary of these sources and an estimate of the prevalence across the interviewee types and across the three main industry sectors⁴.

There appeared to be a hierarchy of information sources, with emphasis on the HSE as they were the regulator and IOSH, for safety practitioners at least, as they were the relevant professional body. In many cases the information was 'pushed' from the source (e.g. a magazine or circular), but there was also evidence of where interviewees would seek out particular information.

Healthcare staff at the case study Trusts have joint training sessions with colleagues from other trusts, often focussing on lessons learnt from implementation of a new procedure or process and stressing the benefits of the broader perspective that this brings.

In construction, various parties shared lessons learnt from accidents on previous projects. Certainly larger companies typically disseminated this learning across their organisations, typically including their sites and therefore the site-based personnel from other companies in the network. It was not clear whether this information was then circulated to the non-site-based parts of the subcontractors' sub-networks.

"I know a lot of clients now are actually sharing their accidents... they are getting filtered through a lot more... we never used to see them, kind of thing, you know. So it makes you all aware."
(Construction site manager)

⁴ The number of interviewees who mentioned each source have been grouped as follows: 100% = ALL; 51-99% = MOST; 11-50% = SOME; 1-10% = FEW; 0% = NONE. The sample size is not large enough for these groups to be considered significant but they are provided here to help present the overall picture.

Table 3.1 External information sources cited by interviewees

External information sources	Citation Frequency by interviewees								
	Healthcare			Construction			Logistics		
	Worker	Manager	OSH	Worker	Manager	OSH	Worker	Manager	OSH
Professional education	Most	Most	All	Most	Most	All	Few	Few	Few
Health and Safety Executive (HSE)	Few	Most	All	Some	All	All	Few	Most	Most
Other Regulatory bodies ⁵	Most	All	All	Some	All	All	None	Few	Few
Insurers	Few	Most	Most	Some	Some	Some	None	Few	Few
Institution of Occupational Safety & Health (IOSH)	None	None	All	Some	Some	All	Few	Most	Most
Professional bodies	All	All	All	Most	Most	All	None	Some	Some
Professional magazines	Some	Some	All	Some	Some	Some	None	Most	Most
Equipment / product suppliers	Most	Most	Some	Few	Few	Some	None	None	None
The media (news about workplace accidents etc)	All	All	All	All	All	All	Few	Few	Few
Personal networks	Some	Some	All	All	All	All	Most	Most	Most

“...obviously HSE because they’re the regulator and IOSH because they’re the main professional body in the country.”
(Logistics OSH Manager)

The HSE was the primary source used in logistics as both senior and more junior managers felt it was appropriate to use information from the main regulatory body. IOSH outputs such as SHP were also frequently cited by logistics’ OSH managers, along with more specific organisations like the

Freight Transport Association.

There were differing levels of seeking information from external sources by workers, ranging from very little or none through to individual workers actively seeking out OSH as much information as they can from every possible source.

“...I’m trying to pick up information in newspapers, magazines - anything I see on health and safety...”
(Logistics warehouse assistant)

⁵ E.g. the National House Building Council for construction or Patient care bodies for healthcare.

3.2.2 Sources Internal to the Organisation

We translated and distilled external information to meet internal aims and objectives across each of the study organisations investigated. Table 3.2 lists the main internal sources cited by interviewees.

Table 3.2 Primary internal information sources cited by interviewees

Internal information sources	Citation Frequency by interviewees								
	Healthcare			Construction			Logistics		
	Worker	Manager	OSH	Worker	Manager	OSH	Worker	Manager	OSH
OSH Mangers	All	All	All	All	All	All	Some	Most	Most
Line managers	All	All	All	All	Most	All	Most	Most	Most
Colleagues	Some	Some	Some	All	All	All	Most	Most	Most
Acknowledged champions (keenies)	Few	Few	All	Most	Most	Most	Some	Few	Few
OSH Committee	Few	All	All	Most	Most	Most	Few	Most	Most

Most of the networks we studied had key individuals who acted either as ‘central connectors’ or ‘brokers’ (Cross et al, 2007). The central connectors are people who are frequently consulted for “information, expertise or decision-making help.” Brokers are people who connect different subgroups in the network.

OSH Managers

Designated professionals, such as OSH managers, were generally the central connectors as the main sources of internal information. The historical term ‘officer’ was sometimes used by others, perhaps betraying the perception of a more officious attitude than the softer skills of an OSH manager. However, none of the OSH people interviewed described themselves as ‘officers’.

[The Health and Safety Officer] helps us and she's very good at it ...it's her sort of special interest, if you like.”
(Clinical Nursing Manager)

A clinical nursing manager described her dedicated OSH ‘officer’ as coordinating OSH from an overall perspective and being trained to do things like risk assessments. She explained that, if she had an OSH problem and needed help, she would go to the OSH ‘officer’ who would help her do the paperwork, which she described as ‘laborious’. She also acknowledged the input from the OSH professional is challenging her assumptions and checking the completeness of her assessments.

Line Managers

Many construction organisations make it clear that the line managers have specific OSH responsibility and cannot pass this on to the OSH manager – often these OSH specialists are called advisors rather than managers to emphasise their background role. Good practice was cited where the line manager would habitually brief a task to be done in the safest way.

“...to change a light bulb, we’ll do a scaffold instead of a chair, you know what I mean?”
(Construction Manager)

In terms of communicating OSH information internally within an organisation, managers would often state that it is cascaded across the different levels of management and down to the worker level. The mode of communication and the emphasis placed on it this would depend on the urgency of making individuals aware of the information.

Whilst specific, detailed OSH information would be sought from the specialists, the OSH noticeboard or the OSH committee, it was assumed that the line managers would know the key principles.

The social skills and management style of the line managers was raised as an issue that could seriously affect the flow of knowledge. This was particularly the case for some of the healthcare interviewees who felt that the perceived professional hierarchy between clinicians and nursing staff could lead to instructions being given in a dictatorial fashion which did not engender a positive reaction.

“...the department must have taken the view that that (a dictatorial style) wasn’t a particularly good way of managing staff for which I’m very grateful.”
(Healthcare office manager)

Colleagues and champions (‘keenies’) - acknowledged and unacknowledged

Because of the networked complexity of each of the study organisations, certain workers were also given the opportunity to act as internal OSH knowledge hubs. For example, each of the healthcare wards had workers who took on an OSH role surplus to their own role. They were provided with training to fulfil this role but, given the additional workload, they also needed a strong personal interest in OSH.

“We’ve got one particular guy who’s got a passion for health and safety and he tends to pick up on things. I think he reads the book every night before he goes to bed and looks at the internet. He’s very good because he alerts us locally to changes that may occur, but he’s also the person that drives the writing of the standard operating procedures and the risk assessments”
(Logistics section manager)

Many logistics interviewees cited the presence of informal OSH experts, often colleagues who, for one reason or another had shown a keen interest in OSH, or were more experienced, or had happened to have more training. These unofficial OSH knowledge hubs were typically called the ‘keenies’. Sometimes these people were overtly acknowledged and sometimes not. Construction workers also cited experienced co-workers as internal sources of OSH.

A clinical nursing manager explained that, in her Trust, every team had a person who had the OSH link role. They would typically be a nurse or other healthcare worker who worked alongside the official OSH professional and the line manager, acting as a secondary source for the ward staff directly. This approach had the advantage that the link person was close to the frontline workers and understood their situation and environment so could ensure that the messages were communicated appropriately.

Within one logistics firm information was said to be freely available to workers who frequently cited being able to ask co-workers if they needed OSH information. As the organisation had a high proportion of long standing employees and low turnover there was always someone working on the shift who knew where to find information.

"You can always get information. If you don't understand it from one person you can always get it from another person... they might put you onto another [worker] and say 'He knows how to do all that. Go and see him.'"
(Retail warehouse assistant)

"...we have a (worker) voice where someone's been selected to listen to everyone's needs and wants and then goes off and talks to the higher ranked people."
(Logistics warehouse assistant)

This view was echoed across the workers at one logistics firm as there was an OSH culture that had been developed over a number of years. Workers knew that they were able to approach someone in the organisation who would be a source of knowledge and experience in health and safety. These OSH hub workers would also provide a route

for feedback from the workers.

'Sitting with Nellie' is an expression used to describe the process of learning by watching a more experienced colleague doing the task. There was evidence of this being done as an intentional strategy for inexperienced workers along with more formal training methods. There was also evidence of it occurring in an unacknowledged manner where workers look around at others to learn what the actual expectations are in the particular work environment, perhaps irrespective of what is the official policy.

We never set anybody to work who's brand new without being with someone experienced, just to show them the ropes."
(Construction supervisor)

OSH committee

Many of the locations visited had OSH committees or groups that generated information themselves or adapted generic information to suit the specific situation. The OSH Director from one healthcare trust stated that all the different divisions of the Trust making up the network were represented at the OSH committee and that they would "all happily and openly share with each other what they have been doing – what they have learnt." The Director acknowledged the challenges in having a representative group given how large the trusts were with more than 2500 staff but still considered that the committee structure worked well.

Logistics interviewees acknowledged the OSH committee as one of the internal sources, although commenting that typically, the messages were then channelled through the line manager or put on the notice board and so the committee itself may not be seen as the source. One interviewee did comment that, as the pictures of the OSH committee members were all on the notice board, it was easy to ask the members directly if you wanted any further information.

In healthcare and logistics, these committees also raised issues from the workforce and passed them on to 'management' for action.

However, not all interviewees considered that the OSH committees were effective, some arguing that they take too much time talking and do not get things done quickly enough.

*“...if you waited for the health and safety committee you’d never do anything, because everything would just be held up all the time. Sometimes you have to bite the bullet and say we’re just going to do it”
(Healthcare OSH manager)*

One healthcare OSH manager cited an example of the ‘plethora’ of committees involved in an OSH initiative relating to ‘sharps’. The new protocol was discussed by committees on education and learning, risk, medical advisors, consultants and doctors, and finance before being finalised and presented to the main OSH committee. Then, once it had been agreed in principle and turned into a directive, the way that it would be implemented across the whole Trust had to be agreed along with how it would be disseminated to all relevant staff. This infers that some healthcare staff work around this committee structure in the interests of expediency which resonates with some of the ethnographic findings and also suggests that, even in the NHS, there is a reluctance towards rote rule following.

3.2.3 Unknown Sources – ‘picking up knowledge’ – Socially constructed knowledge

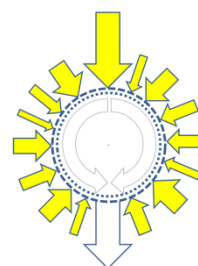
Socially constructed OSH-knowledge will be illustrated in more detail through the ethnographic work (Section 3.9). Yet, it is important to briefly highlight this when discussing the interviews and focus groups because we also found evidence from the interviews that OSH knowledge is co-created and interpreted socially in each of the sectors. In the mix of the formal and informal knowledge flows, workers often ‘pick up’ OSH ‘knowledge’ (and OSH practices) from others. This can be intentional or unintentional, formal or informal. It can also include agents who are external to the organisation. For example, as we considered through the ethnographic research, healthcare and logistics workers were found to draw on the knowledge of patients and customers to enable them to safely approach working in other peoples’ homes when away from the organisational base (Pink at al., in press). These agents were revealed to be crucial sources of information that workers used in order to anticipate, plan, and manage approaches to safe working, and thus were actively involved in the co-production of OSH-knowledge. The social construction of OSH-knowledge was evidenced by interviewees from all three sectors often explaining that they did not really know why they did things in a certain way, arguing that it was ‘just common sense’. In some cases what workers pick up seemed to be good, in others it was thought to begin establishing flawed knowledge. A logistics manager talked about receiving an email from the OSH team which they had not understood. The message was then discussed with others and checked with the OSH team to ensure that it had been interpreted correctly. This type of discussion sometimes led to the adaptation of policies (or recommendations) to make them more applicable to different job roles.

Recognising OSH as socially constructed is central to the understanding of how knowledge is formed, mediated and in some cases corrupted. It suggests that knowing how to work safely is an incremental and an ongoing process, as approaches were developed in response to specific features of workplace environments. In particular, the dynamic properties of diverse workplaces (building sites, organisational bases, and

customer/patient homes) were foregrounded as workers were found to be responding to the uncertain and ongoingly changing features of these contexts by adapting, improvising, and innovating OSH-knowledge and practice. OSH was found to be contingently situated and enacted in ways that were organisationally, individually, culturally, and socially appropriate. Together, these insights into OSH practice suggest that formalised OSH knowledge inevitably becomes intertwined with informal ways of knowing, themselves continually shaped by unfolding and dynamic hazard contexts. This continual re-shaping of what constitutes OSH knowledge renders its codification complex and problematic in highly networked sectors.

3.3 Channels to communicate OSH

Again, following the London 2012 work (Cheyne et al, 2011), the term channel concerns the way information is transmitted from the source to one or more receivers. In this section, we focus on the communication medium used (e.g. training, posters, internet, oral instruction), to transfer information or knowledge from one user to another. Over 40 different channels were cited by respondents. However, Table 3.3 lists the most frequently mentioned.



The importance of using several different channels for communication, appropriate to the circumstances and the receivers was stressed.

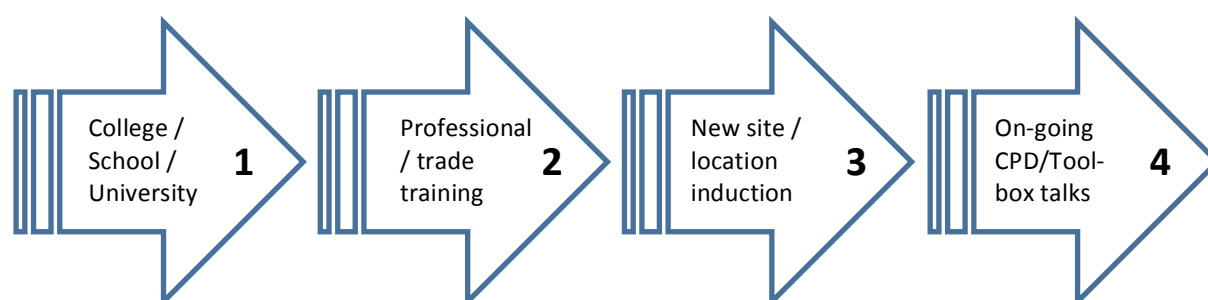
“...we make sure that everyone gets the message in various different formats... We don’t ever use just one medium... We don’t rely on the fact that we email to almost every ward and department... We don’t rely on that alone. We also put it on the health and safety web page and we also print them off and put them on the health and safety noticeboards, which are in the main corridors in all three hospitals.”

(Healthcare OSH officer)

Table 3.3 OSH information channels most cited by interviewees

Information channels	Citation Frequency by interviewees								
	Healthcare			Construction			Logistics		
	Worker	Manager	OSH	Worker	Manager	OSH	Worker	Manager	OSH
Training	All	All	All	All	All	All	All	All	All
Verbal	All	All	All	All	All	All	Most	Most	Most
Meetings	All	All	All	All	All	All	Some	Most	Most
Intranet (company-specific)	All	All	All	Few	Most	Most	Some	Most	Most
Posters	Most	Most	Most	All	All	All	Some	Some	Some
Notice Boards	Few	Few	Few	Most	Most	All	Most	All	All
Emails	All	All	All	Few	Most	Most	Few	Some	Some
Newspapers/magazines	Some	All	All	Some	Some	Some	Few	Few	Few
Leaflets	Some	Some	Some	Few	Few	Few	Some	Some	Some
Internet (www)	Few	Few	Few	Few	Few	Few	Few	Most	Most
Internet forums	Few	Few	Some	Some	Some	Some	None	Few	Few
Real-life examples	None	None	None	Most	Most	Most	None	None	None
TV/Radio	Few	Few	Few	Some	Some	Some	None	None	None

3.3.1 Training



In the interviews, training was the most often quoted knowledge channel presented in various guises; from simple ‘tells’ to more complex training, encouraging workers to process risks actively and determine appropriate courses of action. All three sectors employed a training process that built on school, college or university education and training, along with some form of professional or trade training, particularly at the

start of their working career. There was then some form of induction for new workers, either when they joined a particular company or a new work location or site. This training was then supplemented by continuing professional development or 'tool-box talks' on specific issues.

Stage 1 training was obviously varied in terms of OSH depending on the type, level and quality of education of the individual. The extent of OSH content in Stage 2 training varied significantly across the trades and professions. Construction has adopted a fairly universal (at least on large sites) safety passport (e.g. the CSCS card) which incorporates some OSH training relevant to the specific trade. Most large projects require anyone who wants to come on site to have the relevant safety passport. All three sectors operated Stage 3 'inductions' although content, duration and effectiveness varied considerably. All three sectors had some Stage 4 training which was task specific or responded to changing risks or recent incidents.

Some form of 'new start' induction training (Stage 3) was used across all three sectors. However, in construction it was more frequent for workers as they moved from project to project. This created more of a negative response in some construction workers as they felt that they were hearing much of the same things time after time. This was despite the acknowledgement of the generic 'safety passports' that were becoming ubiquitous. Interviewees still felt that basic content was repeated on each site.

All three sectors would then offer task-specific (Stage 4) training as the need arose or, in many cases, periodically throughout a person's career, particularly for more recent starters.

Both formal and informal worker to worker training was mentioned in all three sectors, being perceived as more credible as it was delivered by those who understood the job (also see section 3.9).

"Our key trainers on the ward are essential because they're on the shop floor; they're dealing with things every day. They would mop up people who didn't fall into the mandatory training or new starters or people coming back with issues. We can't be everywhere all the time. So at least having a link person in wards and departments, we've got that communication."
(Physiotherapist - on Occ Health training)

One physiotherapist explained that they encourage two members of staff from each ward or department to buddy up with each other to deliver the training.

There were aspects in all three sectors where workers had to adapt training to their specific situation over time. Logistics workers delivering to homes could not guarantee what they would face entering the home. Construction workers' task output one day became their workplace the following day as they often stood on the floor that they had just constructed. However, of the three sectors, healthcare presented greater day to day, minute by minute changes in environment due to the varying needs of the patients and the serious consequences regarding patient safety. Thus, healthcare staff in particular had to assess risks dynamically, adapting their generic training to the specific task using 'common sense'. This was acknowledged in the Trusts studied by providing 'scenario-based training'. However, facilities management staff (hard and soft) at the hospital were trained in a more regimented rule-based fashion as they had less direct interaction with patients.

In many cases, where possible, the training was adapted to take the environment and trainer's ability into account. Some interviewees commented that the ability to train comes mainly from experience and presence (personality and communication) and the more senior people are not necessarily the best trainers. The boredom factor was acknowledged by many interviewees and efforts were made to address the challenge.

"Manual handling, like all health and safety training, is not the most riveting of subjects and we give them lots of different ways of delivering the training - not just standing there doing teaching classroom style."
(Physiotherapist)

"If we could find 100 personable good communicators we probably would need to rely less on our systems and our procedures. Every single site manager I've ever interviewed has told me he or she is a good communicator. The reality is somewhat different." (Construction Director)

Most training seemed to be top-down, based on pre-determined topics and expectations of knowledge and competence. One construction director recounted toolbox talks that were also supposed to involve worker engagement but where the site manager trainer was reading off a prepared script and lecturing the workers rather than asking them about their problems and issues and eliciting ideas for improvement from them.

"What we need to get to is people who request toolbox talks. Where the workforce perhaps identify issues and they want to interact with us at a local level. That is going to require our site staff to be trained in those attributes in terms of, not only being a good communicator but also being a good listener, somebody who can articulate the requirements of the business, but equally can articulate back to the business some of the issues the workforce are facing. That's where we should be at." (Construction Director)

Notwithstanding, there were indications of a desire to respond to the workers' needs, or perceived needs.

Typically, younger workers were thought to respond to training opportunities better than older workers because 'they don't know any different' whereas some older workers were thought to be 'set in their ways'. It was also acknowledged that most college and university courses now cover more OSH than was the case previously and so the younger workers (and younger managers) are thought to be more accepting of OSH

"I don't believe written information changes the way I behave. Training or discussion will change the way I behave... I can't recall ever (just) reading something and I've thought: 'Oh I could do something different now'. It doesn't tend to land like that."
(Construction Project Manager)

input and focus.

The importance of practical, experiential learning was stressed. For example manual handling was a core training session for all warehouse workers and included practical 'shop floor' practice. The importance of having trainers who could 'actually do the job' was stressed, rather than just OSH professionals who only knew the theory.

Much of the training was recorded formally. For example, one logistics organisation had a formal procedure with formal training cards for each worker that would be signed off by trainers once training had been completed and checked regularly by managers and supervisors.

There was a view that face to face training was essential for OSH critical issues, rather than just communicating

“...something as business critical as behavioural based safety cannot be something that’s just communicated via email or other methods. It needs to be face to face. It needs to be a proper session. You need to workshop it out. You need to get opinions.” (Logistics safety manager)

via email or newsletter.

Notwithstanding, there was also the acknowledgement of some workers’ reluctance to attend training sessions, particularly in construction where many were paid for the work that they did and rather than on an

“You will get a huge negative reaction on a lot of sites to wanting to do a toolbox talk. It might only be 15 minutes long, but that 15 minutes is worth cash in the hand to the people on that site.”
(External safety consultant – construction)

hourly rate.

3.3.2 Verbal communication

Verbal communication was cited across the three sectors as one of the most efficient and effective means of conveying OSH knowledge. It was also beneficial in cases where workers needed help but were not able or willing to go through the more formal channels, often due to the urgency of the message or scepticism of more formal channels. This type of communication flowed in various directions and between various levels of the organisations and networks. Face to face was the most preferred method of verbal communication and this finding was supported by the ethnographic observations. This was more easily facilitated in the logistics and construction case studies where workers worked in close proximity. However, healthcare workers (especially ward-based staff) tended to work on different shifts or remotely (community based staff) and therefore, more commonly used electronic media for verbal communication. But these messages were often urgent and informal and so there was no formal means of learning from the related incidents.

It is acknowledged that verbal communication, on its own, is unlikely to be effective at maintaining the accuracy of the message across complex networks. But, despite this, it was still felt that the actual delivery of

“...there's so much knowledge that we pass down verbally that it's almost impossible to write down...”
(Theatre nurse)

“Talking to the committee, talking to the managers, talking to people that have been in the branch a long time. Just mainly talking. Communication really. Just talking in general to people. That’s really where you find out most of the information here...”
(Logistics Catering Manager)

the message to the person who needed it was best delivered verbally, face to face.

A microbiologist commented that there was a tendency for people to fill out a form and then think that the problem has been solved. An OSH manager in construction commented that, especially on busy project sites, verbal communication is better even though sending emails may be easier. He argued that the receiver can’t

gauge your tone from an email, nor the urgency of the message. A construction site manager emphasised that the 'vast majority' of communication with the workers was verbal and, unless it was a serious matter where he would put it in writing and 'fire it off to the company', he would leave it as a verbal interaction.

3.3.3 Meetings

Almost all participants referred to meetings as a channel for OSH information and knowledge. Construction and healthcare meetings were generally formalised and occurring at regular intervals at management level. However, as construction and healthcare priorities changed at site or ward level these meetings were less frequent and more informal. Higher-level healthcare meetings had ward-based representatives, however attendance was not compulsory.

"...if we didn't have such a good informal network going, then we would have to have (more) formal regular meetings"
(Healthcare OSH manager)

the informal network was still effective in maintaining OSH.

One healthcare OSH manager commented that meetings worked well but that it was difficult to get people together as they were so busy. She then claimed that, even though the meetings were not so regular,

In one of the logistics case studies meetings were formalised at all levels. 'Coms' (communications) meetings occurred weekly and ranged from suggestions for improving customer satisfaction through to OSH training briefings. Specific OSH meetings included representatives from the logistics workforce but, unlike the coms meetings, they did not include all workers.

One of the construction sites held a monthly meeting called 'work engagement' and also fortnightly subcontractors' meetings where each party in the site network could find out what the others are doing and bring up any issues. The construction site manager described these meetings as 'focus groups'. Another site manager described subcontractors' meetings where the subcontractors brought up things that the principal contractor may not have seen and discussed interfaces between the different firms in the site network. These meetings discussed day to day developments face to face rather than relying on pre-planned schedules on 'pieces of paper'. Another site manager spoke of the large number of meetings on their project such as daily briefings including a larger meeting each Monday run by the senior supervisor or manager. They also had monthly OSH meetings attended by representatives from all the subcontractors and one of the OSH advisors and risk review meetings at the start of each new phase of the project. They had OSH meetings with the designers following the Construction Design and Management (CDM) Regulatory protocols and then finally weekly meetings between OSH staff and the site engineers covering each area of the site.

Line managers and co-workers in each sector used briefing and debriefing sessions to share information from the previous work shift with their co-workers. Construction supervisors briefed workers about the day's work and answered any concerns or questions. Workers were also updated at the start of a new task and where changes required further information. Clinical and community health staff used briefings to share any information that may affect the next working shift, including OSH information, for example, where a patient's

condition had deteriorated and more staff or different equipment was required. Hard and soft FM staff in healthcare were also briefed and debriefed by their co-workers and managers; for example, which chemicals, equipment, or PPE was most appropriate to use.

Logistics line managers were expected to brief workers at the start of their shift and sometimes debrief them at the end, typically taking five or ten minutes but occasionally up to an hour. This could include information about performance, targets, general information and, where appropriate, OSH. Occasionally, when important issues arise, the managers will get both shifts together to discuss and agree the interfaces.

"...we have a start of shift meeting. So, when the team come in, we start them with usually a five or ten minute briefing..."
(Logistics Section Manager)

In one logistics organisation, fortnightly meetings with all the staff on the customer delivery team, were organised by the logistics manager, to ensure that communications on practice and policy, including OSH, were consistent.

3.3.4 Electronic information & communication (intranet, internet and emails)

Electronic communication has revolutionised society over the last few decades, with most people in the UK owning a smart phone capable of phone calls, emails and internet browsing. These technologies have also affected the way that business is done in the three sectors being studied in this project.

Organisation-specific intranets were used to some extent across each of the case studies in all three sectors with employees having concurrent access to the internet. Many organisations prevent the use of certain internet applications such as Facebook or Skype during working time or using work equipment. Most companies have acceptable use policies preventing inappropriate use of the internet or emails.

In healthcare, only staff directly employed by the NHS had log-on details for the NHS intranet, and this was further compounded as not all staff had access to computers. If computers were available then often time was an issue as staff were told to access this information outside their normal working hours which, understandably was often not a priority. Those that did access the intranet noted that, while good information was available, it was often muddled and difficult to sort through, which added to time pressures. NHS managers used the intranet widely in search of OSH information, accessing a number of resources to search for the specific issue or task they are interested in. NHS OSH managers had access to a communications team that periodically placed OSH notices on the intranet system to advertise new initiatives and facilitate OSH knowledge flow. New directives in healthcare are typically posted on the NHS or Trust intranet, sometimes combined with a screen saver reminder to raise awareness.

Company-specific intranet was widely used across logistics, especially by managers seeking OSH knowledge. Several different resources were available and managers could search for specific

"Everything's on our (company) Net. If we're unsure about health and safety, all the information is there. So it's just a click of a button really"
(Logistics deliveries manager)

aspects. Workers also had access to their company's intranet, but the extent to which they used it was unclear.

Logistics firms tend to have information posted on their intranet so that all employees can have access. Some employees had access to the broader internet and were able to search for things. Firms had their own specific OSH webpages and one organisation has an OSH home page where all the main task risk assessments can be found and OSH messages can be posted. Most managers found intranets very useful for finding relevant OSH information.

In one construction case study operating a number of smaller sites, only senior construction staff had intranet access because of limited electronic media on site and the general prohibition of the site use of mobile phones. Smaller sites in this case study did not have computers anyway; therefore any information had to be

faxed through from head office on request. Interviewees felt that there were pros and cons to this approach; for example, while information was filtered to meet specific needs it also meant that there was a delay in receiving information and the method was cumbersome.

"...we use our own (phones for email and internet access)... If we've got an issue that we need sorting, we use our own. It's not ideal. (Construction site manager)

In certain cases construction managers would use their own smart phones to access OSH information. This practice was officially discouraged but unofficially encouraged and typically practiced in the site office rather than out on site due to the usual 'blanket ban' on site use of mobile phones. Whilst managers argue that there is a sound OSH rationale behind such bans, this suggests that OSH practice is not keeping up with the socio-technical reality of people's lives, and the wider networks within which they are enmeshed. There are multiple networks at play, some of them technically enabled.

"I'd probably have to look on the internet and Google it." (Logistics warehouse assistant)

Searches across the wider internet were used to some extent across all case studies. However, this was typically by OSH managers and generally only via "trusted sites" such as the HSE or IOSH. In some instances search engines were used to find information from other sources such as blogs or discussion forums. Many

"You put in your search engine, what you want to find, you could get a lot of garbled goo that doesn't actually relate to what you're looking for, but most of the time you do (find what you want)." (Logistics section manager)

"We communicate by email, some section managers and DM's carry Blackberry's so we get lots of communications. Sometimes we get the same communication twice. I think we may over-communicate if I'm honest..." (Logistics Distribution Manager)

people, especially younger ones, are competent and sifting through the plethora of information available on the internet to access the necessary details.

Emails were widely used across all sectors to disseminate OSH information to managers for wider circulation and were seen as a time-effective means of communication, particularly to a large group

of people. However, the speed with which information was passed on was often not as quick as it should be as the manager may be out of the office or have a large back-log of emails to process.

One problem is the common expectation is for an instantaneous reaction, whereas the reality can be very different, with other pressures and priorities preventing an immediate response. Furthermore, as mentioned previously, smaller construction sites did not have access to computers so messages were sent via fax which was slower but did allow the messages to be more specific and filtered.

A number of interviewees mentioned that they had set up their computers or phones to receive regular emailed updates and newsletters from organisations like the HSE or IOSH. Some also still received magazines and newsletters in hard copy format.

There was however some push back against the move to electronic communication and the use of intranets in particular. An experienced matron bemoaned the introduction of a paperless system where all the policies, guidelines and approved codes of practice were stored electronically on the intranet. She recalled the time when she had to print off the policy and then sign a sheet to say that she had entered it in the file. She explained that now the staff are made aware of new procedures and priorities through the cascade of training and the intranet and the onus is on the individual to look for the information and read it. She claimed that, despite all the training workshops and screen saver reminders, people were still getting it wrong.

Most large organisations in all three sectors recorded incidents and accidents digitally to assist with the analysis and learning from adverse events. This aspect was not raised by many but there was a comment from a healthcare interviewee. A member of a hospital medical physics team explained that healthcare staff are supposed to take note of tasks that they complete, as a way of learning and feeding back to their peers. He then argued that they were less likely to do this for something that happened to them rather than something that happened to the patient. He explained that, if an incident occurs there is an investigation where all of the information is noted down. Whilst recognising the failings of the previous hand-written accident book, he felt that the use of programmes like Datix⁶ has meant that data recording has become slow and not as transparent. There was a concern that staff would avoid entering data feeling that it could be used against them through the database system.

3.3.5 Initiatives and campaigns

There was evidence of specific, time-limited campaigns or initiatives, focussing on particular aspects to raise awareness. A healthcare occupational health manager described the New Year's resolution approach on health and wellbeing linked to drinking more water, taking the stairs, stopping smoking, managing stress or looking after your general cardiovascular health.

In logistics there were examples of managers trying to raise awareness through introducing different initiatives such as the safe use of mechanical handling equipment. A 'Truck Driver of the Year' initiative sought to appeal

⁶ *Datix is a risk management software system for incident reporting and adverse events in healthcare.*

to the professionalism of the drivers, to take pride in what they were doing and recognise that their vehicle has the potential to cause great harm.

3.3.6 Notices and notice boards

All the case study organisations used notices and notice boards as OSH channels.

Even relatively small construction sites had notice boards stating key information including such things as the required personal protection equipment. Many such boards also include daily hazards and safety performance data and are typically positioned in such a way to be very visible to the general public and workers as they enter the site at the start of each shift.

Construction also makes much use of printed posters warning of particular hazards. One member of the research team on their first visit to a construction site actually thought that the site had put all the posters up for the benefit of the research team whereas this was just standard practice. There was some suggestion however, of the

HAZARDS ON THIS SITE		
Before entering this site, you must be aware that the following specific hazards exist & certain emergency procedures are in place.		
Hazard	Location	Method of Control
Earthmoving machines and Cranes moving and striking without warning	Various Locations of the Site	Stay clear of Machinery
Motor Vehicle Moving about the Site	Various Locations	Do not walk along the middle of haul roads
Motor Vehicle Backing up without warning	Various Locations	If you can see the Truck (or other) Mirror, the Driver can see you
Cranes moving Part and gear about the Site	Various Locations	Do not walk under Suspended Loads
Deep Excavations	Specific Locations about the Site	Do not Climb over Barriers
• Working at Height	Various Locations	• Wear eye Protection
• Noise	"	• Wear hearing Protection
• Object falling from above	Various Locations	Wear Protective Helmets
• Deep Basins	Various Locations	Do Not Walk under Suspended Loads
• Tripping Hazards	"	Maintain Safe Distance from edge
Electric Shock	Various Locations	Always pay attention to ground surfaces with carefull
		• Protect Power Leads from damage
		• All power lead must be connected to a transformer outlet (Note: 11kV lead by outlet)

Please sign the attendance register acknowledging you are aware of and understand the above.

"We had a daily hazard board, what was happening on the day... When all the lads walked into the site there was this big board, it was updated twice a day, morning and afternoon. Because you can have something happening out there now and within an hour it's gone, but it's happening somewhere else... (But) no one knows what's on it because they don't read it... The notice is there, you probably first have a look at it and you don't pay no more attention to it, because you're focused on your own work."
(Construction worker)

'wallpaper effect' where too many posters mean that people do not actually notice any of them.

One of the healthcare Trusts used 'shared governance noticeboards' where issues or incidents that have occurred are posted along with an email copy and paper copies to all staff. This 'belt and braces' approach is intended to ensure that everyone is aware of the issue, however, it can backfire with people getting frustrated by receiving the same information several times. One matron interviewee considered that it was better to have something three times than not at all.

Notice boards were used at all sites at each of the logistics firms, generally at the entrance, and were used for displaying up to date OSH information for workers and visitors. Managers also agreed with workers on their views about notice boards, suggesting they were useful for displaying OSH information. Contrary to the

previous comment from construction, logistics workers seemed to appreciate the large number of OSH notices and posters distributed around the workplace, commenting that it is better than having ‘one board stuck out in the middle of nowhere.’ One logistics firm used the OSH board to reinforce the work of the OSH committee, having pictures of committee members on show, which they said made it easier for workers to be able to raise issues with the appropriate people. This greater significance of noticeboards felt by logistics workers could reflect the more regulated, institutionalised environments in a fixed logistics setting over the temporal and transient spaces defined by construction sites.

3.3.7 Feedback

Most of the previous sections have focussed on channels to communicate OSH from the top downwards. Theorists and practitioners agree that feedback is essential for full understanding and, in particular to achieve continuous improvement. Furthermore, we also observed OSH knowledge being created by workers and groups of workers rather than flowing down from the top, which is developed further in the ethnography section (3.9).

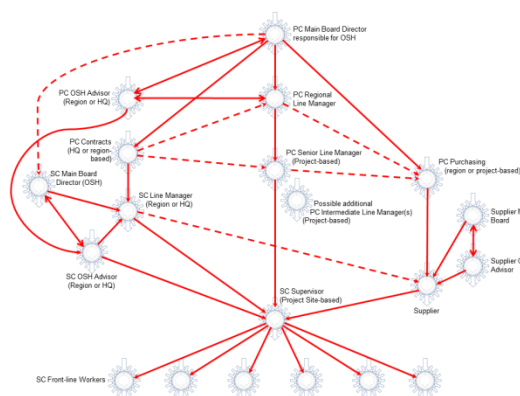
Feedback opportunities such as worker engagement on OSH committees have been mentioned earlier. Other approaches included the construction practice of ‘close call’ or ‘near miss’ reporting. Many firms operate a paper system but some are now experimenting with texting and on-line methods as well as emphasising feedback via an open door policy. A project by Cranfield, also in the IOSH research programme explains the use of worker diaries in capturing safety practices in real time (Davidson et al, 2014).

“We have the manual application of that (near miss reporting) where you fill in a form. We’ve got a text line and we’re working on an online version of that. And then we have the encouragement of informal communication. There’s a lot of open door.”
(Construction OSH Manager)

3.4 Structure and Flow

In this section we describe our findings relating to the movement of OSH information and knowledge through the network. As mentioned previously, we found evidence of knowledge being generated insitu, in response to the environment and opportunities presented (see section 3.9). Notwithstanding, it is clear that *something* flows around the network and that this *something* can be translated into knowledge leading to enactment at a group or individual level.

We asked interviewees about the types of OSH knowledge they used to perform their jobs in a safe and healthy manner. Across each sector, participants stated that they used both formal (in accordance with convention or standard practice in the organisation) and informal (a more relaxed, unofficial style) OSH



knowledge to do their job safely. The formal and informal modes are covered separately here, however, in practice the two modes often become entangled and this discussion is developed further in section 4.2.

3.4.1 Formal Flow

Where OSH knowledge and information was found to flow through organisations, it took a number of routes and was determined, to some extent, by the structure and characteristics of the workplace. All the case studies had some sort of hierarchical flow structure despite their networked nature.

One logistics organisation was particularly hierarchical, with a clear management structure and a stable workforce, enabling messages to ‘cascade’ down to the workforce with established channels for both bottom-up and top-down communication. The flow of information was assisted by the organisation culture whereby the hierarchical structure was seen positively as workers felt able to communicate with all levels of management.

Logistics respondents indicated that information generally came from above i.e. their manager, OSH managers or occupational health staff – they would then pass this information down to the next level. A number of channels were used to pass information on, but email was frequently mentioned. In terms of formal upward communication, channels such as safety and ‘comms’ meetings were used, with ‘reps’ canvassing workers and acting as conduits for communication with management.

A section manager in logistics described the process involved in establishing and communicating a new manual handling assessment process - The managers assembled as a group and then discussed with the risk management and safety committee - They then brought together workers and managers to discuss implementation, timing and dissemination to ensure that all the workforce were aware of the new protocols.

The logistics manager from another organisation with global operations explained that OSH policy was agreed and distributed on a global scale from the CEO. He described how this then filtered down into countries and regions to be implemented at a local level. This involved compliance auditing, agreeing operational OSH control procedures and the extent of standardisation across the global network. Having then agreed a set of OSH procedures that would fit into their OSH manual they would then make them UK-specific and ‘roll them out across each sub-section of the division.’

Workers would often have to formally acknowledge that they had received (and understood) specific training. Construction workers typically signed a sheet after their new site induction. Logistics workers had to sign training cards to say that they had fully understood their training and how they should perform tasks in a safe and healthy way (in fact it usually just focussed on safety rather than health).

“Health and safety - you’ve got to have something signed that you’ve done this... and you fully understand with a signature basically.”
(Logistics manager)

With the extent of churn in multi-layered project-based construction networks, the challenge of achieving consistency and accuracy in OSH messages across the network is considerable. Construction interviewees

explained that site and task changes were communicated daily to workers and new workers were not allowed to start work until they had completed a formal induction. Generally, task updates and OSH knowledge were diffused through the subcontractor management structure, whereas job updates were given by the principal contractor. However, subcontractors were encouraged to work with their main contractor employers at an early stage (pre-tender) in order to coordinate OSH management. The flow was multi-directional as workers were given opportunity to feedback as well as taking part in formal inductions and tool box talks (specific task inductions).

Formal flow in healthcare OSH management was more similar to construction than logistics. OSH knowledge and training to subcontractors was given via their employers following Trust approval of material and methods. However, several respondents noted that minimum standards for the subcontracts often significantly exceeded minimum Trust standards. Clinical staff were given standard OSH training when they started employment in the NHS which was subsequently supplemented based on feedback from accident statistics and changing regulatory needs.

Despite the complexity of the healthcare network, one OSH manager claimed that there were clear lines of communication from the OSH team to the director of safety and risk, through to the medical director and the chief executive – ‘none of that is diluted’. However, there was considerable evidence of difficulties of flow between different parts of the network and between the different professions and job groups in each location, often exacerbated by the churn in team makeup due to shift work patterns.

“(A manager) sends it to the next one and he sends it out to his manager below him. Then he sends it out to somebody else... It takes days.”
(Construction site manager)

In the healthcare case studies there was concern over the amount of time initiatives would take to filter through the complex, network. This was echoed by a construction site manager who claimed that messages sometimes got lost ‘by the time it gets through the chain’. He considered that they went through too many hands before they got to the people who were most affected.

Whilst acknowledging the importance of concurrent informal knowledge flows as illustrated by the ethnographic encounters, the more overt hierarchy on one of the logistics organisations was thought to be extremely beneficial and facilitated efficient OSH knowledge flow. However, the healthcare and construction organisations were more complex and networked and there were instances where attempts to apply a rigid system was not beneficial. For example, some of the healthcare respondents noted that the organisational structure would change quite frequently and it was not always clear who the responsible person was. In construction hierarchical lines were at times blurred through the many layers of subcontracting. This highlights the need for a more flexible management structure in more complex organisations.

3.4.2 OSH message flow diagrams

Data Flow Diagrams (Section 2.2.1) were created for OSH messages for the case studies in all three sectors. OSH management staff were asked to provide details of the routes that OSH messages take within, into and out of their organisations. The diagrams indicate the direction of flow of the messages as well as the strength of the main links. All lines show message flow with bold lines indicating strong flow and dashed, weak flow.

Figures 3.2 and 3.3 present the simplified message flow for the two construction case study networks.

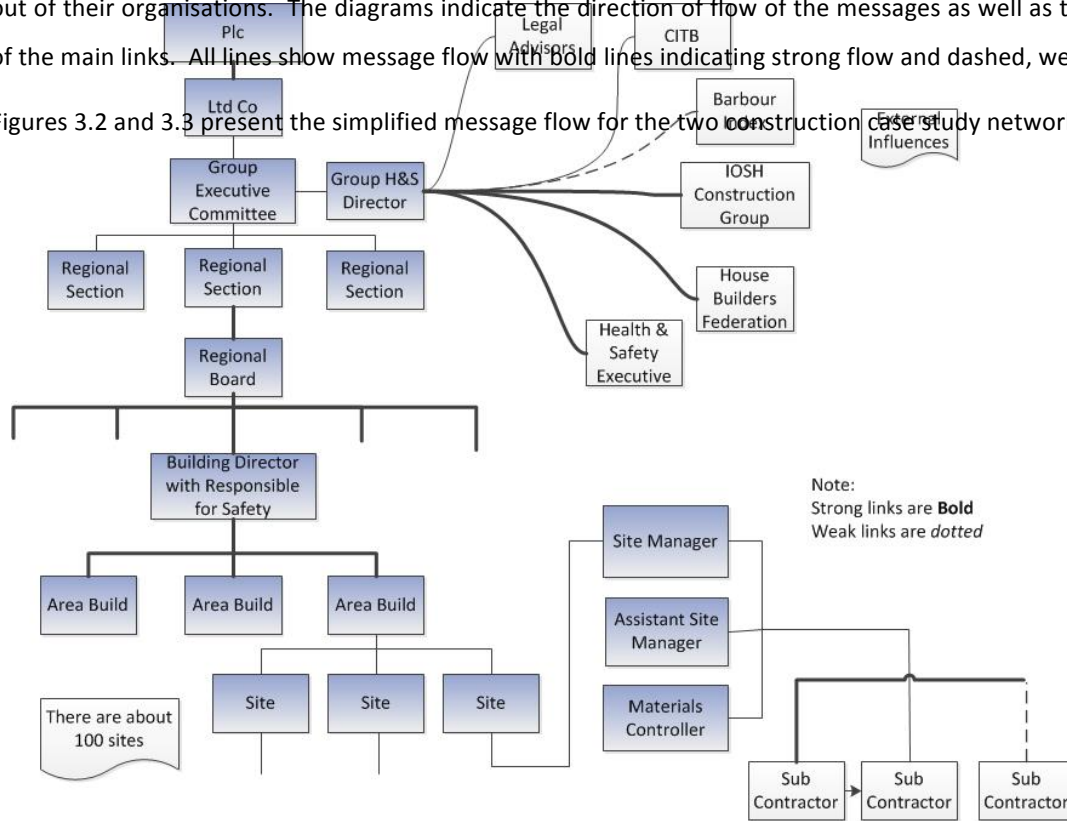


Figure 3.2 Construction 1 simplified OSH message flow

In the construction 1 network (Figure 3.2), the Group H&S Director was the senior hub, gathering OSH input from a number of external sources, particularly the HSE, the House Builders Federation and the IOSH construction group. There after there were direct lines of OSH communication down through the line management of the network to the Building Director who had specific OSH responsibilities. From here the OSH messages were passed to the different regional areas and then to the 100 or so construction sites. Here the site manager was the key OSH hub, interacting in particular with the subcontractors who employed most of the workers.

In the Construction 2 network (Figure 3.3), the Group Health, Safety and Environment (HS&E) Director was the senior hub, commenting that he took guidance from a large number of internal and external sources. There was very strong line management input from the CEO and main board and the main strong external

connections were with legal advisors and specialists groups in the supply chain. The Group HS&E Director deals directly with the Company Senior Leadership Team and there are strong line management and OSH links into the different parts of the company, each of which has another Health and Safety Director.

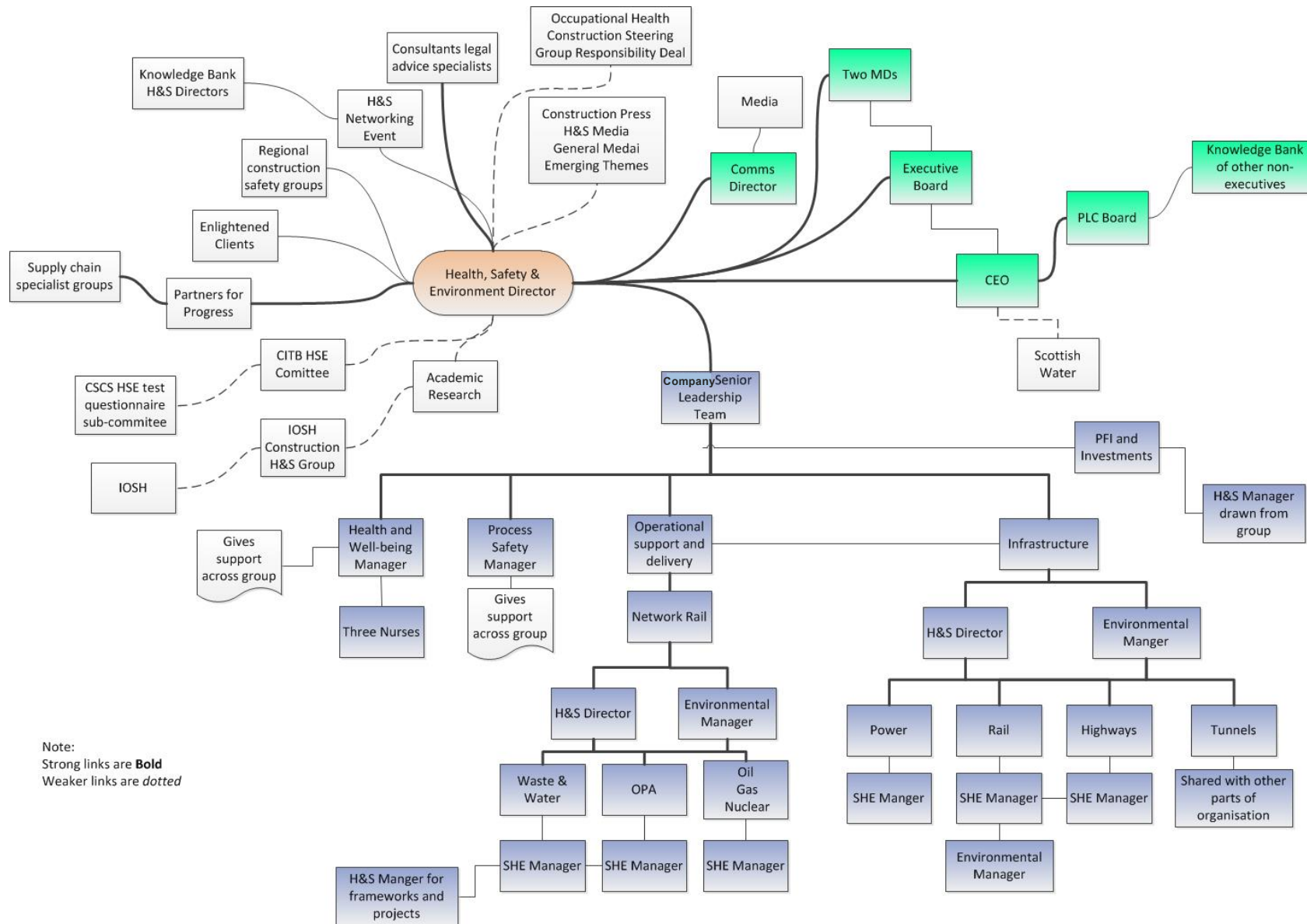


Figure 3.3 **Construction 2 simplified OSH message flow**

These company directors link through to the sections of the company through their Safety, Health and Environment Managers and the individual sites and projects.

The Logistics data flow diagrams concentrated on the within-company network links, rather than including the external links discussed in the construction case studies. The Logistics 1 OSH network flow is shown in Figure 3.4, with strong links from the PLC Board, directly to the H&S Manager on the Management Board. There are direct line management links with various H&S managers on each site. There are Occupational Health Managers providing additional input. The upward flow of OSH messages from frontline workers was emphasised by the contributors to this flow diagram.

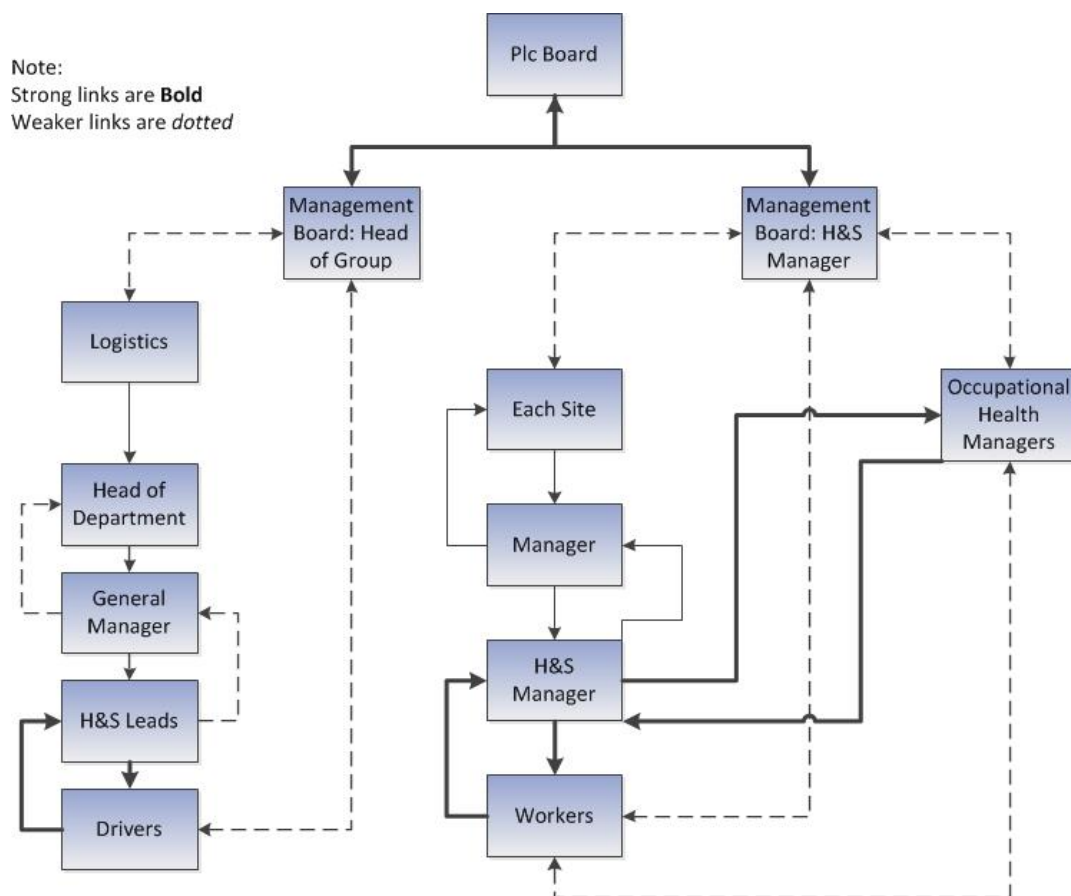


Figure 3.4 LOGISTICS 1 simplified OSH message flow

The Logistics 2 OSH message flow (Figure 3.5) showed OSH links from the Global Lead, who also received some feedback from workers (although the mechanism for this was not explained). The Divisional H&S Manager was the main OSH hub, with strong input from the equivalent individuals from the other divisions of the organisation. There was strong, direct links to the H&S Managers working close to the frontline workers, along with strong line management responsibility through the shift managers.

The Logistics 3 interviewee emphasised the centrality of the H&S function with strong direct links to the PLC Board of Directors and the main line management functions in the company after which the main OSH roles were taken by line managers. There was a less well defined flow from a specific Occupational Health function.

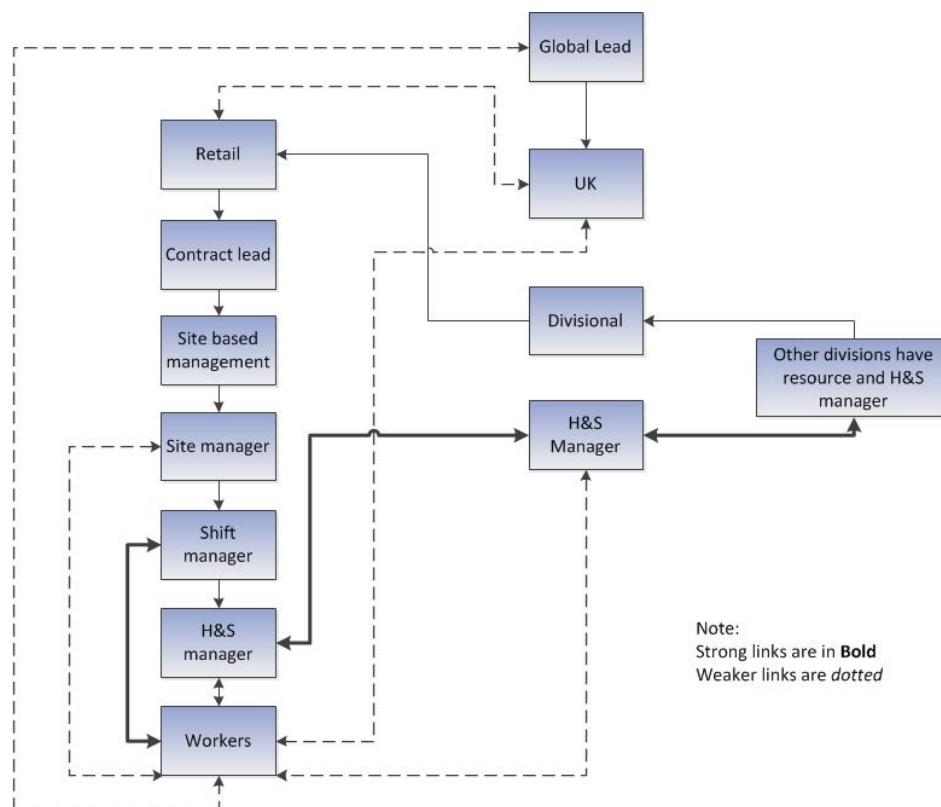


Figure 3.5 LOGISTICS 2 simplified OSH message flow

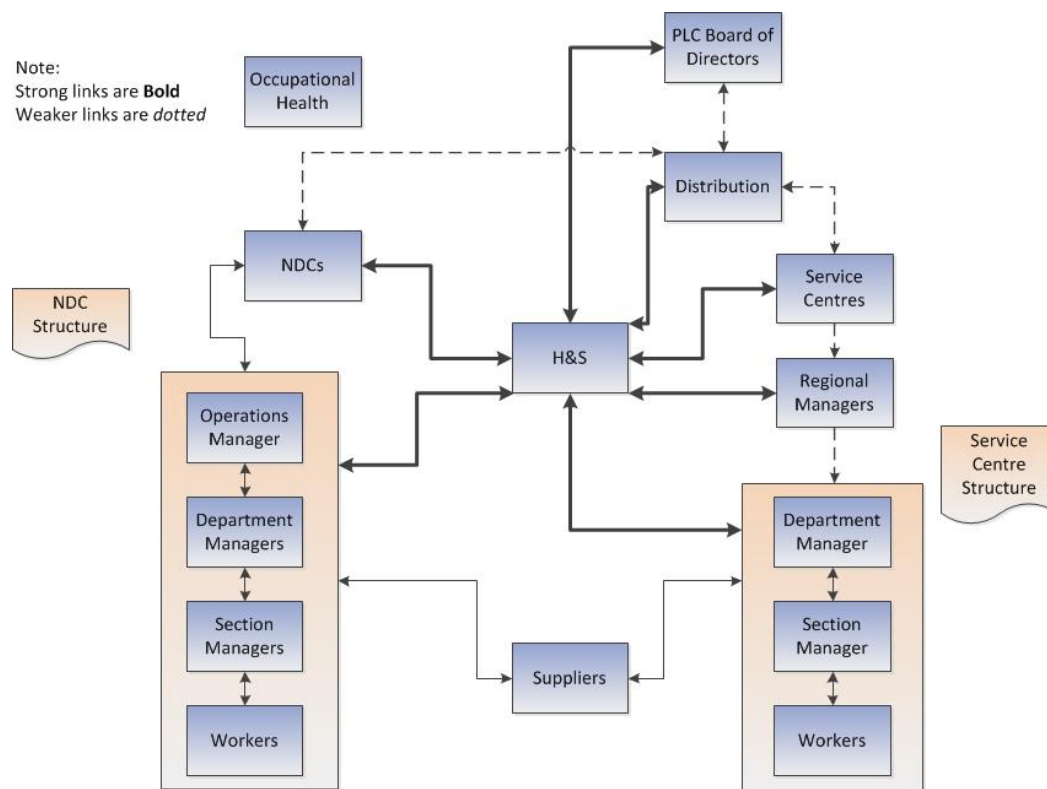


Figure 3.6 LOGISTICS 3 simplified OSH message flow

We were able to spend more time focussing on OSH message flow within the healthcare networks and therefore they are shown at a more detailed level following discussions with interviewees.

The Healthcare 1 diagram (Figure 3.7) was developed in terms of how information flows more generally within a healthcare environment and not specifically OSH knowledge or information. The informal network shape at the bottom of the diagram represents informal interactions between those in the network with regard to OSH. For example, meeting a colleague in the hall and engaging in a quick chat about safety or health issues, or calling up the OSH manager to enquire about a safety concern. In some cases, given the viscosity of information flow in the formal channels this was a preferred method. The strongest link in terms of information flow from the hospital was to patient care management, in this case the OSH manager estimated that up to 90% of hospital knowledge activities were focused on patient care. However, this was to be expected given that the primary function of a hospital is patient care. This is important because it highlights the importance of patient care in general over other hospital functions. However, rather than be deterred, the OSH manager highlighted that this can be advantageous in the delivery and flow of OSH messages. For example, relating a message to a specific environment or task or piggybacking a session that has already been designated to patient safety. However, this may again involve taking advantage of the “social network”.

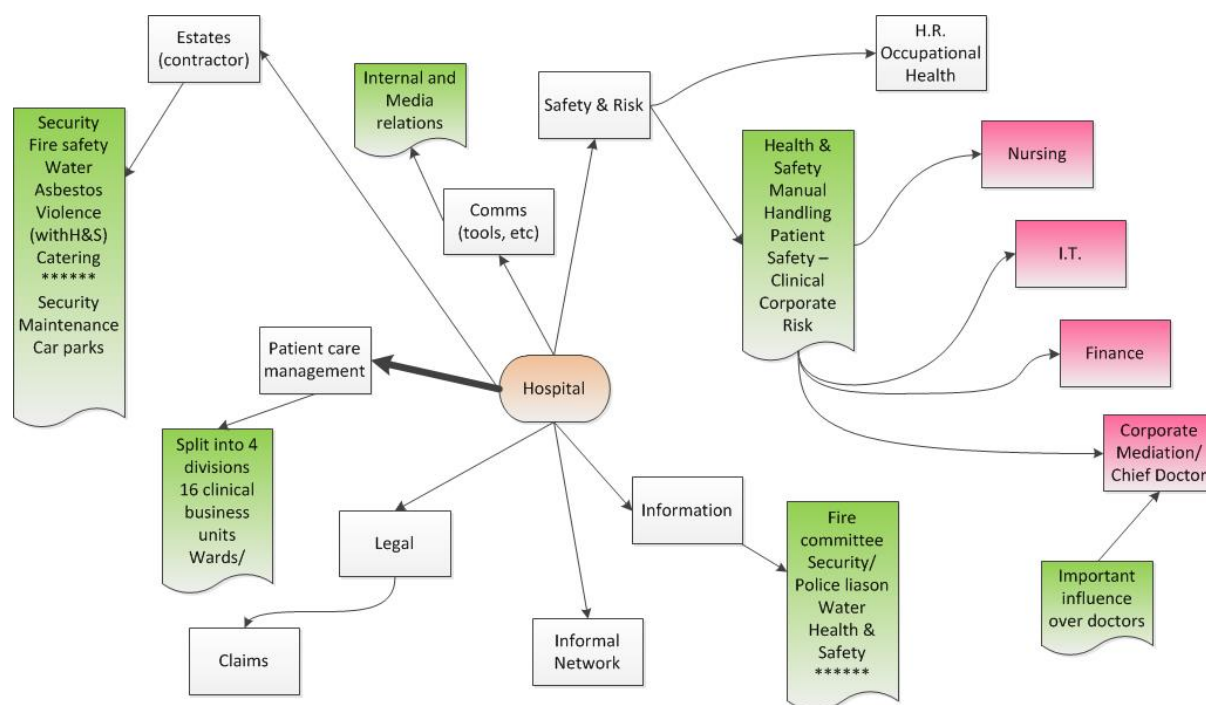


Figure 3.7 Healthcare 1 simplified OSH message flow

The formal structure of the Healthcare 1 hospital appeared to be organised around particular functions. It was felt that this may have interrupted knowledge and information flow related to safety within the hospital. For example, on the left hand side of the diagram services like security and fire safety, services that effect work environment and task completion were subcontracted out to external companies. This meant that there were more bureaucratic levels for knowledge and information to flow through as it was effectively flowing from one

company to another and back again. Moreover, there was a need for translation between each specific company's rules and normalisation procedures.

The legal department within the Healthcare 1 hospital was also part of the knowledge and flow arrangements. This department mainly dealt with claims relating to patient safety; however where claims related directly to workers, OSH knowledge and information was fed directly back to relevant departments. Interestingly, *occupational health* had a different formal flow structure to *health and safety* (which, despite the name was exclusively safety focussed). There was some formal interaction where the cause of the occupational health issue was related to worker health and safety. In terms of the flow of actual OSH information, four important factors are described in the diagram: Nursing, IT, Finance, and Corporate Medication/Chief Doctor. In this particular case study nursing staff acted as an important medium to facilitate the flow of OSH knowledge and information to other healthcare staff. It was felt that the nursing staff understood the role of their colleagues better and therefore found it easier to impart information. This particular hospital was moving towards a more IT based training system where staff would take courses online in their own time. There were positive and negative aspects to training in this way. On one hand staff needed to be flexible to allow them to continue their ward duties, on the other hand their ward duties often meant they found it difficult to take their online training courses. In this case study some staff preferred the idea of being able to block out time to ensure they could complete the course. However, IT facilitated the flow of information by placing safety updates on to a home welcome page seen by staff who had access to computers. As can be seen to the left of the diagram, internal communications were facilitated by a communications team and the budgets for this controlled by the finance department. In this case study the Chief Doctor was also an important figure, having the authority and presence to reprimand staff about their behaviour in relation to OSH.

The Healthcare 2 flow diagram (Figure 3.8) shows the OSH manager at the centre of the diagram. The OSH manager in this case study stated that they became involved in the "social network" to facilitate the flow of OSH knowledge and information. As with the previous case study there was a certain viscosity associated with following more formal channels of knowledge and information flow. Flow to the OSH manager came directly from the board through the Chief Executive to the Executive Director of workforce and management who provided a mission statement to the OSH manager describing the Trust's needs in relation to OSH. The OSH manager's job was to put this mission statement into action. Various channels were used to facilitate the flow of this OSH knowledge and information around the Trust for example, one stop shops, E-Learning and Ad-hoc events all to facilitate a particular OSH initiative. Formally, each of the clinical and non-clinical divisions at the hospital were represented at regular OSH committee meetings attended by managers. In terms of training, the OSH manager had direct contact with the head of learning and education who validates and certifies training courses to ensure quality and meet the overall Trust needs. The OSH manager also collected data from divisions within the hospital to produce reports for formal feedback on OSH performance to managers and directors. OSH committees were present at each divisional level; each of these committees had formal meetings with the OSH manager to discuss OSH issues.

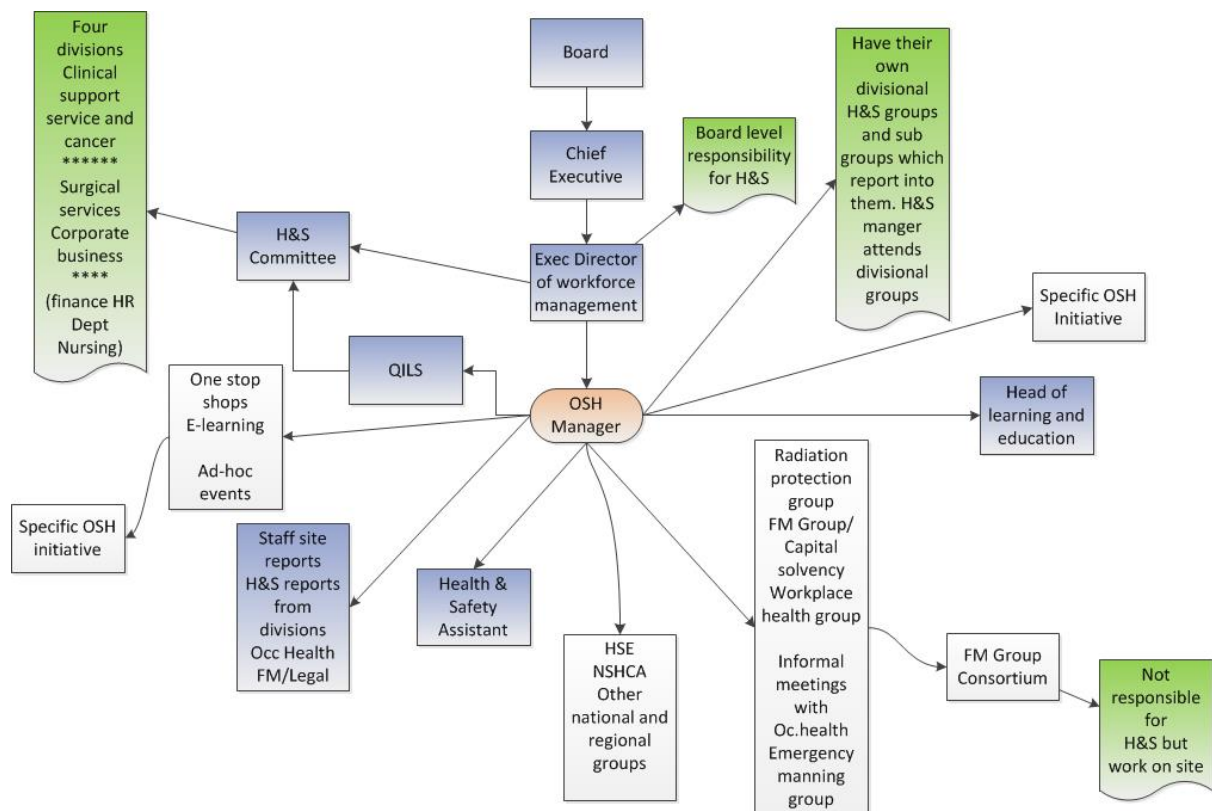


Figure 3.8 Healthcare 2 simplified OSH message flow

Initiatives were generally implemented via the Quality Improvement Leads (QILs) who ensured that initiatives were implemented with quality and safety targets set by the Trust, particularly in relation to patient safety. Given that the hospital had a collection of specialities, there were several unique OSH needs, for example radiation risk to radiographers. In the bottom right of the figure we show several health groups set up to address these needs and facilitate the flow of OSH knowledge information to and from the OSH manager.

There was also an interesting arrangement for the Facilities Management (FM) staff on site. This case study was built and operated via a Private Finance Initiative (PFI) and, although the Trust has a FM department on site, this functions in a management capacity with the FM work completed by the PFI contractor and a series of subcontractors with their own OSH managers and provisions. Technically the hospital OSH manager was not responsible for the contractors OSH, but as they worked on site they still needed to be involved in the communication chain. Regular formal meetings were used to update the OSH manager and ensure day to day FM activities would not impact on the overall OSH management of the Trust. Finally, the OSH manager attended a series of external groups and meetings. This was noted as being the best way to discuss with and learn from peers as, in this particular Trust, the OSH management team was relatively small with only a manager and an assistant.

3.4.3 Informal Flow

All of the sectors acknowledged the importance of informal OSH knowledge flow. Healthcare respondents noted that arrangements were very consensual and took a long time to flow through the system. The flow of information was largely facilitated by key staff members and groups within the organisation despite an apparent robust management system. Healthcare respondents noted that, in this type of environment, face to face communication and social interaction were among the most important ways to facilitate the flow of OSH.

One theatre nurse described informal training of more junior nurses as ‘passing on your inheritance’ and she acknowledged the ‘massive amount of knowledge’ which they classed as experience and it is ‘nowhere written down’.

I've got a team of fairly experienced people... some of them have been with me for 15 years and we have juniors who come along. And it's almost like passing down your inheritance. So the stuff that I know, you know, I've passed down to my slightly more junior staff and they pass it down to the next level.
(Theatre nurse)

Most of the construction site managers were proactive, employing daily face to face interactions on site to monitor OSH initiatives and speed the transfer of OSH knowledge on site. Interestingly, workers indicated that, because of the frequent updates and ‘all encompassing’ training, they were more aware of, and more likely to discuss OSH than was previously the case.

“We’ll get the lads together minus the supervisors, one to one, and basically we just have a chat... like we’re doing now, off the record, like. ‘Have you got any issues, lads? Is there any suggestions? Is there anything we’re doing wrong?’ And it always amazes me how much they pick up on. But there is often a culture that they’re frightened, if you like, some think there’s going to be repercussions... (But) I’d sooner have it said there than go away and say, ‘Well [company name] did this, [company name] did that and did nothing about it.’ Well, tell us guys, and we’ll do something about it”.
(Construction Site manager)

Some construction interviewees believed that there was an informal transfer of knowledge and good practice between sites and between companies, particularly from large to small organisations.

“Fred the bricklayer’, is currently working on a big (Big Firm Name) site and is required to x, y and z and has been to college because he was working for a big contract – a big bricklaying contractor that worked for (Big Firm Name)... and has therefore become accustomed to doing all sorts of things. And then he goes off and either starts working for a smaller contractor on much smaller contracts, or goes and sets up his own company and that knowledge gets spread.”
(External OSH consultant – construction)

OSH message flow in logistics was also facilitated informally; for example, workers could draw on their informal organisational network, including co-workers who were perceived to be experts in the area (although they may not have formal OSH responsibility). The ‘keenies’ mentioned earlier operate in an informal manner whether or not their role is acknowledged formally.

In logistics, respondents raised issues where the message was seen as linguistically complex and difficult to interpret and apply. This was more likely to affect managers, who then translated OSH knowledge into an understandable form for the workers. When managers or workers received something that they did not understand they typically relied on co-workers, subordinates, managers and OSH managers to help them translate the message into something comprehensible. They would often have conversations with people in their network to see if they had understood messages correctly and make it pertinent to their work area. In terms of aiding understanding, the following factors were highlighted: the scope to ask questions in training sessions; competent trainers; frequent reinforcement of messages; hands-on practical training; multi-channel reinforcement; shock tactics and real world examples; visual and verbal channels; information to take away; and worker-to-worker training.

In addition, more subtle informal flow included observing how others work. This phenomenon is more difficult to track, because the only evidence of this type of knowledge transfer is individuals' recollection of events. This aspect is explored further in the ethnography section 3.9.

"...especially when you go to a new area, it's easier to watch other people to see what they do."
(Logistics Department Manager)

Informal communication was seen as a means of speeding up an enquiry (even for more serious issues) and as a form of knowledge flow from workers to managers (a bottom up process).

Some sectors encourage 'near-miss' or 'close-call' reporting, although this is often a struggle to get workers to take part. However, most incidents were investigated in some way and, in general, paperwork was completed following the informal discussions. However, evidence suggested that this was not always the case if the potential outcome of the event was not considered to be serious.

3.4.4 Flow to temporary/contract workers

Temporary, agency or bank workers were used in each of the sectors. In healthcare it was generally the ward manager who trained the staff or provided necessary OSH knowledge and for FM staff it was their line manager. Construction labour-only subcontractors are often used to facilitate specific tasks and logistics subcontractors (who are also effectively labour-only organisations) are used to cover busier periods. Generally, the impact of the external organisational culture and the ambiguous status of temporary workers were unclear. This aspect is developed further in section 3.6.3.

Despite some protestations to the contrary, in most organisations there was considerable variation in training depending on whether the individuals were employed by the main organisation in the network or by a subcontractor or supplier. In particular, employees of labour-only contractors were thought by many to be second-class citizens in terms of training. For example, permanent NHS staff attended formal generic NHS OSH training courses, whereas subcontractors or temporary staff

"Anybody who starts... that's both agency staff or new (direct employees) are given induction. The agency staff have probably a little bit less induction... but they're obviously shown all the site fire exits, fire procedures, health and safety procedures."
(Logistics warehouse assistant)

received training either from their employer or a designated NHS staff member. In one logistics firm, workers commented on the high level of training that would be delivered for both permanent and agency staff. However, permanent staff would also be expected to participate in further, ongoing training. Unsurprisingly, managers stated that agency staff were trained to an adequate level so that they were able to conduct their job safely.

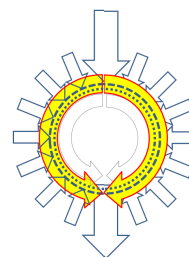
“They (temporary workers) should be trained normally by the agency before they even come into the warehouse. As to what the agency train them I do not know. So we will train them again anyway.”
(Logistics Section Manager)

Although these workers were checked for competence and often paired with a ‘buddy’ to train them (particularly in logistics), it was not always clear what prior OSH knowledge agency workers had. This presented challenges for the networked organisation in deciding what additional training was necessary. Interviewees stated that, once they were within the organisation, temporary workers received pertinent training, often ‘on the job’.

In construction, the site induction is common for all people new to the project, but the underpinning training is likely to be very different, particularly for temporary or agency staff. The introduction of ‘skills certification cards’ incorporating a certain level of OSH training have started to improve this situation somewhat at least in terms of a base level of competence, although not particularly relating to more specific, bespoke training.

3.5 Influencing Filters/Membranes: Conflicts with OSH

In a simple, ideal world, the OSH message would be transmitted from a reliable source through an effective channel to a receptive receiver who would accurately process it and enact it appropriately. There are many other aspects that will affect how the receiver processes the main task-specific OSH message along with all the other related ‘messages’. We have described these aspects as filters, or membranes, through which the messages must pass and which will affect how the messages are translated and processed and eventually enacted. In reality however, these things are not discernible filters, but can be more like a fog through which the messages pass and can be changed and corrupted or, in some cases, improved. In the main, the individual receivers have little control over these filters. These aspects are explored further in section 4.



In this section we cover “conflicts”, referring to other priorities which conflict with OSH. These are caused or strongly influenced by either the situation or the individual and have implications for OSH enactment and behaviour. As such, all of them are, to some extent, personalised and internalised by the individual, either consciously or subconsciously.

3.5.1 Conflicting resources – time and cost

We asked interviewees to give reasons for unsafe behaviour. A variety of responses were given but the main ones were pressure, rushing and performance measures.

In construction and logistics OSH conflicts were largely related to performance and time pressures. Although workers felt that there was a genuine concern for their safety on site they also saw conflict between time, planning and cost commenting that this may affect worker behaviour approaching deadlines. Workers felt that it was difficult to get something done during their shift and would therefore “cut corners” or use “workarounds” to get the job done (See Section 3.8.2).

Rules can sometimes conflict with the speed needed to ‘get the job done’. However a middle manager at one logistics firm, whilst acknowledging the temptation to cut corners, opined that managers and workers have the understanding to know that they must follow rules even if it takes longer or is slightly more difficult.

However, there were examples of logistics workers being timed to do particular tasks which they believed caused them to make adjustments in the way they worked and lessened the priority that they put on OSH. Limited storage space meant that some had to work in confined and restricted spaces, especially during busy periods when more stock needed to be moved in a shorter period. One logistics site had problems with space owing to the turnover of items, which also was exacerbated during busy periods such as Christmas.

“The space deteriorates and you get less working space turning areas. You get more damaged stock when your turning areas are decreased. When it’s really busy people start rushing around too much. Some of those basic things like sounding the hooter go out the window.”
(Logistics Manager)

Warehouse workers working with pallet trucks explained that, at busy times there were more trucks and hence less available space, leading to conflicts between OSH and ‘trying to get the percentage that they should be on’.

“When it is busy there’s a bit more emphasis on getting the job done over how safe it is... It’s more about speed... not all the time but sometimes it seems to be... the only way you can meet the targets that they want to sort of set is by cutting corners sometimes.” (Logistics worker)

Busy periods were often mentioned as the time when ‘short cuts’ would be taken and where things don’t always get done safely but have to get done in order to meet targets.

The conflict between the OSH needs of the healthcare staff and the safety of the patient is covered later (Section 3.5.5). Healthcare interviewees explained that this conflict is exacerbated when the wards are understaffed due to cost constraints because of the restrictions on healthcare budgets at local and national level. The perceived enormity of the challenge was obvious in several interviews.

“I have a team that look after health and safety, but we have nearly ten thousand staff within the organisation. We take the safety, care and health of those very seriously, but we treat a million patients...”
(Director of clinical risk and safety)

Hospital laboratory-based staff rely on clinical staff to provide sufficient information about the sample they are testing so that they can do their job safely. However, a biomedical scientist explained how time and patient

demands on the ward may influence this. A doctor was under time pressure and made some errors on a form requesting some blood and urine tests. The error was to omit the fact that the patient had been visiting a particular country which would have classified the samples as 'high risk'. As a result a number of laboratory staff had to have a precautionary course of antibiotics.

Construction projects are typically working to tight time schedules and the subcontracting culture tends to pass the time pressure down the network through the subcontractor to the frontline workers. Many construction workers are still paid on basis of the work that they do which can create a conflict with OSH.

"... the majority of people on site... are paid by the amount of wall they lay... the amount of hole (they) dig... the plumbing that they install. So it's always about speed, it's always about how quickly can I get the cabling into this house, how quickly can I lay this wall... anything that provides a delay to that is viewed negatively."
(External OSH consultant: construction)

3.5.2 Conflicting cultures

It was apparent in healthcare and construction that there were several sub-cultures which meant that OSH messages could become distorted.

Each of the construction case studies was implementing an OSH culture programme but, given the transient nature of the industry, this proved incredibly difficult. Subcontractors who worked for short periods were, at times, unwilling to accept the overall OSH culture of the site. There were some exceptions to this; for example where more hazardous tasks were being done such as gas equipment installation which is closely regulated – subcontract workers seemed to be more open to such programmes where they saw that there was an obvious significant risk.

"It's something more than knowledge... People know the rules. People know what's expected. But they don't quite believe in it and don't quite get it and don't quite want to do it sometimes."
(Construction Project Manager)

A number of healthcare respondents suggested that there were 'several OSH subcultures' or several groups of people who have different ideas or understandings about the importance or relevance of OSH which can cause multiple issues in terms of worker safety. This was considered especially true where staff were patient-facing. There were examples of conflict between clinical and nursing staff. An OSH manager described a situation on her first day at work, where a doctor had told a ward sister to get the nurses to carry a bariatric patient to the X-ray department. When they refused on the grounds of manual handling risks, the doctor became indignant. The nurses were supported by the NHS manual handling expert who was called in for advice but it illustrates some of the tension between the different professional groups.

Healthcare is a complex work environment where staff have different OSH cultures dependant on whether they are patient-facing (including the type of patient) or not, as well as their own particular OSH needs and priorities. This makes it difficult to portray a consistent and unified OSH message and affects their OSH information and knowledge requirements. For example:

- Lab-based staff work under strict OSH regulation because they often work with contagious, biological samples; are not patient facing; and to some extent their workload can be managed.
- Ward-based staff work in dynamic environments where the condition of patients may change rapidly and can affect their workload.
- Doctors are patient-facing but operate under a different management structure to the nursing staff and do not seem to have the same background level of understanding of OSH issues.
- Facilities management staff work within the hospital environment, come into contact with patients but are not part of the immediate care system so are less affected by patient issues.
- Community-based staff work in dynamic environments, that are patient-facing and outside the more controllable confines of the hospital.

There was less of an issue with sub-cultures in one of the logistics firms despite operating across several sites. The organisation was described as having a single culture amongst all workers whether they were warehouse workers, managers, middle level or senior managers they were all able and encourage to communicate with one another. There was a consistent OSH message in this organisation and all worker interviewees knew the reasons for OSH and the need to consider their own and others' OSH needs. OSH had become augmented into the organisational culture and was actively seen as part of working practices, workers and managers would develop standard operating procedures together which sought to develop worker acceptance of OSH. This ethos was only challenged during very busy periods when many agency workers were typically taken on and permanent workers would notice an increase in violations of standard operating procedures.

In another logistics firm each site operated its own OSH systems as a result of the structure and set up of the organisation which had been highlighted as a potential problem by the senior OSH manager. This meant that, unlike the firm described above, sites were allowed to operate their own OSH procedures with site OSH managers reporting to site line managers not group OSH managers. This can present issues over responsibility and hinder the roll-out of OSH initiatives.

"...it's quite a challenge getting group initiatives into sites because they obviously prioritise site activities as opposed to group activities."
(Logistics OSH manager)

3.5.3 Conflicting or 'over the top' rules and procedures

In certain construction cases the client, contractor and subcontractor all had a separate set of rules and procedures to deal with the same issue. This may be because they are all required by law to make provisions to protect workers regarding that issue; however the legislation does not prescribe how it should be done. Interviewees explained that this had caused confusion for the person doing the work when faced with several sets of protocols that may all be satisfactory in dealing with the issue but may tackle it in different ways. A construction site manager described the confusion caused for a subcontract crane driver who had his own company's generic risk assessment which applied to any site, whereas the principal contractor had their own, more specific, requirements which also incorporated the client's rules which were more appropriate for a

permanent industrial environment rather than a construction site – there was some debate over which risk management plan should be used.

Healthcare interviewees explained that rules were technically the same for OSH across each Trust network. In theory there is no conflict between patient safety and healthcare staff OSH, but the enactments are very different, creating many conflicting priorities (see section 3.5.5).

There was a spectrum of the degree of rule and procedure standardisation in the logistics organisations depending on their different organisational structures and cultures.

Unnecessary, bureaucratic paperwork

Several construction interviewees commented about the increase in (what they considered) unnecessary paperwork required to show that OSH procedures were being followed. Whilst this is not truly a case of conflicting rules, it does illustrate the tension between assurance and bureaucracy. One of the reasons suggested for this extra paperwork was that insurance companies want the employers to record everything so that, if workers or the public make a claim against them there is less of a problem. Workers feared that they could become over reliant on the paperwork and not look for risks in their activities. Method statements were ubiquitous and some interviewees felt that they were ‘over the top’ and only used to pass the blame on should anything go wrong, supported by the procedure requiring workers to sign that they have read the document or understood the briefing. This suggests a link with the conflicting cultures section. The conflict occurs when the rule or procedure itself, although intended to support the OSH of the worker, actually creates the opposite response where workers reject the ‘over the top’ approach and so may miss the importance of the initial OSH message. A number of construction operatives felt that there was too much repetition of the same rules and procedures even though the workers were very conversant with them.

They have to sign to say that they understood it before they went back to the workplace. We do those every week, more than once. There's quite a lot of paper signing to do but I think that's just the norm now. Yeah, I mean, if they're signing to say they've understood it then they've got no excuse for going out there and doing something wrong and saying they didn't know.” (Construction supervisor)

The contrary experience was evidenced at one logistics organisation where all levels of workers and management were involved in developing the standard operating procedures and they were seen as something useful and were regularly updated.

“...It became a tick box exercise, which is a shame.”
(Medical Physics team member)

Notwithstanding, bureaucratic form filling or report writing was criticised by a number of interviewees. One healthcare example dealt with decontamination of equipment where ‘everyone has to fill in a form to say that the equipment has been decontaminated in a certain way.’ But, because of a reaction against too many forms it became ‘a tick box exercise’ and often the equipment would be sent from the clinical ward to the workshop without the form which would then be sent

afterwards but filled out in a very generic way, leading to the workshop staff not trusting that the equipment had actually been cleaned anyway.

An OSH manager in one of the Trusts commented that the repeated writing of reports and filling in of forms was preventing people from getting on with the work.

*There is this obsession about report writing...
Why do you need to write a report on everything?
Let's just do it!"*
(Healthcare OSH manager)

Conflicting initiatives

Many organisations have periodic OSH initiatives where they have a focussed campaign on a particular issue. They also have a corporate house style for posters, flyers and emails. There was a suggestion that this can sometimes hinder the timely dissemination of OSH issues that do not fit with the current initiative.

In both healthcare case studies the flow of OSH knowledge was facilitated by an in-house communications team. However, the provision of guidance and training material was held back to ensure that it met Trust requirements. For example, proposed OSH posters for a ward were (understandably) held back as they did not meet the requirements to be 'wipe-clean' and 'splash-proof' to stop the spread of infection. However, information must also be checked by hospital management and directors to ensure that it aligns with the Trusts specified directives. This can be an issue as it affects how quickly important information and learning can flow around the organisation. However, the social knowledge network, where people have close working relationships, facilitates the flow of this information, albeit in a highly unregulated way. This emphasises the need for both formal and informal networks to work in concert.

3.5.4 Conflicting environments

A director of risk in one healthcare Trust explained the different environments in various departments as they affect the OSH culture and the risks to healthcare staff:

"In terms of staff safety, risks are very different in the different departments..."
(Healthcare Director of risk)

Outpatient clinic:

- Presents a very low-risk environment in terms of the patients
- The patients are self-caring and mobile and are not resident which poses less of a risk to staff
- The clinic is a light, bright environment with not a lot of complex equipment, largely operating in the daytime.

Intensive Care unit

- Patients are immobile and need a lot of help with moving and handling
- Much complex equipment to negotiate and handle
- Operating 24 hours with night-time working presenting additional risks

"...having one consistent message (is) quite tricky in an organisation like this... it's a very different work, with very different clients, with very different staff operating at different times of the day and night."
(Healthcare Director of risk)

This makes it difficult to have a consistent OSH message across all hospital departments and, in turn, there is a tendency to focus on the highest risks within the organisation.

Hospital laboratory staff considered that they had a stronger OSH focus and were more likely to comply with protocols because they work in a lab environment which is regularly handling hazardous samples and chemicals.

3.5.5 Conflicting priorities - The patient

"Patient Safety" is a major factor that affects OSH knowledge flow translation and enactment in the healthcare sector. For example, while the OSH of healthcare staff is taken very seriously, in terms of OSH knowledge flow there is a pragmatic balance that is usually

"People do generally put the patients first because they're caring, which can be a problem because, you know, they are putting themselves at risk, sometimes unnecessarily."
(Healthcare OSH manager)

struck between patient risk and worker safety.

"...the attitude of this particular midwife was that delivering that baby was more important than her own life, you know. And she's wrong, but that's her culture."
(Healthcare OSH Manager)

A ward nurse acknowledged the tension but explained that fairly recent changes in the approach had started to correct the imbalance and put more emphasis on employee OSH rather than patient safety. Nevertheless, there was also a general feeling among interviewees that certain healthcare staff would choose patient safety over their own. Many healthcare workers consider their role as a practical, hands-on vocation rather than 'just a job' and feel passionately about their responsibility to care for the health and safety of their

patients. Often, nurses would use the phrase 'my patient', illustrating their personal commitment. In addition, various suggestions were put forward to explain the patient-centric focus. For example, fear that patient injury would result in more serious repercussions than worker injury. Lack of understanding of OSH rules among healthcare workers and time pressures were also mentioned.

Several participants also noted that building up a close relationship or rapport with patients is vital to allow them to do their job. It establishes a degree of trust in the relationship that facilitates patient treatment. In this sense it is also interesting that a separate risk assessment is conducted for the patient to allow the healthcare worker to make job and task adjustments that facilitate the patient's safety and their own. Building rapport with a patient allows the avoidance or de-escalation of stressful situations. Patient risk assessments should ensure that the correct tools and equipment are available for the job. However, even if the work is planned, building a rapport allows the carer to manage the situation better if the patient's needs or the conditions change.

A community midwife explained the procedure of notification of additional risks when visiting certain patients in the community but also stressed that she also had to be conscious of the unknown risks that no one was

aware of. This aspect is explored further in the ethnography section (3.9).

Employers have a duty of care to provide manual handling training and nurses are told that if a patient is about to fall they should guide the faller to the floor and not attempt to hold up the patient. However, nurses were described as being dedicated and caring and putting patient safety before their own. In one case, a young nurse was suffering from “frozen shoulder” as she had tried to stop an elderly patient from falling and, in her opinion, ‘breaking bones’.

3.5.6 Conflicting priorities - The customer

Generally, the healthcare worker’s customer is the patient and that issue is covered in the previous section.

Some logistics workers considered that the focus on performance for the customer meant that their needs were sometimes put above OSH needs. An operations manager in a logistics organisation, having a particular campaign about increasing customer service, explained that drivers were ambassadors on the road and that delivery standards had been established including that TVs would be set up, washing machines connected and beds built. A delivery driver added that this increased customer service was important but that it did create something of a conflict. He said that workers were not supposed to give the impression to the customer that they were rushing just to get the job done. So, in some ways, the increased customer focus created an OSH conflict for delivery workers. Notwithstanding, the impression from the ethnographic studies was that customer deliveries workers felt they had autonomy and institutional support to not put customer satisfaction above their own needs – i.e. to ‘fail’ a delivery if their OSH was compromised and this is explored further in section 3.9.

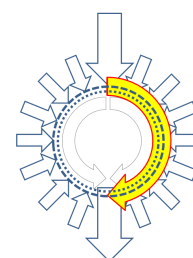
The construction case study sites did not generally have any direct interaction with the customer. This aspect is more relevant to our parallel project which is considering micro organisations, where construction work is often done in people’s homes. However, the residential building sites in this project do still have some interaction with the customer when certain houses on an estate are occupied whilst others are still being built. However, in terms of OSH, this is likely to have a positive effect with the expectation that the site would be kept tidier when members of the public were in the area.

3.5.7 Interface Conflict

Healthcare staff highlighted that, at interface areas such as between the lab and the ward, safe working was more difficult because there was a lack of understanding between the different staff. For example, a member of the medical physics equipment maintenance team noted that equipment was arriving to their lab contaminated with blood and other biological substances despite a procedure circulated to ward staff that they clean the equipment in advance of maintenance work. The maintenance team said they were forced to use a workaround where they wore PPE before they cleaned the hazardous equipment themselves. The clinical staff cited time pressure as the main reason for not cleaning the equipment.

In another example a lab-based member of healthcare staff stated that clinical staff were not filling in sample information clearly. Forms were either incomplete or, as they were filled in by hand, were difficult to read. At this time this form was the only method to instruct lab workers about how contaminated the sample is and which PPE or equipment they should use. To be 'better safe than sorry' they have decided to assume all samples are the most hazardous and therefore apply the highest level of OSH standards. Curiously, this workaround was only initiated following an incident in the lab where a high risk sample was treated as low risk (the paper work had not been completed properly by the clinical staff). The risk of infection was so high that all samples in the lab had to be destroyed, the staff medicated and the lab shut down for two weeks.

The challenges for construction organisations at the interfaces between different subcontractors has been well documented previously (e.g. Pavitt & Gibb, 2003 and Al-Hammad, 2000). In our study, construction respondents in one organisation noted that the main contractor gave subcontractors a template and guidelines to develop method statements. However, although the subcontractors used the guidelines, they developed the documentation themselves to suit their organisation. Conversely, one of the construction organisations used subcontractors for most of their trades. However, because the same subcontractors and the same gangs were generally used on every site, the workers behaved much more like direct employees. Therefore the interface conflicts were not as great.



3.6 Influencing Filters/Membranes: Barriers and Enablers

3.6.1 Stability, instability and change

Workforce stability and longevity

The ethnographic discussion (3.9) mentions the OSH benefits of working repeatedly with the same people and the challenges of working with new/unknown people. This finding was also prevalent in the non-ethnographic investigations.

All three logistics organisations were made up of a core of stable personnel, including both managers and workers. For one organisation it was not unusual to speak to people who had worked at the organisation

"50% of my [workers] are 11 years plus... Then if I look at the management team, 75% of them have worked between 15 and 30 years."
(Logistics Senior Manager)

"...it's not somebody who sits in an office and never does the job coming out and telling you what to do, it's generally the people that do the job themselves."
(Logistics worker)

for many years and this stability was seen as a significant enabler of good OSH knowledge flow.

The tacit OSH knowledge and experience of long-term employees was an asset to the organisation. This was often transferred in an informal way through observation and giving helpful suggestions to novices on the job. Experienced workers were also a credible source of worker-to-worker

training, being perceived as people who also appreciated the difficulties of doing the job.

The low turnover of personnel enabled relationships and informal networks to form throughout the organisation. This was particularly useful in instances where help was needed (i.e. a problem had arisen and advice was required or information coming from management was difficult to understand). In these instances, in addition, or instead of going to their managers respondents consulted their network for help.

I find (talking to experienced colleagues) the most useful 'cause I'm not really one for reading...it's not exactly an interesting subject, is it? I'd rather pick the phone up and ask someone."
(Logistics Senior Manager)

"A number of our systems are still in place so the selection process and the requirement that they (subcontractors) demonstrate past track record, competence capability is there."
(Construction OSH Director)

By contrast, project-based construction is known for its use of subcontractors, employing both itinerant and migrant workers. This results in a lack of stability in work teams with some trades only being on each site for a matter of days or weeks before moving on, with consequent effects on OSH knowledge flow.

This reliance on construction subcontractors emphasises the need for systems that ensure that competent and knowledgeable subcontractors are selected. Even in the fluid, and frequently changing environment of construction, longer term/more stable work relations are valued for OSH benefits.

Although healthcare had a relatively stable overall workforce, due to shift work and the use of temporary 'bank staff, it was common for teams to be very fluid with little continuity (also see section 3.4.4).

"There's a lot of experience and knowledge and skills have been lost in the change - with any change you get that."
(Healthcare Ward manager)

Cuts in healthcare funding over recent decades have resulted in many experienced workers leaving the sector and this appears to have a long term effect on knowledge flow. A ward manager added that, as well as the loss of experienced personnel, much of the published information has also been disposed of due to a lack of space.

Variable Working Environment

The construction site environment changes rapidly because, in many cases, today's work is tomorrow's work platform. Also each project is unique and there are many different trades on site, sometimes only staying a few days or weeks. This makes the first few days on site more hazardous due to unfamiliarity.

The variable working environment also appears to make it difficult to get a consistent transfer of OSH knowledge across a site network. For example, depending on the stage of the project a range of different trades may be present on-site, each with a separate culture and general level or understanding of safety, this can lead to contrasting work environments, making safety messages difficult to implement. In such cases, adapted OSH practice emerges from the workers or groups of workers and the OSH knowledge does not flow. This new enactment may or may not be as 'safe' as the initial OSH instruction, but it will almost certainly be different. This aspect is explored further in the ethnography section (3.9).

The warehouse environment in logistics is relatively stable, the only time the warehouse environment changed was if the goods received changed. For example, one warehouse moved from handling white goods to handling mattresses so therefore required a different set of working practices. The same site also started to take delivery of large screen televisions, some up to 60 inches, which also presented challenges in terms of handling.

"Everything's always changing. If new stock comes into the warehouse that we haven't dealt with before, maybe that needs to be looked at before people start booking it and picking it and putting it into cages or whatever."
(Logistics worker)

"You can't have an emergency delivery room in somebody's bedroom."
(Community Midwife)

Home deliveries in particular produce a variable work environment and this is explored in more detail in Section 3.9. Similarly, community-based healthcare workers have to deal with varying environments in the homes that they visit. A community midwife explained the challenges of delivering babies in someone's own home. Despite the many benefits of home delivery, she commented that many low risk pregnancies can turn into emergencies very quickly.

Ward-based healthcare workers have some stability of environment although the patients usually provide significant and challenging variability. However, the changing structure within the Trust made it difficult to write and apply appropriate policies and procedures. A healthcare OSH manager explained that it was really difficult to try and actually write a policy when you're trying to reflect a management structure or a committee structure that is in the process of changing.

"There are risks inherent in the system at this time of change"
(Healthcare office manager)

Project-based culture

Long term organisational learning is important for OSH to maintain continual improvement and avoid 're-inventing the wheel'. However, in construction, once a project is finished, any learning or innovations that may be passed on to future projects are often lost. Reasons given for this are that each project is unique and something that happens on one site may not happen on another or it may only happen several years later. However, as construction workers move around so much then there is the possibility of spreading this good practice. However, workers can only share their knowledge if they are actually present on site at that time. In other words, a lot of construction OSH knowledge is transferred informally through the experience of those that work on site.

3.6.2 Organisational Structure

Hierarchical vs matrix organisational structure

As discussed earlier, the logistics organisations who took part in this research could all be characterised as traditional hierarchical organisations, with explicit lines of command from the top of the organisation, clear expectations in terms of OSH managers' and line managers' responsibility for cascading OSH information in a top-down fashion through the organisations, and formal structures for the communication of information from

the bottom-up. All three organisations had several layers of management. When questioned about where OSH messages came from and where they were passed to, respondents indicated that it came from the person above them in the hierarchy (i.e. their line manager or OSH department) and that they then conveyed the information to their subordinates.

"The flow of information... Updates to legislation and things like that would be looked at centrally and then cascaded down."
(Logistics Middle Manager)

These formal structures facilitated OSH information flow. In addition, the formal structure was used as a means of passing information back up the organisational hierarchy and specific channels had been developed to facilitate this, for example formal accident reporting or OSH meetings with worker reps.

Notwithstanding this hierarchical nature, there were different underlying organisational structures, with one organisation operating more as a cooperative of different companies, with a greater level of devolved responsibility and decision making. Effectively this led to a reduction of the influence of the hierarchy which has both positive and negative implications for OSH message flow.

Although the logistics sector does use subcontractors and external suppliers, the relationships between them seem to be fairly clear and unambiguous in terms of rules and OSH message flows. Consequently, the hierarchical structure mentioned above tends to be the overriding influencer for knowledge flow. Construction also uses hierarchical organisational structures, but the relationships with subcontractors and sub-subcontractors seem to be more tenuous in many cases. Furthermore, the management of certain key disciplines even within the large contractors can complicate the direct hierarchical management on a particular site – for instance engineers, quality surveyors, planners and procurement staff typically have line managers based at the head office or regional office and therefore the site-based project manager needs to operate in more of a matrix structure. This can affect the clarity of the communication channels.

The organisational structure in healthcare seems to include both a social and a more formal hierarchy within which there are many competing themes. This adds complexity and complicates the hierarchical relationships. For example, the nurses have a line management structure, but in many cases the doctors can cut across this structure. In some cases this can complicate communication and cause confusion. In effect, healthcare also operates a matrix organisational structure, although within that there are some clear hierarchies. There was a considerable number of negative comments about the hierarchical structure in healthcare, particularly relating to some doctors acting in a dictatorial manner to nurses and other healthcare staff.

In the healthcare case studies there were also concerns that there was a lack of understanding of the cause of accidents in this hierarchal system. Some respondents thought that blame was often placed directly onto the workers, whereas they considered that the system of work or conditions was the main cause.

"As a health and safety rep... I try and get managers to look at the system to see whether they're safe - there is a safe system of work."
(Matron)

Frequently changing structure of the organisation

Several participants noted that healthcare is subject to the conditions of a number of external organisations, both external (e.g. HSE, Quality Care Commission, National Patient Safety Agency) and internal (e.g. NHS procurement, human resources, Quality Assurance committee) and changes in these requirements can bring significant changes in the Trusts. Moreover, as a publically funded organisation, the NHS is accountable to government and, when the government or even the minister changes, NHS priorities and strategies often change. This may have some similarities with a construction or logistics company being taken over by a different organisation, but the public nature of the NHS also makes these things more crucial. As a result of these frequent changes the flow and translation of information is complex and difficult to reconcile with other information, and participants felt this made the NHS information flow quite reactive. For example, when a recent critical report⁷ about a major Trust was published, changes were made across the sector. Also, interviewees explained that the last change in government altered the structure and layout of the NHS which had affected staff morale and culture and in turn the translation of a consistent message for OSH.

This complex structure and reactive nature can have negative effects for OSH message flow. Participants noted that, if the structure of the organisation changed, they may not know where or who to get the information from. Some participants commented that their training told them to initially contact their supervisor regarding OSH matters; however, the same participants also highlighted that they were not completely sure who that was, or who was the best person to contact on OSH.

Healthcare participants also noted that, in a reactive system, changes can be made without considering the effects on other business areas. This may affect the importance that is placed on OSH.

To an extent, the project-based structure of the construction sector means that the specific organisational structure changes frequently. However, this seems to be accepted by most in the industry and was not identified as a particular issue by interviewees.

As mentioned previously, logistics tends to have more stability in personnel and therefore also in organisational structure. Although, major changes in the organisation such as a new CEO or take over by another organisation is likely to create barriers to the effective diffusion of OSH knowledge that are similar to the other two sectors.

3.6.3 Temporary or contract workers and job security

This project has focussed on more complex, networked organisations and thus the use of subcontractors and suppliers is germane to this study. In some cases the different organisations involved are transparent, with each organisation having its own identity, typically acknowledged formally and perhaps by signage or uniform. But in other cases the dominance of the primary organisation subsumes the other organisations and they

⁷ <http://www.midstaffspublicinquiry.com/report>

appear to be just one body. Notwithstanding, temporary or contract workers, typically supplied by a labour-only organisation, are often incorporated into the primary organisation at least superficially. Knowledge flow to temporary or contract workers has been covered in section 3.4.3.

The preponderance of the use of subcontractors, particularly in construction has been discussed earlier, but this section concentrates on the use of temporary or contract workers, or labour-only contractors. There are structural issues here with extended lines of communication and a degree of confusion of who the employer is. These have been studied extensively elsewhere, particularly the issue of bogus self-employment in construction. Respondents felt that this issue is generally overcome by OSH policies where people are only hired from approved subcontractors that enforced good OSH practices.

The OSH culture of a construction site is dictated by the principal contractor, but is also likely to be negatively affected where there are more temporary workers. There is anecdotal evidence of identity confusion, with some contract workers, when asked who their employer was, responding by looking around, noticing the tower crane and repeating the name that they can see on the crane. There was also a somewhat comical example of a worker looking at an OSH logo and claiming to work for 'Zero Accident Ltd'.

There was some evidence of a pragmatic acquiescence of the subcontractor to the principal contractor's OSH processes and systems. A construction site manager explained that all the subcontractors 'signed up' to the principal contractor's paperwork and came under their responsibility while they were on site. He acknowledged that, although they had their own method statements and protocols, they were made to 'sign on' to the principal contractors systems, so that they were 'fully versed in what they had to do.'

Healthcare relies heavily on temporary 'bank' staff, who are usually experienced workers who have trained in the NHS but now work flexibly through agencies. Such workers can often work many hours in a week although most are effectively on 'zero hour' contracts and some directly employed NHS staff will do extra shifts via the bank. However, compared to construction, these bank workers would almost certainly have been trained in the NHS and so there was less of an effect on the overall OSH culture when such temporary staff were predominant.

Logistics seems to rely less on temporary workers than construction and healthcare, except at very busy periods such as Christmas. One of the logistics case organisations had a particularly strong OSH culture. However, at peak times of business the significant increase in temporary workers could influence how OSH was manifested in the workforce behaviour, arguably, diluting the positive safety culture.

There was anecdotal evidence about the effect of job security on the way that workers responded to OSH messages. Workers feeling less secure were thought to be more likely to perceive more pressure to maximise work output and productivity rather than OSH – fearing that they may lose their job if they commented on OSH or were thought to be overly concerned about hazards and risks. An example was given of a nurse concealing her dermatitis by wearing gloves for longer periods of time (which actually aggravated the

condition) so that she could continue working⁸. Although it was not explored directly in this project, the recent increased emphasis on empowerment of workers is acknowledged, in particular the right (or even responsibility) to stop work if they consider it unsafe. This is explored further in the next section.

3.6.4 Creating a culture of individual ownership of and responsibility for OSH

Ownership and responsibility

Notwithstanding the external barriers and enablers, a number of the interviewees acknowledged the responsibility of individuals to listen, appropriate, translate and enact OSH carefully, effectively and appropriately. The culture and environment created in the networks and the individual workplaces was significant in encouraging or discouraging this.

Within one logistics organisation there was a culture where everyone was encouraged to take responsibility for OSH and it was apparent that there was devolved responsibility, both for oneself and for colleagues. This was manifest in attitudes, beliefs and behaviours.

"We're all responsible for health and safety, every single one of us, regardless of hierarchy (or) management status..."
(Logistics Middle Manager)

There was a view from many of the managers that they considered that they were approachable regarding OSH matters. Often, but not invariably, worker interviewees felt able to approach colleagues if they perceived them to behaving unsafely. The responsibility to do something about unsafe acts when they are observed was overtly emphasised although actually putting this into practice was seen as being more problematic.

"There's some people...you can say something to and they'll just bite your head off... They're the kind of person you keep away from, you don't want to get involved with, because they get a bit heated..."
(Logistics Worker)

The supportive culture of one logistics organisation was largely due to the exceptional status of the workforce, who were treated as partners and had a vested interest in the business. There appeared to be a 'caring culture' in the sense that management genuinely cared for the workforce, frequently identifying them as 'my' workers. There was a low level of 'us and them', with workers feeling able to raise issues with managers or senior managers; workers were listened to and actions were taken by managers as a result. There was evidence of both managers and workers striving to improve the business as this has positive implications for profits and bonuses. There was an appreciation that poor OSH would have a negative impact on the bottom line of the business. Therefore, in addition to genuinely caring for co-workers' well-being, there were pragmatic reasons for preventing accidents.

"...my [workers] welfare is important to me, I want to know that they come to work and they've had a safe day at work and they go home safe."
(Logistics First line Manager)

⁸ Dermatitis is a common health concern in healthcare and in extreme cases the skin can become broken and tender. In these cases nurses are not allowed to care for patients (due to risk of infection as there is an open wound) and should take sickness absence or switch to other duties.

Effective use of worker feedback was shown through an example where a task method had been chosen on OSH grounds, but was then thought, by the workers, to be creating other OSH problems – so the method was changed.

The overwhelming view of increased personal ownership and responsibility was positive. However, in some cases it seems that the underlying culture was not supportive of this approach and several participants felt that if anything went wrong it would be their fault and they would get into trouble. As a result they felt that the onus was on them to find right guidance information to keep ‘within the rules’. The importance of the role of the first line supervisor in creating this supportive culture was stressed.

Interviewees were asked to give reasons for why they behaved safely. The majority of responses given related to a general sense of responsibility for safety which seems to permeate the workplace, including:

- caring for others;
- feeling responsible for other people’s safety; and,
- acculturation into the safety culture of the organisation.

Recognising the level of risk

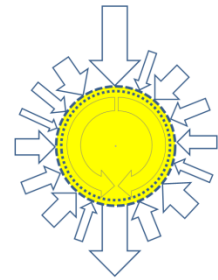
A necessary requirement for and consequence of individual responsibility is the need for individuals to recognise the level of risk that is present. This ability is clearly linked to the experience and competence of the individual. Generally, novice workers would not be expected to be able to do this whereas expert workers would. However, the expression ‘familiarity breeds contempt’ was used and some experts may have lost the ability to adequately assess risk. In certain cultures and in certain situations in all cultures, it may be that the individual’s requirement to assess risk may be replaced by systems or protocols. For example, for tasks with very high consequence risks, a rule-based approach may be appropriate, however, our work suggests that involving the individual is sensible as it will happen anyway and may well be better to be managed proactively rather than ignored in vain. Examples include hospital laboratory staff considering that they had a stronger OSH focus because they regularly handle hazardous samples and chemicals and can appreciate the risk; or asbestos removal experts having a healthy regard for the risks of ingesting asbestos fibres.

“...it’s the nature of the roles rather than the information itself that make people interpret things differently.
(Healthcare workforce management Director)

3.7 Translation

3.7.1 Individual, internal translation

The C-HIP model (Conzola & Wogalter, 2001) focusses on the process of translation of messages in a personal sense, in that each person who receives information from a source through a channel must then translate it before then enacting it through their resulting behaviour. According to C-HIP this translation is affected by the receiver's attention, comprehension, attitudes, beliefs and motivation. This section considers this individual, internal translation: what goes on internally to the individual receiver.



The cognitive abilities of the receiver and the psychological aspects of the internal processing of information are outside the scope of our project. Nevertheless, we did investigate barriers and facilitators that affected the taking in of the OSH messages and their enactment. The C-HIP model excludes other parts of communication theory such as 'noise' that affects the communication process, whereas our project included aspects other than the direct, task related OSH instruction to help answer the questions: "how do you know how to do what you do and how to do it safely?"

Earlier sections have covered the plethora of information sources, both internal to the organisation, outside the company but still within the main organisational network and also external to the main network.

The environment that workers find themselves in was also seen as a reason to interpret the OSH messages differently. For example, in the healthcare case studies, participants noted that while healthcare workers were aware of appropriate procedures they were often put in difficult positions where patient care seemed to conflict with their own OSH. These aspects are developed further in section 3.6, Barriers and Enablers.

"As far as the nurse is concerned, that's her patient, that's her care and if something happens... she ignores the manual lifting procedures... I know... I've lifted patients the wrong way. But you do. You know it. (I) know that I should be squatting down; I should be using my thighs, keeping my back straight. But when things are going a bit wrong you don't have time to think like that."
(Emergency planner - healthcare)

Conversely, factors which hinder translation were also highlighted. For example, ambiguous messages, which were not explained in terms of their consequences for a particular role, were problematic.

The need to ask workers if they understood all of the information they received was raised. This was particularly the case in construction where there were many workers whose first language was not English and also, generally, low levels of literacy. Checking understanding was taken a stage further and more formally in many instances however, requiring workers to sign that they have heard or read and understood the message.

3.7.2 Translation or adaptation before passing on to others

The main enactment for most of the members of the network is to pass the OSH messages on to others. Invariably, except for literally forwarding an email, this will involve the person receiving the information themselves and processing it internally before passing it on, often consciously but sometimes subconsciously. This will mean that, even subconsciously, there will be an element of translation or of the message as it moves through the network. There may also be a more definite adaptation of the message which may change its meaning in some way. However, there may also be the conscious decision to change the way that the message is conveyed to improve the likely understanding of the people who will next receive the message, or to make it more palatable – ‘to soften the blow’.

In one logistics firm information was interpreted by experts before re-written into a more practical form for workers. The argument was that the audience were site-based managers who would not want to reading ‘reams of legislation and policy.’ They wanted to produce a simple guide to why and how to do the work and what and where are the tools to do it safely. They acknowledged that the ‘professionals’ needed to know the legislation in order to check compliance but operational managers were concerned with delivery. They argued that such managers were much more likely to read a one page summary than a 50 page document, which should be kept in reserve to be referred to if necessary.

Healthcare FM workers were given specific OSH knowledge relevant to their tasks. OSH knowledge was assessed to ensure that it met Trust standards. The degree to which and stringency with which it was assessed appeared to vary; however there was a general assumption that it met minimum standards.

The primary aim of healthcare is to ensure a high level of patient care, so task specific OSH knowledge was given where workers interacted with patients in order to protect both the patients and the workers. For example, where work on services (water, electricity etc.) was required it was important to ensure that vital patient services were not cut off; however arrangements were made to relocate patients if urgent work was required and services needed to be disconnected.

Patient dignity was also a concern and was taken into consideration in planning safe tasks. For example it was considered unethical to publically display information about patient illnesses; but domestic staff needed to know what type of PPE to wear to prevent cross-infection. A sticker system was used in one Trust with different colours to indicate the severity and nature of particular illnesses. The meaning of each sticker was only known to staff and it indicated the appropriate PPE to wear depending on the patient’s condition. Similarly, in a blood donor setting, coloured tags were hung outside consultation booths to indicate that a particular check was required, typically requiring a different member of staff, without disclosing to the waiting members of the public what the health concern was.

“...very simple, in your face, and it was attached to everybody’s payslip.”
(Matron)

In a similar way to logistics, one matron explained that she could understand the code of practice documents because she ‘lives and breathes’ OSH, but the main audience are looking for practical ways to apply the

principles – what does it mean to me? What do I have to do? She also cited an initiative where they attached messages to the payslips in order to get the message out. This is similar to the Trojan Horse initiative (SCI, 2005) in construction where OSH messages were fixed to materials and products so that workers would see them without looking for them.

Clinical staff were given broader OSH training which respondents felt was understandable from a theoretical perspective. However, because the training was so broad, it was difficult to understand how to actually use the training in practice and how OSH needs could be considered in conjunction with patient safety needs. OSH managers in both case study trusts highlighted that they were available to help staff work through these issues. However, this was hampered by limited staff resources; in each Trust there was a maximum of four OSH managers. Furthermore, it is interesting that lab-based staff, who are not patient-facing, found the OSH knowledge beneficial and useful in their work. It was suggested that, because patient risk training is more dynamic than OSH training, it tends to ‘stick’ better in the mind.

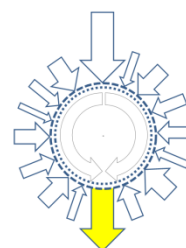
“...at the end of the day, most of those you're trying to get to are at the coal face, and you then need to be very cognitive of how it is communicated.”
(Construction Project Manager)

In construction, a number of channels and channel characteristics were discussed as aids to understanding; for example practical training given by co-workers was perceived to be a good means of message transfer. Conversely, factors which hinder translation were also highlighted; for example there were problems with ambiguous messages, which were not explained in terms of their consequences for a particular role.

There were also examples of adding visual and physical aids to get the message across. One example highlighted by a construction manager was how information about walkways that were subject to daily change was communicated. Initially workers were asked to contact their supervisors and sign-off once they had received specific information; but there were timing issues with this type of delivery. Subsequently employees were given diagrams with colour coding to represent changes in the location of walkways. However, the site managers highlighted that, eventually, they had to implement a system of taller barriers so that workers would not be able to enter unsafe areas.

Some difficulties with translation by managers and supervisors before passing the message on were also raised. A Healthcare office manager took the view that what she had been instructed to organise would not work ‘further down the line’ which affected her enactment of the instruction.

A number of interviewees also commented that the effectiveness of translation for the benefit of others was often strongly influenced by the translator’s devotion to OSH and therefore the desire to pass the message on effectively.



3.8 Enactment

We have mentioned previously that the main enactment for most of the members of the network is to pass the OSH messages on to others. However, in this section we deal with the enactment at the end of the network, by the people who are doing the tasks and are most likely to be hurt if something goes wrong. The C-HIP model (Conzola & Wogalter, 2001) uses the word 'behaviour' which is appropriate for this workplace enactment.

The reality is that many players in the network do not enact in precisely the way that the initial source intended. This may be middle managers who do not pass on the message accurately or the worker who does not follow the procedures completely. The reasons for this are complex but are likely to be a combination of how well they understand the message, what they think about the person or organisation that is giving the message, what other messages are impacting on them at the time and whether they think that the message is applicable to the specific situation that they face.

A full consideration of OSH behaviour is outside the scope of our work, but there was a considerable number of comments in the interviews on workarounds and dynamic risk assessments, but also novel use of OSH messages and procedures evolving through practice. These aspects are also developed further in section 4.3.

*"Training doesn't cover all scenarios and there's always the human factor. There's always the patient who doesn't do what you ask them to do
(Ward nurse)"*

3.8.1 Dynamic Risk Assessments

There was a clear difference between the environments faced in static, relatively unchanging work environments and those where the situation was constantly changing or more unpredictable. Often, it was these less predictable situations that people cited as the reason for assessing the risk 'in the field'.

For instance, ward-based healthcare staff had a more consistent environment than those who worked in the community. All healthcare staff had to deal with the changing situations and behaviour of patients, but, in the ward, at least the overall environment was fairly constant. Community-based staff were faced with the variation in patient condition and behaviour but also the significant variation in the home environment. Community staff had both unofficial and official routes to exchange information about certain patients or the environments in certain homes.

Training of healthcare staff includes the use of scenarios, which are intended to provide the skills to cope with changing circumstances and the need for dynamic risk assessments.

Another area where insitu consideration of risk is needed is where a worker encounters a task or product where there does not seem to have been a risk assessment, or at least the worker is not aware of it. A healthcare OSH manager recounted a situation where a nurse was concerned about the use of a new type of 'plaster of paris' for which there was no safety data sheet or task risk assessment. The initial phone

conversation established the situation, the extent of the exposure to risk and what risk control measures were already in place. The manager then met up with the nurse and obtained the name of the product, checked the safety data sheet on the intranet and confirmed that the ventilation measures that were already in place were adequate. The manager also confirmed that health surveillance was not required. The nurse wanted the advice in writing which was provided.

Home delivery workers in logistics faced the variable environments of the houses that they were delivering to. There were some good examples of OSH knowledge being passed between delivery workers regarding special circumstances at a delivery point, with the first driver having to assess the situation insitu and adjust the detail of the method but then pass the information on to future drivers so that they were more prepared.

As mentioned previously, the construction work environment is forever changing, but this is normal and therefore is often taken into account in the way that risk assessments are drawn up. Furthermore, in construction there is usually a manager or supervisor present, at least on larger projects, and therefore less is left up to the discretion of the individual worker compared to a logistics delivery driver or community healthcare worker. Therefore, in construction, it is mainly where unforeseen situations occur that true dynamic risk assessments are required.

In all sectors there has been a move to spend more time considering unforeseen situations and to ask the question: what is the worst that could happen? A number of organisations also organise mock ups of emergencies to test the resilience of their systems and protocols and also, by inference, the ability of their staff to assess the risks insitu and respond appropriately, based on the health and safety framework that has been established.

3.8.2 Workarounds

The term 'workaround' seems to be somewhat emotive in all three sectors, and, particularly amongst OSH professionals. There is an assumption by some that workarounds are always wrong and always less safe than the prescribed method. The term 'shortcut' was also used frequently, although often in a slightly more negative way than workaround, suggesting that the shortcut was perhaps less safe than the official method. Occasionally an interviewee talked about 'breaking the rules' but they would often indicate that this was still done safely. The reasons why people used workarounds or shortcuts were discussed, for example, lack of necessary equipment, situation being different to the one assumed in the instruction/method statement or perceived time pressure. Sometimes it was seen as the only way in order to do the job and was deemed the safest way to 'bend the rules', thus mitigating the risk.

The interviews uncovered both 'as intended' enactment and 'not as intended' enactment across the network. Interviewees commented that there was both 'good' and 'poor' practice across all

"...if it's a shortcut that the manager says makes the job more efficient, more effective, then they'll look at it and if it's deemed to be a good thing to do, then they'll put it in the procedures."
(Logistics Worker)

sectors where they considered that people either acted more safely or less safely. However, they also cited alternatives to the official way to do a task, based on an insitu assessment of the risks that were still considered safe, at least by the workers themselves. Workarounds were more likely where the worker, rightly or wrongly, considered that the risk resulting from the new method was not great, probably because they considered that the risk from the original task was not great either. Thus, workarounds were considered less likely for high risk tasks.

Some logistics respondents stated that they did not behave unsafely. Within one organisation there was a devolved sense of responsibility with the workforce whereby they knew the rules and what was expected of them and they understood the need for safe working practices. But it was not unusual for them to do things which were counter to organisationally-specified rules which they called 'short cuts'. However, where they did 'break the rules' they would typically indicate that this was done safely, implying a degree of acceptance of distributed leadership by the organisation, where workers would appear to be able to make such decisions in their own right.

Sometimes within the organisation there would be difficulties in developing suitable safe systems of work and ensuring that these practices were undertaken by workers. Often managers had to decide on the 'best' way to deal with awkward goods received. This creation of OSH practice insitu is explored further in section 3.9.

A hospital ward manager explained how staff used workarounds to manage flaws that existed in the system and that they are almost forced to do so. However, his view was that you 'should not need to find a workaround' because the processes should be better and more aligned to reality.

OSH behaviour in healthcare is an interesting conundrum. First, the many different facets of healthcare worker cultures need to be taken into consideration. In general, it was felt that domestic and maintenance staff were far less likely to behave unsafely or "break the rules." Several assertions were postulated as to why this may be the case; for example although they work in a hospital environment they may not be involved in patient care. Moreover, there were standardised rules and regulations for their jobs which were more routine than for healthcare staff. However, healthcare staff were deemed to be very different culturally, which was thought to have a significant impact on their OSH behaviour. For example, some respondents considered that doctors often considered themselves to be outside of the management structure and therefore, did not need to follow OSH rules. There was also a feeling that the historic focus on patient safety had deeply affected the development of an effective OSH culture in healthcare. There were further differences between hospital-based and community workers, whose behaviour may have been affected because they work outside the confines of the hospital. However, lab-based staff who were not patient-facing and worked in a controlled environment with chemicals and bio hazards were thought to demonstrate good OSH behaviour.

Despite the overwhelming opinion that workarounds were 'safe', one construction worker described his method of walking and standing on the open joists of an upper floor of a building which broke the rules and which he admitted was hazardous. He said that he did it because he could, because he had done it many times before and because it was a quick job. He believed that he 'probably wouldn't fall down through the joists' and hurt himself and that he would have finished the task before anybody noticed.

This salutary example emphasised that, despite all the well-intentioned, well thought out workarounds, there were still workers who were willing to take significant risks, breaking the rules 'because they could'. This is not actually a problem with knowledge flow as the worker did what he did in the full knowledge of the risk he was taking. Hence, effective OSH message flow does not necessarily lead to safe behaviours, just as emergent practice does not necessarily lead to unsafe behaviours.

3.8.3 Novel use of OSH knowledge – evolving procedures/evolving practices

Evidence that OSH knowledge is interpreted and co-created was found across each of the sectors. There were examples of facilitating procedures in novel environments and evolving procedures through practice. This is closely entwined with both workarounds and dynamic risk assessments and is developed further in section 3.9.

Several healthcare OSH managers argued that they were not managers, but facilitators; healthcare work can vary and therefore it is difficult to have a "one size fits all" OSH solution. Instead, it was considered important that OSH managers understand current OSH legislation, NHS standards, and the systems and interconnected levels of work within the system so that they may use participatory methods to develop the most effective OSH knowledge for a particular situation. For example, if a new product or way of working was needed, staff would probably need help to make sure it was implemented safely.

"If the trial run doesn't work then I'm sorry; the process we've used is wrong."
(Construction site manager)

As part of a strategy for continual improvement within one logistics firm there is opportunity for workers to

suggest changes and be part of developing OSH knowledge as long as it did not conflict with safe working practices. A middle manager commented that they get a lot of workers taking advantage of this by identifying things that they considered 'need looking at', challenging the existing operating procedures or identifying new equipment or techniques. Their committee

structure, mentioned earlier, facilitates this creative development of OSH procedures by half of its members being frontline workers. Once accepted, the new method would be incorporated into the company's standard procedures. This process gave workers ownership of these procedures and created a culture of 'buy in' for safe working.

They're the ones working out on the shop floor and doing the job, so they know best. And then we can have a look at it and then see what we can do."
(Logistics Manager)

"...because I can do it, that's the way I've done it a lot of the time... I probably won't fall down through the joists and hurt myself and it's quick and, quite frankly, by the time you notice me doing it, I'll have probably finished doing the job."
(Construction worker)

A construction site manager described the use of trial-runs to test out method statements for new tasks. He explained that, even if they think that they have 'covered all the bases' by planning every detail and assessing the risks they would still have a trial run to check things before 'doing it for real'.

There appear to be two different things happening here. In healthcare it is more about facilitating procedures in novel environments whereas in logistics and construction procedures are evolving through practice. In one case we are talking about new things in a constrained environment, in the other about new procedures developed through new experiences.

Another construction supervisor described their 'simple' solution to prevent the need for the driver of a telehandler from needing to assess each bundle of trusses to decide if they were too heavy to lift – they made sure that the supplier provided bundles that were no more than 600 kg and therefore well within the lifting capacity of the machine.

3.9 Ethnographic findings

Our report so far has mainly discussed the non-ethnographic data. However, a key objective of the research was to use ethnographic research methods to complement the non-ethnographic findings. Like the interviews and focus groups, with the ethnography we set out to understand how OSH knowledge ‘flows’ – or is learned, communicated, and *actually* used by workers – in complex networked organisations from across the healthcare, logistics, and construction sectors. Themes discussed in the previous sections were found to be reiterated through the ethnographic research (as will be further illustrated below), and ethnographic insights have thus implicitly informed the preceding discussion.

Yet, while complementary in its aims, the ethnographic approach also differed from the non-ethnographic study in several key ways. New areas of focus, including an interest in ‘quiet safety’ (Pink and Morgan 2013) and workers’ adaptations towards safety in contexts of uncertainty (Pink et al., in press) emerged. These did not always easily translate across research contexts, and to attempt to merge these with discussion of the interview and focus group findings would run the risk of obscuring ethnographic specificity. Partly this is common to ethnographic methods which typically foreground the ‘unexpected’, but it also reflects that (due to it not being practicable to undertake the research with the same participants as the non-ethnographic research) the ethnography was conducted at different locations and, in some cases, with different kinds of participant (i.e. frontline workers rather than OSH managers). Moreover, as we have noted earlier in this report, the ethnographic research started from a slightly different interpretive position. Differing from conventional approaches to OSH, the ethnography sought to understand how OSH is articulated as a ‘way of knowing’ rather than simply as ‘knowledge’.

To understand these differences the distinction between institutional-OSH and tacit-OSH is useful. Previously we have made visible and explored these differences through a focus on ‘local knowledge’ in the construction sector (Pink et al., 2010). Attempting to understand ‘what people know’ and ‘how they know it’ requires ‘attention to the detail of their everyday practical activities, common beliefs, values and discourses in which this knowledge is manifested’ (Pink et al., 2010: 651). People ‘know how’ to do tasks safely not only from what they read or are told, but through embodied, sensory, and affective knowledges engaged in practical activities undertaken in specific workplace contexts. Here, as we have also discussed elsewhere (Pink et al., 2014a), our approach connects in some ways (yet differs in others) to a broader field of ‘practice studies’ safety research (e.g. Gherardi and Nicolini 2002) which understands OSH as ‘knowing in practice’, or knowledge that is ‘learnt, adapted, modified, and engaged in practice by group(s) of practitioners who are in frequent contact with each other’ (Pink et al., 2010: 653). Precisely because of its tacit (or unspoken, taken-for-granted, and otherwise not easily articulated) nature, to investigate such ‘local knowledge’ requires ethnographic approaches which, through sustained immersion in the context under study, reveal the kinds of easily overlooked details of practices and understandings (usually) more difficult to access through interviews or focus groups. Moreover, while existing literature has shown how ‘local knowledge’ sometimes differs from institutionalised or regulated

OSH, the ethnographic research that we account for in this section points towards rather different conclusions. It reveals an entanglement between these different knowledge bases as we found workers to skilfully blend the local/institutional, tacit/explicit and informal/codified to ensure safe working.

The ethnographic findings demonstrated that OSH happens in and as part of an ongoingly changing world, in which personal and tacit ways of knowing are vital. By revealing the role that tacit (or usually unspoken) ways of knowing – including the embodied, sensory, affective, and experiential – play in worker safety, the ethnography posed different understandings to the idea that OSH-knowledge *always* ‘flows’ and does so *only* through formalised mechanisms from one person to another. Learning was found to also happen through informal mechanisms, and knowing how to work in safe and healthy ways was generated through practical activity undertaken in specific workplace environments.

Thus, the ethnographic findings suggest that: *OSH knowledge is not static, but institutionally, individually, and socially constituted while inextricable from the sensory and material environments in which it is learned, communicated, and enacted. Knowledge is not only something that ‘flows’ into and around an organisation, but emerges from practical activity engaged with material, social, sensory, and representational elements of the environment. OSH is enacted at the intersection between the formal / informal; institutional / personal; individual / social; regulated / improvisatory; and explicit / tacit.*

To further illustrate this distinct argument, this section reports on the findings of the ethnographic research which were part of the broader study, and outline shared principles to have emerged from a cross-sector analysis of how OSH is learned, communicated, and used by workers. It also flags implications of, and recommendations generated from, the ethnographic perspective for OSH-practice which will subsequently be taken forward in the project-wide discussion (section 4) and conclusions (section 5).

3.9.1 Where and how OSH-knowledge is learned

OSH knowledge in our ethnographic study (as was similarly flagged through interviews and focus groups) was received from external sources (e.g. through professional bodies, equipment suppliers, networks) and was also internally generated by organisations as they analysed and reacted to incidents or, in the case of the construction sector, identified and regulated for project-specific risks and hazards. The formal ‘flow’ of this OSH knowledge through organisations took a number of routes and was determined, to some extent, by the structure and characteristics of the workplace. Yet, common to the sectors, there was an institutional approach to knowledge acquisition that understood that workers learned OSH within the formalised spaces of training (e.g. induction) and through the mechanisms of instruction (e.g. policy, guidelines). Learning was mainly understood to be a one-way and mono-directional ‘flow’ of knowledge between people (e.g. from trainer to trainee, or supervisor to worker), although there were some innovative approaches to reconfiguring learning OSH through worker engagement initiatives. For example, within the logistics case study, workers’ preference for being instructed by their (suitably qualified) peers was built into training, as were mixed and hands-on methods, and holding training on- as well as off-site. Across the sectors, specific character traits of

trainers – including practical experience of the industry, using participatory communication styles, and being “trusted” by workers – were associated with participants as prompting uptake of OSH-messages by giving “credibility” to communicator and OSH-content. In the construction sector “toolbox talks” were intended to facilitate greater worker involvement and sites used card systems to invite worker feedback, with one offering rewards for the best OSH “innovations”. At this site, as well as displaying adopted ideas on a noticeboard, (Figure 3.10), management response to worker concerns and ideas were communicated by displaying cards that were “in progress” and cards that were “completed” with the resulting “action taken” recorded for the workforce to see.

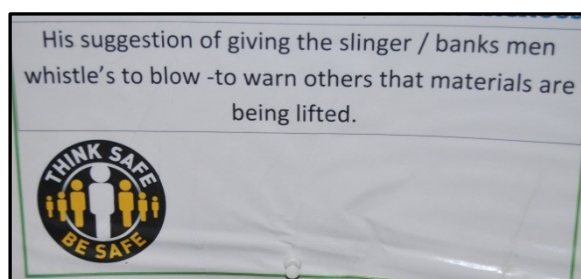


Figure 3.10 an example of a construction worker OSH “innovation” through a feedback card system

Despite these novel approaches to learning, OSH knowledge was largely considered something that was added to the workplace (through verbal, textual, and visual channels) *before* workers undertook practical tasks within, and encountered the specific social, material, temporal, and institutional features of, workplace environments. While workers evidently positioned their practice in relation to the OSH knowledge transmitted through such organisational training and instruction (e.g. community healthcare workers spoke about ‘conflict and resolution’ training and the ‘lone worker policy’ as enabling them to work safely away from an organisational base) the ethnographic research revealed how workers also learned to work safely in less formal, more indirect and subtle ways. Individuals used their informal organisational networks including co-workers who were perceived to be ‘expert’ in the area (although they may not have formal or official OSH responsibility) and talked about their experiences during fleeting moments (e.g. in-between shifts, during vehicle journeys, on breaks). In such spaces and moments of learning they developed skills and abilities needed to anticipate, plan, and manage approaches to working safely. Furthermore, learning OSH was shown to be an incremental and ongoing process. This finding supports our claim that workers enacted and developed ‘ways of knowing’ rather than simply receiving, sharing, and transferring already formed OSH ‘knowledge’.

There was a general sentiment shared between workers that ‘learning by doing’ – or what one participant referred to as being “experiential learning” – was key to ‘knowing how’ to undertake tasks safely. A construction site groundworker expressed this viewpoint during an interview when he recounted his experiences of translating vocational training into site work.

"[...] when you're doing your ticket [...] all the footpaths are perfect and there's a little place there were you're going to be digging out, but that's not like that on a site. On a site, there's going to be uneven ground that you're going to be walking on. So that's all stuff that you're going to have to deal with [...] laying flags in that situation is going to be a lot easier than actually when you're out on site [...] you just have to get on with it at the end of the day. They can't say, 'go on a course to learn how to walk on uneven ground'." (Construction groundworker)

This comment resonated more broadly with notions of “experiential learning” that characterised worker’s understandings of how they have come to ‘know how’ to work in healthy and safe ways; or the idea that undertaking work tasks safely required blending institutional training and the continuous experience of undertaking practical tasks to develop abilities, skills and embodied techniques to identify and appropriately respond to contingent features of specific scenarios and workplace environments.

3.9.2 Where and how OSH-knowledge is communicated

Managers, supervisors and others with explicit OSH responsibility played a key role formally communicating OSH-knowledge to workers, and did so by using textual (handbooks, guidelines), electronic (emails, online resources), visual (noticeboards, signs, walkways), verbal (training), and audio-visual (DVDs, PowerPoint presentations) methods. They understood themselves to play an important communicatory role as they selected what information to share with workers, made it relevant to tasks undertaken, and enlisted others to help distribute this information. Responsibility for safety was simultaneously diffused throughout the case-study organisations as workers were also encouraged to take care of themselves and others.

Yet, the ethnographic research revealed and provided detail on how communication of OSH knowledge occurred, again, in less formal, more subtle and tacit ways. To better understand where, when, and how workers communicated about OSH, it was important to pay attention not only to how workers talked about safety in explicit ‘OSH’ terms (i.e. safety guidelines, regulations, and procedures) but how they did so in other ways and *not only* through talk. This included identifying routine and taken-for-granted ways of ensuring worker safety; characterised as being “quiet safety” (Pink and Morgan, 2013). Indeed, these findings suggest that focusing only on formalised OSH knowledge acquisition and transfer may overlook the other ways that workers learn about and communicate safety in the workplace, and may not recognise the safe practices that workers have already developed in response to the contingencies of particular workplace scenarios and contexts. Such practices were found to have been developed by workers from working with, talking to, and watching others, as well as the embodied, sensory experience of undertaking practical tasks. Thus, OSH knowledge was shared not only in verbal or textual ways, but through embodied and sensory communication channels.

This was illustrated through the practical techniques (or what was commonly referred to as being “the little things”) developed and shared between co-workers and within teams to make tasks ‘easier’, ‘quicker’, and ultimately ‘safer’. Logistics deliveries workers, for example, used a shared verbal and physical language of

agreed upon manual lifting techniques, or knowing where to position ones hands on a good, how to identify a secure gripping point, and what part of the body (arms, legs, shoulders) would take the strain (Figure 3.11).



Figure 3.11 a customer deliveries worker demonstrated different lifting techniques

Although commonly used, workers struggled to describe physical and bodily techniques for these lifts (suggesting that these taken-for-granted techniques were rarely explicitly spoken about with others), yet by using visual ethnographic methodologies while asking workers to not only describe but to show us how they lifted and carried goods, these subtle and otherwise easily overlooked details were revealed. Workers did not regard these shared approaches – and the verbal and bodily language to accompany these – to have been explicitly taught or otherwise formally communicated, yet they did stress these incorporated techniques from manual-handling training (e.g. bent knees, straight back, holding objects close to the body). Thus, these techniques (and processes for acquiring them) illustrated how regulated OSH came together in practice with less formal approaches including experiential learning and embodied interaction with materials, goods, and equipment. These shared approaches were regarded to have emerged through the continued experience of doing the job; encountering a diverse range of goods and packaging (e.g. knowing certain brands of goods to be heavier than others); and responding to their specific material qualities (e.g. looking for secure gripping points) by developing techniques thought to make lifting and carrying “easier”, “quicker” and “safer”. Slippery or smooth surfaces, unevenly weighted objects and bulky shapes were some of the challenges (and potential risks to worker safety) navigated through such physical techniques.

In some organisations, non-verbal methods of communicating safety messages were embraced by managers and supervisors. For instance, in the construction sector whistles were used by banksmen/slingers to signal lifting cranes, and coloured hard-hat schemes used to visually flag the role, status, and responsibility of different workers. In all sectors, mobile and digital media (e.g. cell phones, radios, email, electronic databases) were used to communicate OSH content as workers developed OSH practices in relation to their use.

Community healthcare workers could use mobile phones to send a text message to co-workers with their whereabouts if late for an appointment, while on one site a construction supervisor cited the importance of a mobile phone for enabling him to communicate with his workers in “real time” (see Pink et al. 2014b). Beyond being a practical way to ‘flow’ OSH along complex networks, workers (especially those undertaking lone and mobile work) valued these media for enabling them to feel “connected”, “backed up”, and “supported” when working in isolation. As cited elsewhere (Pink et al., 2014b:343), one community healthcare worker described how: *while the role of new technologies in enabling safe working should not be under-estimated these (as has been noted by others – e.g. Cook, 2008:28) must be co-joined with effective organisational support systems so that they do not create a false sense of security.*

Significantly, when considering OSH communication, our ethnographic research found that people external to the organisation such as the patient (in healthcare) or customer (in logistics) were also crucial sources of information that workers used to anticipate, plan and manage approaches to safe working, and thus were involved in the co-production of OSH-knowing. For community healthcare and logistics customer deliveries workers pre-arrival phone calls were important ways for workers to gather information to help them plan their visits to other peoples’ homes (see Pink et al., in press). In healthcare, responding to referrals required balancing a need for speed with information gathering from the referrer, electronic databases, external agencies (e.g. GPs, hospital, carers) and the patient themselves and/or their family. A phone call from the organisational base was used to find out about access to their property, equipment in the home, services already involved and the patient’s opinion on their condition. Such information was used to make decisions about the combination of specialist workers and equipment needed and issues the worker would need to take care of (e.g. access issues, animals on the property).

3.9.3 How OSH-knowledge is performed insitu where participants were doing actual tasks

Our ethnographic research examined how OSH knowledge was used and produced insitu by focusing on the everyday work-based activities of healthcare, logistics, and construction workers. Guided by the emerging empirical findings, it was necessary to ask not only how safety *could* happen in these contexts but how it was *already* happening, or to understand OSH as something that is both regulated and practiced (as being ‘performed’). At all sites covered by the ethnography, safe working was found to occur through the nondramatic and routine ways that everyday tasks were performed. Our research revealed ‘quiet’ (or usually taken-for-granted, commonplace, and unseen) activities that workers did to ensure their own and others safety. By exploring these activities, our research provided insight on how workers ‘know how’ to work safely in ways that went beyond what was only talked about or could be directly observed to include (yet are not limited by) bodily, sensory, affective, intuitive and experiential ways of knowing.

For example, the use of embodied, sensory ways of knowing how to work safely was evident in the construction sector. This was common to the diverse trades that were involved: bricklayers described the

importance of 'mortar control' or using movement of the trowel to feel for the right consistency of mortar (not too wet or dry) to minimise splashing of this corrosive substance (Figure 3.12), while scaffolders demonstrated how they knew a wedge to be secure as they looked, listened and felt for a particular "bounce" of the hammer when knocking these into position. These skills of working with particular kit (and knowing how to intuitively judge when an activity had been done safely by recognising and responding to physical sensations and material qualities of tools, objects and equipment) were considered to be learnt over time, through repeated experience, and encountering different scenarios in which techniques needed to be adapted through a process of trial-and-error. For instance, heavier blocks require a different consistency of mortar from lighter blocks, as does laying these in dry or damp, hot or cold conditions.



Figure 3.12 a bricklayer described feeling through the trowel for the “right” consistency of mortar, and developing physical proficiency working with this material

By highlighting these aspects of safe working we are not suggesting these were the only (or even dominant) ways of knowing how to do tasks safely, and indeed construction workers cited following instruction from supervisors (who in turn described their practice and supervision of tasks as informed by 'method statements' and 'risk assessments'), looking at site plans, using specialist equipment, talking to co-workers, and their vocational training. It is, however, to indicate how diverse ways of knowing - including knowing safety through bodily and sensorial response - were entangled in practice, and how these ways of knowing complemented more formal OSH knowledge communicated through training, instruction and guidelines.

Moreover, our ethnographic research indicated how these kinds of knowledge were especially important when scenarios could not always be mapped in advance. For instance, community healthcare and logistics customer deliveries workers used biographical and local knowledge gained from growing up in, or working in an area over time, to safely approach working in other peoples' homes (see Pink et al., in press). Logistics workers supplemented information generated through organisational guidance (printed delivery sheets), digital media (the Satnav) and their trained capacity (to risk assess) with 'local knowledge' to anticipate access,

parking and the types of homes they may be likely to encounter in particular neighbourhoods, and the subsequent delivery implications. Similarly, community healthcare workers recognised and valued ways of knowing that could not easily be written into institutional training yet were evidently considered important for navigating the unknown qualities of home visits. When faced with unpredictable qualities of the home visit, tacit ways of knowing (in addition to those carried with workers through their trained capacities, equipment, uniforms) were drawn on to guide actions and decisions to navigate towards safety. This included ways of

"[...] I was in not a very great part of town, and I was going into a multi-storey block of flats and I was going up to the 11th floor and it was quite eerie feeling; it's very low and it's not very nice, there wasn't a great smell, there wasn't a great feel of the place and I was on my own then. I knew my colleague was already in the building; they'd met me there and they'd already gone in, but it was that sense of, 'where is my phone?' Just in case this door opens on this lift and there's somebody waiting there who isn't as friendly and it's just – I knew that my phone was there in case I needed it, but everything turned out fine in the end. But it's just awareness, I think, that I've had [...] I am aware of areas that aren't so nice" (Healthcare worker)

'sensing safety' or what workers described as being an 'instinct' or 'gut feeling' *en route* to the home. This was expressed by one healthcare worker (also cited elsewhere - Pink et al., 2014 in press):

The spatial, material, and sensory qualities (low ceilings, dim lighting, unpleasant odours) of the route became part of how safety was 'sensed' and 'felt' by this worker. This feeling had emotional resonance (e.g. evoking anxiousness, fear, or uncertainty) while flagging actual risks (e.g. isolation, unclean or non-sterile environments, difficult exit routes). It also indicated, though the reference to being 'aware' of risk from working repeatedly in the area, of the perceived importance of experiential knowing in enabling workers to navigate the emergent, uncertain aspects of home-based work.

Thus, through such empirical examples, our ethnographic research offered a novel perspective by revealing a complex ecology of OSH-knowledge. In addition to formalised and regulated-OSH, these tacit ways of knowing may be categorised as:

- **experiential** or 'knowing how' from accumulated experience over the biography of an individual's working life
- **embodied/sensory** or 'knowing how' through bodily and sensory encounters including touch and sound
- **intuitive** or 'knowing how' from a familiarity and empathy with a place, person, or thing
- **affective** or 'knowing' how from things *feeling* safe, right, and effective

These ways of knowing were not antagonistic to but were brought together with (and used to supplement) institutional-OSH through the cognitive (problem-solving) approaches and embodied, sensory performances of workers which made OSH 'feel right' or 'work in practice'.

3.9.4 Adapting Towards Safety

The adaptive and improvisatory aspects of safe working were foregrounded through the ethnographic research, as workers were shown to respond to the ongoing and changing features of the workplace environment. This was especially heightened in the healthcare and logistics sectors where community workers and deliveries teams work away from the organisational base in other peoples' homes (widely considered to be 'unknown' and 'unpredictable' contexts). Yet, the dynamic nature of the work environment was also navigated by construction workers as they responded and adjusted their practice to the ongoing material, physical, spatial, social, and temporal changes of building sites. This does not suggest a binary relationship between 'dynamic' non-organisational contexts and a 'regulated' organisational base; indeed observations in the logistics sector support more complex understandings as variable features (time pressures, available equipment or help, kinds of goods entering the system, layout and space) of the warehouse were experienced by warehouse workers as making for an continually changing environment. Likewise, institutional OSH accessed through training, handbooks, PPE, standardized equipment, risk assessment, method statements and so on were used by workers to stay safe beyond the organisational base, but were brought together with the ways of knowing outlined above. However, if workers are understood to perform safety in changing environments, then it follows that safe working demands from workers the ability to make decisions 'on the spot' about how best to safely improvise.

As workers were followed moving through different work contexts and scenarios, the ethnographic observations revealed how institutional OSH-knowledge is appropriated, modified, and adapted by workers to produce new ways of knowing intended to make tasks (as noted above) 'easier', 'quicker', and ultimately 'safer'. In healthcare, as we have also discussed elsewhere (Pink et al., 2014a), nurses occasionally removed gloves, or adapted these (by cutting off a fingertip) so that they could use their highly responsive, skilled and

"I tend to take my shoes off when I go in a house. Not all the time [...] but we do have some cultures which [...] they don't agree with shoes, when [I visit] I take my shoes off in their houses. I could [also] walk in and see cream carpets. There's no way I'd walk onto cream carpets with my shoes. So I respect, straight away I respect peoples' homes as soon as I walk through the door and the way they keep their homes. If it's raining, if it's snowing, I take my shoes off everywhere because I'm not going to walk snow and wet shoes into peoples' homes" (Healthcare worker)

trained sensation of touch to find a "good" vein from which to take a blood sample. Sometimes they also removed their shoes (part of the work uniform) before entering a patients' home to show "respect" for its aesthetics and furnishings; and the patients' expectations of how they should act appropriately as a professional and as a "visitor" or "guest" in this context. One worker explained (Also cited elsewhere - Pink et al, 2014a submitted):

By removing her shoes the nurse indicated feelings of safety, illustrating how OSH-performances are done in ways that are organisationally, individually, culturally, and socially appropriate. Additionally, safe working across these sectors required workers to navigate institutional commitments - for example, in construction

those of workforce productivity and speed, in logistics that of customer satisfaction, and in healthcare an emphasis on patient safety. Participants (as is supported by findings in the interviews and focus groups) recognised the potential for these priorities to conflict with worker safety, and acknowledged the importance of institutional support and worker autonomy in upholding worker safety when negotiating different priorities in practice (e.g. the ability to say no to tasks felt to compromise worker safety without experiencing an adverse outcome).

These kinds of insights revealed how workers in our ethnographic study were confronted with complex situations that – we would argue – *always* have some element of uncertainty, precisely because the future is unknown. Indeed, as we have accounted for elsewhere (Morgan and Pink, submitted), this was an element of our ethnographic practice that we likewise had to navigate to uphold our own researcher safety when operating in these potentially hazardous contexts. In these workplace environments there are sets of variables that are ‘known’ that workers can be reasonably certain of given their training and past experiences. However, there is always an unknown and uncertainty about exactly what the immediate future will be like, and thus the need to improvise arises as those moments emerge. This is an important point because it adds further nuance to understandings of ‘workarounds’ previously introduced in this report (section 3.8.2) by suggesting that often workers *adapt towards safety* rather than away from it. This understanding assumes that workers frequently ‘need’ to improvise in relation both to the context in which they are working (the environmental material and social elements, for instance) and the OSH guidance that frames their activities. In emphasising this point we would make it clear that we are not suggesting that OSH guidance is not necessary. Rather, that it needs to be ‘open’ enough to encourage improvisations towards safety outcomes, while precise enough to ensure that improvisation is directed in the right ways.

3.9.5 OSH-Futures, Interventions and Change: Implications of the Ethnographic Findings

The ethnography demonstrated that OSH happens in and as part of a continually changing world, in which personal, embodied, and tacit ways of knowing are vital. This paves the way for developing applied interventions around how OSH knowledge is learned, communicated, and used by organisations. While regulatory intervention is one way to achieve safe working, we recognise that alternate interventions which recognise the difficulties of attempting to account for all of the contingencies faced by workers are also vital. By acknowledging the inevitability of uncertainties, rather than seeking to account for them through regulatory processes, the challenge for OSH practitioners is to design ways to better support worker response. To achieve this goal, organisations may benefit from seeking to understand how informal ways of knowing and practicing safety are used in relation to, and complement, formalised-OSH. The ethnographic findings push forwards this understanding by revealing the specific practical ways through which OSH-knowledge learning

and transfer happens; including the places and activities through which it occurs, and the social relationships and institutional processes this involves.

Our findings suggest alternate understandings to the idea that OSH-knowledge *always* ‘flows’ and does so only through formalised mechanisms from one person to another. Learning also happens through informal mechanisms; and safety knowledge is generated through practical activity undertaken in specific workplace environments. OSH-knowledge is not only transferred between people (e.g. trainer to trainee), but workers generate approaches to safe working from their repeated interactions with other people (in and outside of the organisation), objects, materials, and spaces. Learning is an ongoing and incremental process, which happens not only from what people are told or from what they see, but also the embodied, physical and sensory experience of doing.

OSH training would benefit from incorporating these perspectives on how workers learn and share OSH-knowledge. Training should be designed to equip workers with the skills and confidence to adapt their practice as appropriate to specific contexts, yet this must necessarily be precise enough to ensure that decisions taken by workers are directed towards safe working. Additionally, training methods that acknowledge the situated, practical and socially co-constructed nature of learning and transfer of OSH-knowledge should be encouraged. For example: ‘hands on’ mixed-methods; visual media including video to encourage reflection on how OSH is learnt and used; ‘buddying up’ of more with less experienced workers; and on and in-site training (e.g. walking site induction) may be harnessed for effective learning strategies. Standardized and generic training should be complemented with locally specific methods and information.

By acknowledging the positive role that workers play in maintaining their own and others health and safety – in often unnoticed ways – organisations could better seek to identify and build into systems locally generated innovations that have emerged from the experiential learning of workers. Existing worker engagement initiatives (e.g. feedback cards, rewards-scheme, worker representatives) should be encouraged as avenues to involve workers in the design of safety strategies. But there remains a need to capture safety innovations as they are continually experienced and occur in normal work activities; particularly the kinds of subtle practice revealed through the ethnographic research. Institutions should develop strategies to enable workers to openly discuss, reflect on, evaluate, and share decision-making processes, while recognising and seeking to alleviate the power and status differentials, or fear of reprimand, that may result in reluctance to talk about OSH issues and innovations.

In this section we have outlined key insights, perspectives, and implications emerging from the ethnographic research. These will now be taken forward with findings from the non-ethnographic research into the discussion section of this report. Our aim in doing so is to consider how, in tandem, these mixed methods have informed the development of an integrated model to understand a productive and novel ‘third way’ for OSH research.

4 DISCUSSION

In this section, we seek to position the findings from this study against contemporary debates and emerging theoretical thinking concerning approaches to OSH. As part of this, we interpret the findings from the fieldwork, drawing on our different disciplinary perspectives, using this to formulate a pragmatic, person-centric approach account of knowledge and information flow, applicable to individuals in a network and the networks themselves. Where appropriate in our commentary, we highlight what we believe to be key implications for the OSH profession arising from the research, based on our interpretation of the data.

4.1 Types of OSH knowledge, their interaction and production – How they are channelled, engaged, navigated, interpreted and enacted

One of the aims of our study was to identify what types of OSH knowledge and evidence circulate and work in relation to each other in organisations involved in networked delivery systems. The main types of knowledge found in the study are model 1 (formal, top-down) and model 2 (social, bottom-up). In this section we discuss how these two interact and the necessity of social knowledge as the network becomes more and more complex. In Section 4.2 we propose a third way continuum with model 1 and model 2 at the extremes and a model 3 alternative inclusive perspective.

The formal knowledge base associated with OSH management in complex, networked workplace settings

The formal knowledge base has been mapped by the Institute of Occupational Medicine as part of another project in this research programme. The IOM identified that there are a large number of groups involved in disseminating OSH including those in professional practice and non-professionals who are tasked in industry. There are multiple sources of OSH available, however not all are freely available in the public domain and a subscription must be paid to access them. The IOM work brings the cohesiveness of the current OSH landscape into question where there is a lot of “know what” rather than “know how” to prevention of injury and ill health at work. There is also a need to identify the quality and trustworthiness of the source.

The informal, socially constructed OSH knowledge base

Both our interview and ethnographic data suggested that OSH knowledge is co-created and interpreted socially, both in an informal and formal manner, often leading to workers ‘picking up’ knowledge either explicitly or tacitly. Our ethnographic studies also revealed how knowledge is not static but is, in part, socially constructed in and through practice. Workers placed value of ‘learning by doing’ and more informal clusters of knowledge. These findings support Waring’s (2009) and Waring and Bishop’s (2010) argument that OSH knowledge is socially constructed and embedded in practice.

The importance of social networks as a source of information was also highlighted by interview respondents – many relied on social networks and colleagues as sources of information. This is unsurprising given the

prevalence of strong social hierarchies in many work organisations (for example as noted in the healthcare case described here) and the natural development of ‘arenas’ for shared learning (Carroll and Edmondson, 2002).

In this report, we have foregrounded the role that tacit, informal, and ‘alternative’ (i.e. non-organisational) ‘ways of knowing’ play in maintaining worker safety. Our ethnographic study, in particular, offered empirical materials supporting these statements by providing the kinds of details that are not so easily accessed from the interviews (precisely because tacit knowing is not always easily talked about or observed). It also enabled us to develop different perspectives from those dominant in safety research by exploring how worker OSH, the environment, perception, and practice interact to produce safe working.

Interaction between formal and informal knowledge

The extent to which individuals rely on formal and informal knowledge can be a function of experience, familiarity with the work environment and instruction from their organisation. Indeed the nature of a dynamic work environment (such as those faced in many of the organisations studied here) suggests a level of flexibility in the interpretation of formal information as well as the use of more individually and/or socially constructed practices. These two types of knowledge are often used together to develop an approach appropriate for ‘in the field’ operations. We discuss the exact nature of this flexible approach in some detail as part of the proposed ‘Third Way’ continuum in section 4.2.3.

Production of knowledge

As outlined above, knowledge can be produced both top-down and constructed by individuals and social networks from the bottom up. Formal external sources tend to be used by managers and OSH professionals. Many internal sources played an active part in knowledge production, including managers, professionals, colleagues and champions. As well as the more structured, top-down information used in production, informal knowledge tended to be socially constructed via colleagues, champions and external agents (including patients or customers) who were also crucial sources of information used to anticipate, plan, and manage approaches to safe working.

Effective channels

The most commonly used effective channels for the movement and transmission of OSH knowledge, motivators and practices that we found were face-to face (meetings, training and verbal communication), electronic (internet, intranet and emails) and written media (notices, leaflets and posters). On the whole verbal communication was cited as one of the most effective and efficient channels, in line with views on the importance of media richness in conveying messages. However, it was felt to be important to employ several different channels appropriate to the needs and circumstances of the receivers, especially those working in dynamic environments.

Knowledge Flow

Our work has questioned the extent to which OSH knowledge flows in a linear sense. Rather, what unites the various strands of our study is that OSH knowledge is shaped and reshaped through the process of enactment; at times it is appropriated, while at others it is augmented through its situated application and re-application elsewhere in the network. It is, therefore, always mutating as it travels through time and space.

The ways in which formal and informal OSH knowledge interact and mutually shape each other is a product of both the complexity of the networks within and across which it must travel, and the nature of the hazard context and regulatory environment for which it has been designed. In some cases formal knowledge will gather tacit practices as it travels, growing in terms of its scale and complexity. In other situations it will remain largely intact, shaping and determining the processes and behaviours it is designed to govern. The challenge for the OSH practitioner community is to understand the role of the institutional context in shaping this pathway, knowing when to accept localised contingent practice as being equally valid to formalised knowledge, and how to harness the power of emergent practices alongside those of codified approaches to achieving positive OSH outcomes.

Furthermore, in considering the aspects of OSH messages that do flow, large networks can be challenging, creating long complex communication paths. Therefore the OSH 'successes' of large networked organisations are all the more remarkable which may suggest a very keen and active OSH support from and stimulation from senior management.

Enablers and obstructions

Notwithstanding the above, there is still evidence of OSH messages moving across the networks and there are many enablers and obstructions to this flow; filters or membranes through which information and knowledge must pass before enactment. The transmission of knowledge and its final enactment can be inhibited by lack of stability, time pressures, priorities, social groups, or sub-cultures within organisations, conflicting messages from different sources and the interface between organisational departments. While these were the main obstructions cited, there were also a number of enabling conditions that facilitated the transmission and flow of knowledge. The stability and structure within organisations, as well as diffuse responsibility within a culture of OSH ownership were likely to ease the transmission of, and promote, appropriate information.

Networks may pose a difficult environment for OSH but there is an important facilitator role for the OSH hub (who may be an OSH manager or consultant or may be a keen worker), namely the 'political reflective navigator'. This is where the OSH hub, whether acknowledged formally or not, is an 'actor' who pursues a work environment agenda in a complex network in which other actors pursue other agendas such as productivity, economics and quality. The OSH hub person is political in the sense of pursuing a work environment agenda; and is reflective in the sense of being able to switch between different roles and mobilize different types of knowledge depending on the context; the OSH hub is a navigator in the sense of knowing how to navigate in the complex organisation surrounding the technological change process. The

competencies of a political reflective navigator are outlined with the aim of revising the training necessary for OSH professionals (Broberg and Hermund, 2007).

Engagement, navigation, interpretation and enactment

Engagement, navigation, interpretation and enactment was studied in the context of differing organisational contexts and power relations and also addressed the tensions between apparently conflicting goals such as patient safety and occupational safety in healthcare or productivity and worker occupational safety in construction or logistics. We cover the enactment of OSH messages in section 4.3.

4.2 Beyond ‘procedure’ and ‘adaptation’: towards a third-way for safety research

4.2.1 Theoretical context – rule-based or experientially constructed knowledge

Over the last decade or more an ongoing debate in safety research has focused on the extent to which OSH is a product of rule-based compliance, or instead a practiced or more contingent cognitive activity. The underlying emphasis of this debate has been on the extent to which those who are subject to OSH policy use rules to define their role, or preference more independent or contextual ways of working. The ongoing nature of this debate is unsurprising given the focus of OSH professional practice on risk management and regulatory compliance, and the psychological foundations of much research in the OSH field. However a result of risk management being so enshrined in safety practice, and the behavioural emphasis of so much safety scholarship, is that the safety research community is left having to simultaneously confirm and deny the importance of worker independent thought (Dekker et al 2012). Moreover, efforts to understand safety knowledge tend to focus on either top-down rationalistic perspectives, or bottom-up constructivist models of safety knowledge. Such debates have therefore largely proceeded along parallel trajectories with relatively little work examining formal and tacit OSH knowledge in practice.

The concept of distributed cognition emanated from work by Hutchins (1991) suggesting that most models of cognition are biased towards ‘knowledge in the head’ as compared to ‘knowledge in the world’. Hutchins and Norman refer to the interaction between the two as the ‘division of cognitive labour’. Using this terminology, some of the examples that have been discussed earlier, such as the bricklaying example, would be classed as ‘knowledge in the world’ which are also referred to as cognitive artefacts. The idea is that cognition is a process of continual interaction between these internal (‘in the head’) and external (in the world) types of knowledge. In this sense, the environment is a resource for safety.

In line with the notion of factional approaches to OSH, Dekker (2003) outlined two perspectives on rule development in the workplace, model 1 (procedure application through rule following) and model 2 (procedure application as substantive cognitive affectivity). Hale and Borys (2013) developed these notions further outlining the advantages and disadvantages of each.

Model 1: Top-down classical rational approach to formally pass on OSH information.

From this perspective there is 'one best way', which can be dictated by formal procedures or rules. These are devised in advance by 'experts' and imposed and implemented by management. This is a logical and rational approach; both the rules and the consequences of breaking them are explicit. From an organisational perspective, this is classic Taylorism but it has also been discussed more recently in the context of public sector organisations (Diefenbach, 2009). Rules of this type are said to be good for novices and useful when 'golden rules' (key rules or checklists which aid fast working or must not be broken because of the extreme consequences) are necessary. However, this approach cannot deal with anomalies well, can result in a blame culture and disempowers workers.

Model 2: Bottom up constructionist approach to socially constructed practice.

This approach indicates that a range of behaviours are acceptable within permissible boundaries. In this context workers are experts and apply their experience and knowledge to develop rules. Rulemaking is ongoing and dynamic, evolving in an ever changing working environment. This approach is said to deal better with the ambiguous realities of work. However, there are limitations to this approach, it lacks transparency and can therefore be difficult to audit and problematic for novices. The role of the organisation is diminished and the active management of rules is undervalued.

Dekker (2003) indicates that where there is a focus on Model 1, it results in a 'double bind'. A 'double bind' occurs when there is a gap between procedures and practice i.e. workers can fail to adapt to a problem when adaptation was necessary or workers attempt an adaptation which results in a problem. Rather than seeking to increase compliance, through the application of pressure, organisations should try and understand the gap between procedures and practice, and address competencies which will help workers adapt to new situations. Moreover, Hale and Borys (2013) suggest that a combination of the classical rational and constructivist approaches will enable organisations to manage safety more effectively. They propose a "Framework of rule management", and call for more research exploring how rules are used in practice and ethnographic research in this field.

The descriptor 'absorptive capacity' refers to the process by which valuable external knowledge is assimilated at multiple levels within an organisation, involving several processes that shape the way that newly acquired knowledge is combined with existing knowledge (Lane et al., 2006). This construct contributes to the links between model 1 and model 2. For example, training, CPD, learning from guidelines and rules (model 1) and experiential knowledge, on-the job knowledge and socially constructed knowledge (model 2). Some organisations are good at absorbing knowledge and hence learning from it, others are poor. An example of this is where organisations take worker's suggestions and turn them into procedures. The logistics example cited in section 3.8 showed that the organisation learned from the experiences of the workers and adapted the methods and protocols to suit. Waterson (2014) explores some of these issues in his book on patient safety.

Harvey et al (2014) suggest a link between absorptive capacity and performance. They showed that strategic priorities, processes for managing information, communication and orientation to learning and development impacted on the organisation's ability to engage successfully with external stakeholders and make use of available knowledge.

Another author who has recently discussed OSH in terms of two different models is Hollnagel, who talks about Safety-I and Safety-II and contrasts them as the past and the future (discussed further later). However, in reality, these two 'types' of safety co-exist and our consideration is that both approaches are necessary to fully grasp the full picture.

This also links with the creation and fostering of communities of practice (Wenger et al, 2002; Cambridge et al, 2005). Communities of practice are relevant here because they:

- Connect people who might not otherwise have the opportunity to interact, either as frequently or at all.
- Provide a shared context for people to communicate and share information, stories, and personal experiences in a way that builds understanding and insight.
- Enable dialogue between people who come together to explore new possibilities, solve challenging problems, and create new, mutually beneficial opportunities.
- Stimulate learning by serving as a vehicle for authentic communication, mentoring, coaching, and self-reflection.
- Capture and diffuse existing knowledge to help people improve their practice by providing a forum to identify solutions to common problems and a process to collect and evaluate best practices.
- Introduce collaborative processes to groups and organisations as well as between organisations to encourage the free flow of ideas and exchange of information.
- Help people organize around purposeful actions that deliver tangible results.
- Generate new knowledge to help people transform their practice to accommodate changes in needs and technologies.

Our research has aimed to investigate the interaction between these two extremes of formal and informal knowledge. We take this concept further by providing evidence to explore this 'third way' combination of model 1 and model 2.

Rule-based behaviour (Model 1), experientially constructed behaviour (Model 2) and some mixture of the two (Model 1.5) exist as a result of a combination of the experience and competence of the person or group, the type of task and the context or environment. In some cases rule-based behaviour (e.g. in a safety critical context) will be appropriate, in others it leads people to create workarounds to artificially constrain OSH. However, these two models should not be seen simply as opposites but rather that they shift around according to the prevalent constraints and opportunities.

There are various graphical presentations of models 1 and 2, for example Figure 4.1.

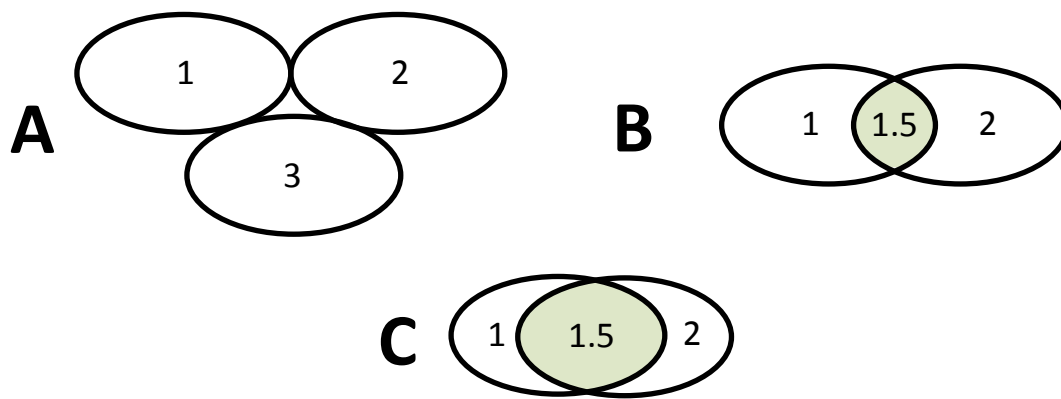


Figure 4.1 Graphical representations of models 1, 2 and model 1.5

Image A in Figure 4.1 is an inappropriate way of representing the knowledge models. In reality, models 1 and 2 are not separate domains and the combination of the two does not create a new model 3 as a completely separate domain. Image B is more interesting in that it acknowledges that there is some middle ground (Model 1.5) and this would then suggest that an improved situation is Image C where there is a greater overlap and more engagements are occurring in model 1.5. However, these representations do not allow for the almost continual movement between the extremes of the two models depending on the person, the environment or the task.

Model 3 rule- and practice-based knowledge

Figure 4.2 suggests that both models 1 and 2 occur together, side by side and are actually subsets of a larger and more appropriate reality which is model 3. We recognise that there may also be situations where this type of model 3 approach would be appropriate. People can add their own practice to rules to create new ways of working. In this case these are not workarounds or compromises, but rule-informed.

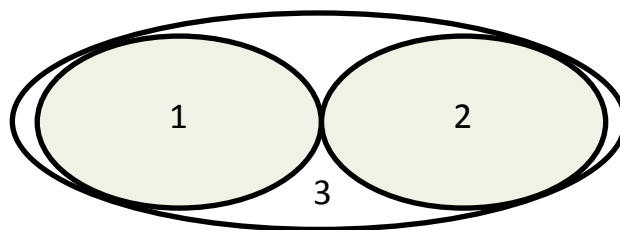


Figure 4.2 Model 3 combination of rule- and practice-based knowledge

The two extremes (models 1 & 2) interact to mutually shape each other through practice. Thus, far from OSH representing an internalisation of rules or the addition of knowledge to action, it represents a way of knowing that emerges incrementally through interactions between social, spatial, temporal, material, sensory features of workplace contexts. So, formalised OSH knowledge both shapes, and is shaped by knowing in practice in a range of unfolding and complex ways. We argue that this blended perspective on OSH represents a ‘model 3’ perspective for OSH research in that it simultaneously accounts for formal, codified and explicit OSH knowledge (itself enshrined in OSH professional practice), as well as informal, emergent and tacit knowledge. Moving beyond a perspective where the formal and informal are seen as being in opposition, to examine the

ways in which they dynamically and continuously shape and reshape each other, is significant for OSH professional practice. For example, an acknowledgement of the changing nature and context of OSH environments presents a radically different vision of the role of the OSH professional in shaping OSH outcomes, especially in the ways in which risk is considered and accounted for in dynamic work-based assessments.

4.2.2 The Third Way – Model 1.5

However, all of these representations are too static and do not reflect the dynamic reality of OSH knowledge or enactment in large, networked organisations. They also do not lend themselves to helping identify the factors that influence the extent of rule-based or improvised enactment. They may describe the problem but do not lead the way to a solution. Figure 4.3 is an alternative representation of the combination and interaction between model 1 and model 2. It recognises that there are never situations where either model is fully employed, but that there are variations in the proportion of each model due to differences in the individual or group, the task or the environment.

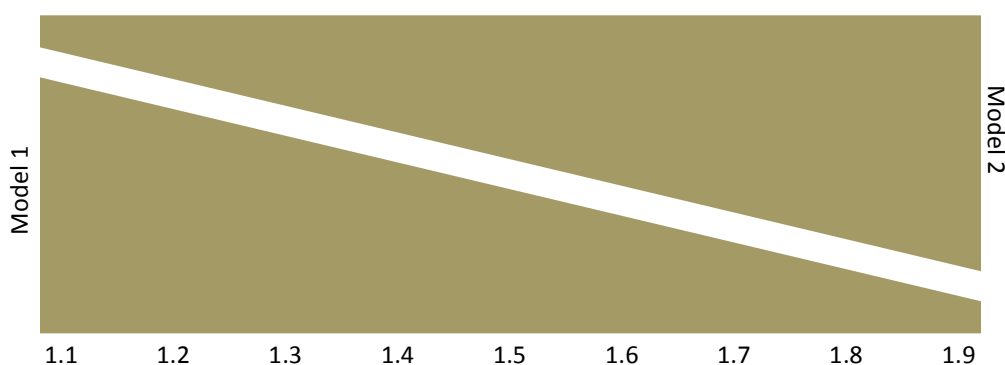


Figure 4.3 The Third Way Continuum

A more experienced and competent individual would tend to be able to operate in a more flexible way towards model 2 and be better able to make appropriate dynamic assessments of the risks and required behaviour. A less experienced individual would tend towards model 1, needing more certainty and clarity of what was allowed and what was not. They are likely to be less able to assess risks insitu or know the appropriate behavioural response. An experienced person who has not been well trained may veer towards model 2 which could be problematic if the missed training is germane to the message and task. However, it could be argued that a lower level of experience fosters more on the job learning as they do not have the formalised rules embedded in their practice.

A more controlled and consistent environment would enable a more rule-based approach to work, whereas the more varied and unpredictable the environment the more contingent the necessary behaviour to maximise OSH and a successful task. Where the negative consequences of an incident are very significant appropriate behaviour should tend towards model 1. The criticality of precise and accurate completion of the

task is likely to encourage protocols tending towards model 1. However, where the task is very complex then model 2 behaviour may be necessary to achieve a positive outcome.

4.2.3 Fieldwork Evidence for The Third Way

Our research has studied the types of OSH knowledge and evidence that are in circulation and how they interact with each other in networked organisations. More specifically, we investigated how workers interpret the multifaceted information they are exposed to and how this interpretation, in dynamic work contexts, influences their behaviour. The data obtained illuminates how top-down rules (explicit information) and socially constructed knowledge manifest and combine in different types of organisations, groups of workers and individuals.

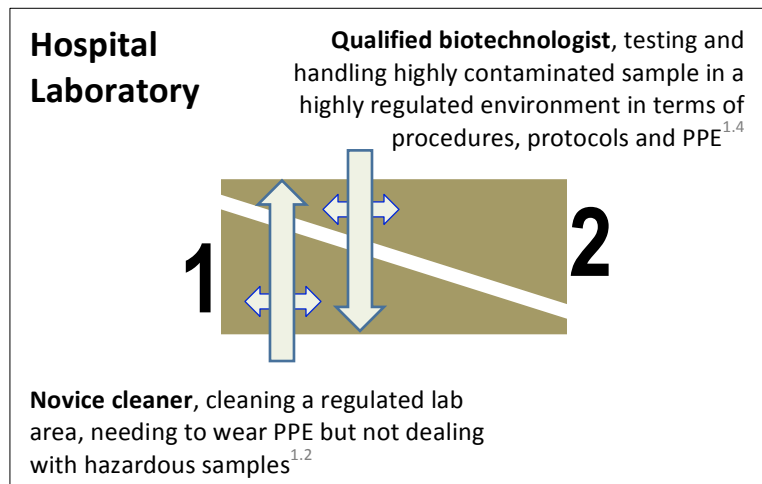
In line with these theories, we found that both types of rule formation occurred concurrently, with the production of both top-down rules and facilitating constructivist approaches. The working environment was the main influence on the type of approach taken. In controlled environments top-down approaches are more likely; however, in dynamic environments expert workers are given the means to develop their own practices. Notwithstanding, the reality is much more nuanced than this and the two approaches often appear as a fog through which workers must negotiate the OSH landscape (Hartley et al, 2014). Workers operate in a hinterland where, consciously or subconsciously, they use a combination of formal rules and informal learning and experience to determine their behaviour. When questioned and observed it becomes apparent that workers are often using a combination of top-down, socially constructed and experiential expert knowledge to inform their performance of a given task. For example, delivery drivers use a combination of formal manual handling training, experience, and 'on-the-job' learning from colleagues to manoeuvre goods into customers' homes. Behaviours varied depending on the circumstances, with workers evaluating their course of action having taken account of multiple variables. For example, workers may or may not ask for help lifting a heavy object depending on the proximity and workload of their colleagues – if their colleague is busy or some distance away they will not ask for help, if they are close they will ask for help. Rules are adapted, this does not necessarily compromise safety, as workers are able to apply their knowledge to adjust to situations, in fact we found that often workers adapt *towards* safety rather than away from it. However, when rules were broken, with resultant negative consequences, evidence of 'the gap' was sometimes found.

In this research we are contributing to attempts to reconcile this biased debate by shifting the debate away from the rule and compliance based nature of the current OSH knowledge debates and focus on what actually happens in OSH practice. However, a simplistic distinction between formal OSH rules and situated OSH practice limits the understanding of a far more complex and subtle picture where the two interact to mutually shape each other through practice.

4.2.4 Applying the Third Way Continuum

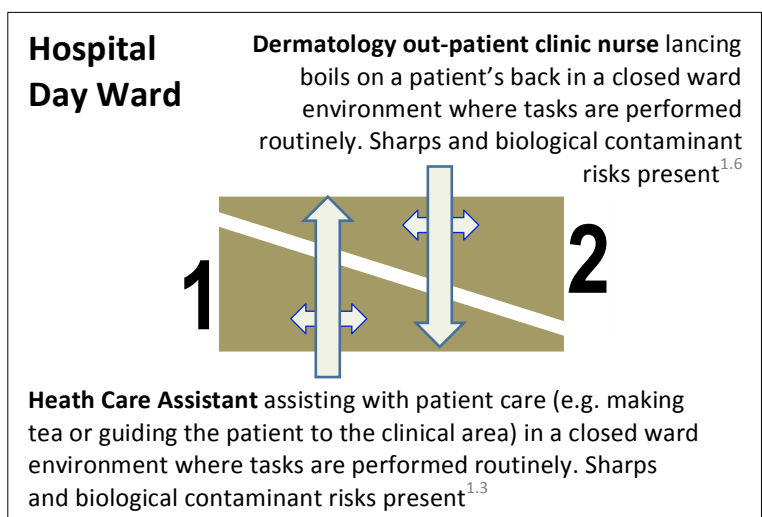
The following snapshot scenarios are used to illustrate the sorts of tasks, individuals and environments that will require, or are likely to promote behaviours at different points of the spectrum between the extremes of the two models. The scenarios are not intended necessarily to show 'ideal' or trained behaviour, but rather likely behaviour given the situations faced.

This snapshot shows two different individuals with different tasks in the same hospital laboratory. Even though the lab is highly standardised and controlled, the biotechnologist would need to be able to respond flexibly if something went wrong, albeit based on a clear framework of risk minimisation. The technologist would also need to be able to differentiate between more and less highly contaminated samples and



choose the appropriate protocols. The cleaner would be able to use routine cleaning procedures but would need to be fully aware that they were now working in a more hazardous environment than normal. They would be unlikely to be able to differentiate between different hazards in the lab and so would need to follow the appropriate procedures when in the environment (e.g. wearing the correct PPE).

On the day ward the nurse would be carrying out routine tasks; however, each patient is different and has different needs. Moreover, the nurse will need to be aware of the risk in the job and make appropriate decisions for personal OSH. The tasks completed by the health care assistant (HCA) are generally very routine and low risk. However, this is still potentially a relatively high risk environment which



must be understood along with the appropriate action if incidents occur. A common incident for healthcare workers is caused by the patient stumbling or falling and the worker being injured trying to prevent the fall. The protocol is to allow the fall but 'guide' the patient to the floor to minimise the potential injury to both parties. Patients' conditions and behaviours will still vary but they are likely to be less infirm on this day ward than on another hospital ward.

Healthcare work in the community requires a more flexible, contingent approach than similar work in a hospital ward. Complex home environments are not uncommon and in some contexts, such as mental health, the risk of violence can be high. The routine check-up could be rescheduled and so the nurse could (and maybe should) make the decision to follow normal lone working

protocol and walk away. However, given the same hazardous home environment, the midwife may take a different approach and need to assess the risk and determine their behaviour much more dynamically due to the real risk to the patient and unborn baby.

In logistics, the warehouse environment is relatively stable and enables a reasonable level of control. Operations which are particularly hazardous such as using forklifts and handling large goods often have specific protocols. However, a delivery driver must adjust to the environment of the house to which they are delivering.

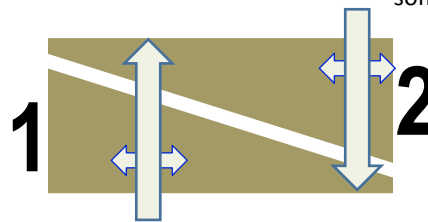
Principals can certainly be set, but the operationalising of the principals will be down to the driver.

Construction sites are hazardous by nature, even at ground level, but falls from height are a particular problem and scaffolds, as temporary structures, are even more hazardous. A general operative cleaning the scaffold may also not be familiar with working on the scaffold. Therefore, even though the method of the task itself would not

need to be rule based, the location means that this worker would need to follow agreed protocols on working at height. In addition of course, in cleaning the scaffold there would be a risk of the debris falling over the

Community Midwife

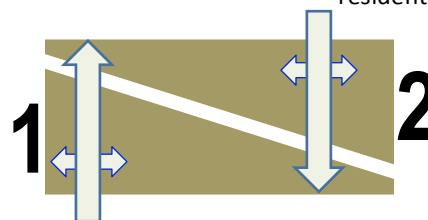
Community midwife attending to a patient who has gone into labour. A stressful home environment where there may be some violence^{1.9}



Nurse doing a routine check on a patient in the community. A stressful home environment where there may be some violence^{1.3}

Logistics

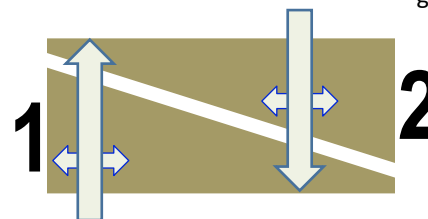
Delivery driver unloading large items and delivering to an upstairs room in a residential dwelling^{1.7}



Warehouse worker using mechanical equipment with high stacks of large goods^{1.2}

Construction

Operative sweeping construction site at ground level^{1.6}



Operative sweeping scaffolding on the 4th floor of an office block^{1.2}

edge of the scaffold and injuring those below, which this worker might not be aware of. This is another reason why a more rule based approach would be appropriate. The worker sweeping at ground level will still need to be aware of the site hazards and adjacent work, also probably mechanical equipment. Nevertheless, the sweeping task would be open to a degree of flexibility and some opportunity for the worker to develop suitable techniques based on more framework protocols.

4.2.5 The Third Way continuum: Conclusions and Implications

In practice, classical rational and constructionist rule development are conjoined and symbiotic; in dynamic working environments their manifestation is complex with the influence of either approach waxing and waning depending on circumstances. Our data reveal good practice within organisations who manage the transfer of OSH knowledge well in that they recognise the value of both approaches and adapt their strategies depending on the job role and situation.

Individuals and groups tendency towards either the rule based or the experientially constructed understanding of OSH knowledge will depend on a number of entwined and interacting factors including the experience and competence of the individual or group, the nature and complexity of the task and the influence of the environment.

The Third Way Continuum has been proposed as a way of both better understanding the reality of OSH knowledge and its enactment but also providing pointers towards more effective management of responses to the challenges. There is always a combination of the two models and organisations should recognise the fact and harness the opportunities rather than bemoan the reality.

4.3 Responding to Reality

We have proposed an alternative to the two extremes of rule-based and an experientially evolved approach to OSH practice (Section 4.2) with the intention of helping people to respond to the reality of the ‘fog’ that is OSH communication and enactment. The situations where ‘it is obvious’ are very rare and both managers and workers need to be able to respond to the real-life challenges that are faced. This section considers partial enactment, workarounds and dynamic risk assessments.

4.3.1 Partial enactment

As explained in section 3.8 and illustrated in section 3.9, the enactment of OSH messages is rarely completely in line with the intention of the original source. Acknowledging the danger of oversimplification, there are a number of different types of enactment, using the word ‘exact’ to represent enactment in line with the intention of the source. The boundaries between these categories are both flexible and porous as each category is not exhaustive.

Exact enactment			Partial enactment	
1	2	3	4	5
Exact enactment of initial message following accurate interpretation and assimilation of the transmitted message, both by the individual and previously across the network and given an environment suitable for the intended enactment.	Exact enactment of the direct message as given by the immediate source, but only partial enactment of the initial message which has become corrupted across the network	Partial enactment of the message because the individual does not understand it.	Partial enactment of the message because the individual considers, rightly or inadvisably, that the conditions and environment that they face makes the message inappropriate.	Partial enactment or non-enactment of the message because the individual decides, consciously or subconsciously, not to follow the guidance or instruction of the message.
Perfect but unrealistic	Likely in large complex networks	Likely, especially for inexperienced workers	Likely in changing circumstances – workarounds & dynamic risk assessments	Requires action to address risk and prevent reoccurrence
6 Enactment wholly or largely determined, based on contingent knowledge, created by the individual or group concerned.				

Category 1 is idealistic and probably unrealistic in most cases. Corruption of the message through the network (2) can also apply to categories 3-5 and would lead to an enactment even further away from the initial intent.

Category 6 is likely to apply fully in some cases, but is also likely to be an influence on the other categories. In other words, some level of co-creation of knowledge by the individual or group occurs in all cases.

Category 2: corruption across the network has been considered previously (particularly section 3.4). Category 3: failure of understanding has been considered briefly in section 3.7. Category 6: co-created, contingent knowledge is discussed at length in section 3.9. This section deals with category 4 and, some aspects of Category 5, in particular, the topics of 'workarounds' and 'dynamic risk assessments'.

It is also acknowledged that, even if the message is clear and suitable for the person, the task and the environment, some workers just do not do what they know they should do for them and their co-workers to stay safe. A full consideration of this issue is outside the scope of this research project, however, we consider that, if the good practices that we have identified are applied then the number of people choosing not to follow the OSH message will be significantly reduced. The recommendations in section 5 provide practical advice on how to best manage this situation and a more practitioner-focused output is planned as a follow up to this report.

4.3.2 Dynamic risk assessments

Dynamic risk assessments fall into enactment category 4: Partial enactment of the message because the individual considers, rightly or inadvisably, that the conditions and environment that they face makes the message inappropriate.

There was a difference between the environments faced in static, relatively unchanging work environments and those where the situation was constantly changing or more unpredictable. For patient-facing staff in healthcare it was often the unpredictable nature of the patient that provided this unpredictability whereas for community healthcare workers or residential delivery drivers in logistics it was the unknown of the home situation.

Construction workers faced a constantly changing environment, but one that was expected and, to some extent, predictable – predictably changeable. Furthermore, construction workers on most sites were facing these changes in the workplace along with their colleagues and supervisors. The project-based, itinerant nature of construction seems to have built up a culture that, at least when it is practised well, can cope with the vagaries in the workplace. The catch phrase response of the children's TV character Bob the Builder comes to mind: "Oh dear, Bob, it's gone wrong again, can you fix it?" – "Yes we can!" However, some construction workers and managers, at least in the smaller companies and sites seem to use this equality and an excuse to not plan at all. This aspect is being addressed on a parallel project on SME and micro organisations⁹.

⁹ *SMEs and micro organisations engagement with occupational safety and health – A Loughborough University project funded by IOSH (2013-15)*

Where the work situation was such that it would regularly change beyond the boundaries envisaged when the task was planned, alternative ways of establishing agreed methods and appropriate training are required. The scenario- or simulation-based training in healthcare, albeit usually focussing on patient safety rather than OSH, seems to provide an example of this approach (e.g. Rosen et al, 2008). The term “simulation” has been defined as “instruction that makes use of simulations of real world contexts where learners interact to acquire knowledge, skills, and affective elements that will ultimately transfer to the real world context” (Salas et al., 2013). Simulation-based training has been used for many years to train those who work in hazardous environments. Effective and safe performance in these settings requires both highly skilled individuals and a high degree of team coordination. In addition to individual competence, communication between team members and decision making become particularly important during the management of crisis scenarios (Moorthy et al., 2005). The concept of ‘safe improvisation’ could be explored, which would require the team to have a sound understanding of the underlying principles of assessing risk and designing tasks rather than just understanding the rules that have been set. Through worker feedback, these improvisations could then be incorporated in revised safe work methods.

Insitu assessment of risk should not be used as an excuse not to plan or assess the risk in advance. But, if the risks are assessed insitu properly then this could lead to an effective workaround which would not need to be less safe than the original method.

It is acknowledged that there are some tasks that have legally prescribed restrictions but managers are advised not to try to control things that don’t need to be controlled and to avoid ‘making sackable offences out of trivia based on dubious statistical studies’. The evidence that we have gathered would suggest the best solution would be to minimise the situations where managers try to control the risk by setting prescriptive rules and to maximise training based on contingent, scenario-based approaches where possible.

The links between minor, insignificant events and more serious incidents have been used to drive down accident rates in a number of high risk sectors including construction, especially with the reporting of ‘near misses’ or ‘close calls’. However, it may be that one undesired effect of this emphasis has been the trivialising of OSH and the overemphasis on rule-based approaches, even for tasks where the negative consequences are minor. Of course, this needs to be taken in the context of acknowledging that some apparently minor but repeated incidents can lead to significant problems in the long term, especially with regard to occupational health incidents. This is clearly not a simple problem and requires further pragmatic engagement away from the rhetoric to work out sensible ways forward.

The findings suggest that managers need to be more sophisticated in managing these insitu assessments and there is not ‘one size fits all’ approach for all sectors, all network types, all individuals and all situations. Nevertheless, they happen, people will assess the risk for themselves and make decisions on that basis but still need to be held accountable for their decisions and actions. The reality needs to be managed rather than ignored, hoping it will go away. We need to stimulate people to understand the consequences of their actions, both for themselves and others. If we take a narrow, directive, procedural approach we should not be

surprised when it does not work – people will adapt and stretch the boundaries – we need to understand this and manage it accordingly. There is a difference between OSH as imagined and OSH as actually done.

4.3.3 Workarounds

Workarounds, shortcuts, cutting corners and bending the rules are expressions that were prominent in the interviews and workshops for this project. Sometimes the words were used interchangeably to mean the same thing although there were also nuanced differences in the way some individuals discussed the subject (see section 3.8.2).

Shortcuts or cutting corners sometimes suggested that the worker was not doing the job properly and was somewhat ‘slap-dash’ in their approach. It was thought that this may have a, usually negative, effect on the quality of the work or on OSH. Bending the rules sometimes suggested the idea of pushing the limits as far as possible without actually breaking the rules or interpreting the rules in a way that was probably different to their initial intention. Workarounds however were more often talked of as pragmatic ways of doing the job which could not be done exactly in the way that was initially planned. This discussion therefore uses the term workarounds in this way, although we acknowledge that this is not always how it is used. In this way workarounds would be the result of a conscious or subconscious dynamic risk assessment. In other words the OSH implications of the new way of doing the task would have been considered before making the change.

Relating to section 4.3.1, most workarounds fall into category 4: Partial enactment of the message because the individual considers, rightly or inadvisably, that the conditions and environment that they face makes the message inappropriate.

It was not the intention of the researchers to make value judgements regarding the precise risks of the tasks discussed. Nevertheless, this research has identified enactment that is at variance with the agreed or prescribed methods or organisational policy which are accepted by the respondents as being equally safe or even more safe. Furthermore, this has not been the case of workers saying they were safe and managers or OSH advisors saying that they were not, but rather an acceptance that alternative methods are sometimes appropriate. The ethnographic work (section 3.9) suggests that workers will always make changes to the ‘formal’ procedures and that this is a normal part of human behaviour and should not be seen as negative. The interviews and focus groups data would suggest a small, but significant change to this claim, namely that these changes should not ‘automatically’ be seen as negative.

It may be that the OSH professional normally only hears the ‘bad news’: the (few?) workarounds that do not work rather than the (very many?) ones that do. They don’t measure successes of workarounds because they never see them.

Workarounds were seen as ways to achieve the intended end goal when faced with situations that were different than those planned or to manage ‘flaws in the system’ that were outside of their control. There is a close link here with dynamic risk assessments – in many ways they can be considered as dynamic problem

solving. There were also differences between an individual worker deciding to use a workaround and a team discussing the issue and coming to the same conclusion, whether or not an official 'supervisor' was present and whether or not the workaround was subsequently acknowledged and adopted as standard (and by implication 'safe') practice.

Notwithstanding, despite all the well-intentioned, well-thought-out workarounds, there were still workers who were willing to take significant risks, breaking the rules 'because they can', because 'it won't take long', because 'on one is watching'. This is a salutary lesson when discussing the reality of workarounds.

A number of the organisations studied had ways of encouraging worker feedback and responding to it. In these organisations it would seem that an ideal 'solution' to workarounds would be that, except in extremely urgent situations, the worker would decide that a workaround would be beneficial but pass that message back up the network to effect a change in procedure, rather than just use the workaround. Certainly, the continued use of the same workaround suggests a breakdown in the feedback mechanisms. From this perspective, workarounds would only be short-term fixes only and become regularised as soon as possible.

As mentioned in the previous section on dynamic risk assessments, the use of scenario- or simulation-based training is likely to be a good opportunity for staff who would be regularly facing these changeable work environments.

4.3.4 Behaviour as a resource

Behaviour as a resource has been described as an extension to resource advantage theory (e.g. Doherty, 2001) which is part of the general theory of competition. We consider that it can and should be applied in respect of OSH.

In a recent paper presented at the IOSH-supported Working on Safety conference, Kirsten Jørgensen (2014) cited a previous colleague Carin Sundström-Frisk from 1982 and argued that "people don't cause accidents, they prevent them". Sundström-Frisk's words were: "People can work day in and day out in a hazardous environment. Through their thoughtfulness, ingenuity, attention and physical abilities they can compensate for poorly designed equipment, facilities and routines, and thus prevent the risks being triggered. Then one day in a few seconds someone loses his or her attention and the accident happens." She argues that this is when people are given the blame for something going wrong.

Behavioural safety or behavioural management is an important focus for many industries today, particularly construction. Most companies want to have a BBS system (Behavioural Based Safety System). Much of this focus concentrates on eliminating negative behaviour and stimulating positive behaviour. This in itself is not a problem but many who are involved in operationalising the BBS systems assume that the default behaviour is bad and that they need to work hard to make it good. The basis of this negativity may well be a concern that people tend to make changes to formal procedures and apply workarounds. We tend to agree with Sundström-Frisk that people are thoughtful, ingenious and attentive, most of the time using their cognitive

and physical abilities to get the job done and get the job done safely. If we could harness this behaviour as it is and apply it to the challenge of creating a healthier and safer workplace then we would achieve much.

This approach is similar to the Safety-I and Safety-II approach by Eric Hollnagel (2014). Hollnagel argues that the existing approach (Safety-I) works to reinforce compliance and avoid things going wrong and is therefore linked to and focussing on failure rather than success. It attempts to prevent failure, for example by constraining performance. He argues that the challenge here is that, as OSH performance improves and incidents decrease, then there is a low frequency of failures and hence less opportunity to learn from them. He challenges the assumption that there is a correlation between a successful outcome and a low probability failure. He argues that systems and decomposable and functionality is binary. Hollnagel proposes Safety-II by moving the manifestation of OSH to focus on what goes right, moving from 'everything' going right to 'enough' going right, from 'avoiding failure' to 'ensuring success'. This is more than purely semantics; he argues that this approach can cope with emergent properties and that the outcomes are due to transient phenomena.

4.5 Person-Centric OSH Knowledge (P-COK) Flow – Sources, Channels and Filters

The person-centric OSH knowledge (P-COK) flow model looks at the findings from this research from the perspective of each individual in the network. It should be considered alongside the Third-Way Continuum which provides more of a holistic perspective. Members of the research team have previously looked at communication flow on the Olympic Park construction for London 2012 (Cheyne et al, 2011 & 2012; Finneran et al, 2012) which built on Conzola and Wogalter (2001) C-HIP model (Figure 4.1).

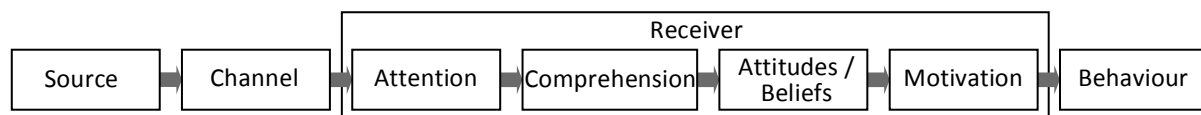
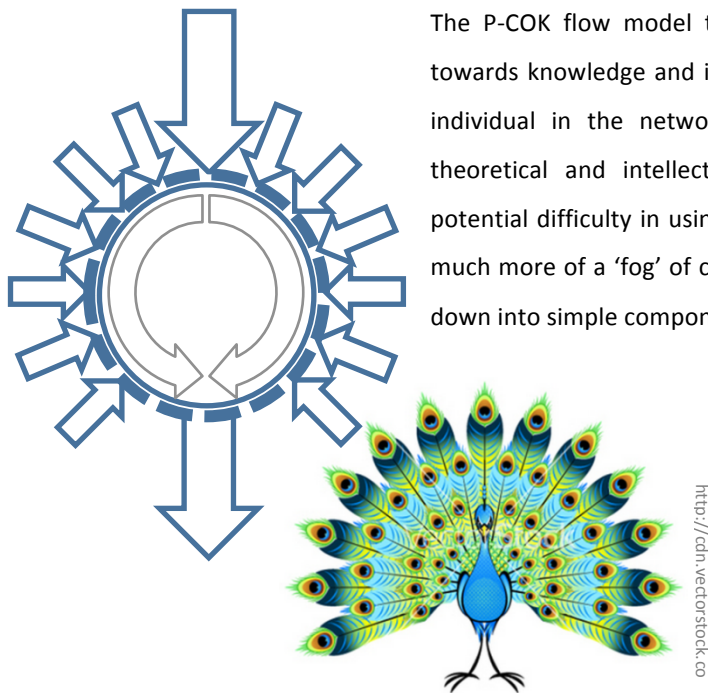


Figure 4.1 The C-HIP communication model (adapted from Conzola & Wogalter, 2001)

Other literature, particularly from the human factors domain, leans favourably towards this way of thinking. Participatory ergonomics, for example, uses participative techniques and tools in projects with people who have sufficient knowledge and control to achieve desirable outcomes (Wilson, 1995). In task design, participatory ergonomics is an umbrella term for a number of user-centred factors that improve the success or integration of a new way of working (Haines et al., 2002; Vink et al., 2005). Endsley (2011) defines situational awareness as the operator being aware of the 'here and now' or their current environment, and understanding what information means to them now and in the future. This information is usually defined as what is important in terms of a particular job or goal. Situational awareness is broken into three stages: perception of the elements in the environment, comprehension of the current situation, and projection of future status. Once an operator has reached the final stage alternating between bottom-up data driven and top-down goal directed processing of the message is one of the vital mechanisms supporting situational awareness. In other words, should the person stick to the goals of the task or alter their work based on cues? However, good situational awareness does not always mean that the best decision will be made. For example, individuals may have good situational awareness, but have inadequate strategies or tactics guiding their decision processes. There may be limited decision choices available due to organisational or technical constraints. The person may have limited or insufficient training or experience to make the most appropriate decisions. Individual factors such as impulsiveness or indecisiveness may make some individuals more likely to make poor decisions. Whatever the reason, the important point here is that these approaches are putting the individual at centre and investigating the factors that affect knowledge flow and action. The person-centric OSH knowledge (P-COK) flow model takes the same approach.

4.5.1 The Person-Centric OSH Knowledge (P-COK) Flow Model

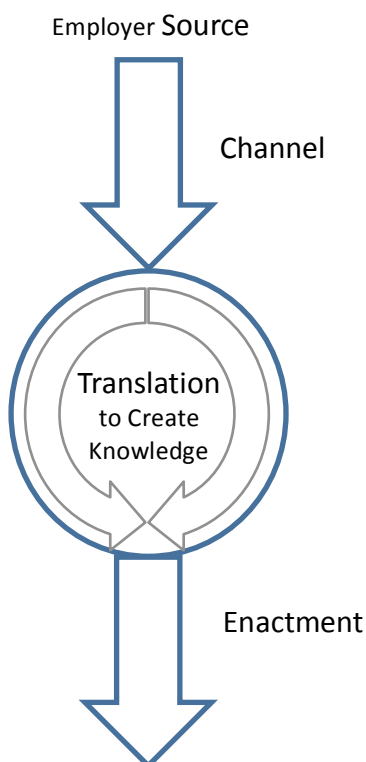


The P-COK flow model takes a pragmatic, person-centric approach towards knowledge and information flow and can be applied to each individual in the network. The research team acknowledge the theoretical and intellectual limitations of this approach and the potential difficulty in using formal geometrical shapes – in reality it is much more of a ‘fog’ of complex interactions which cannot be broken down into simple components as shown here.

We acknowledge Dekker (2011) who criticises the approach of breaking down everything into components which makes them seem artificial or trivial rather than recognising the complexity of the whole system.

Figure 4.2 Idealised Person-Centric OSH Knowledge (P-COK) Flow Model

Idealised knowledge flow process

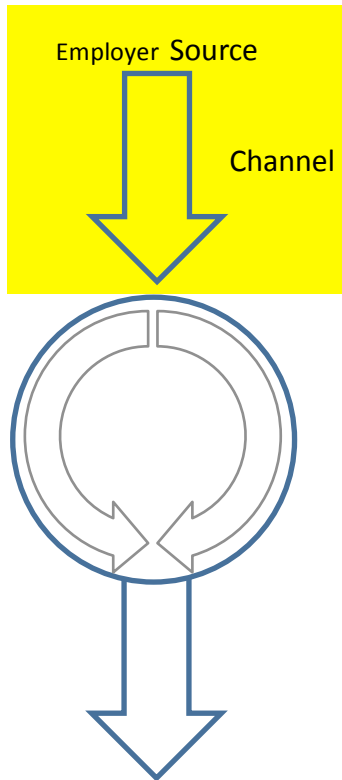


The idealised knowledge flow process assumes:

- A reliable, trustworthy and knowledgeable source
- An effective communication channel
- No other significant influences
- The person’s adequate cognitive ability to achieve accurate translation of OSH message
- The person’s obedient enactment of the message

This is perhaps best understood as the employer’s direct input relating to the task at hand. Typically this is transmitted to each person in the network by their line manager, either verbally or in some written form. The form of enactment varies depending on the person’s position in the network. For many, the primary enactment is to pass on the knowledge or information to the next level of the network. At the final workplace the enactment is the task itself and these ‘workers’ are the ones who are most affected by the information and knowledge as they are the ones who are most likely to be hurt by doing the task.

Source (Employer) and immediate communication channel



The P-COK flow model distinguishes the main formal OSH message source and channel from other sources and channels. For a frontline worker, this message would typically be communicated by the immediate supervisor or manager. It is acknowledged that, in practice, the source and channel are not separate and are significantly affected by other knowledge flow. Factors affecting this source and channel include:

- Accuracy of communication of message to this point in the network
- Quality of information / guidance / instruction
- Appropriateness of the channel
- Influence of employer network
- Culture of the organisation and/or team
- Employment status of the worker (temporary/job role)

In networked organisations it is important to acknowledge the significance of multiple levels of organisations or sections within organisations. Figure 4.3 is taken from a study of communication on the project to construct the London 2012 Olympic Park (Bust & Gibb, 2011) and this aspect is developed further in section 4.6.

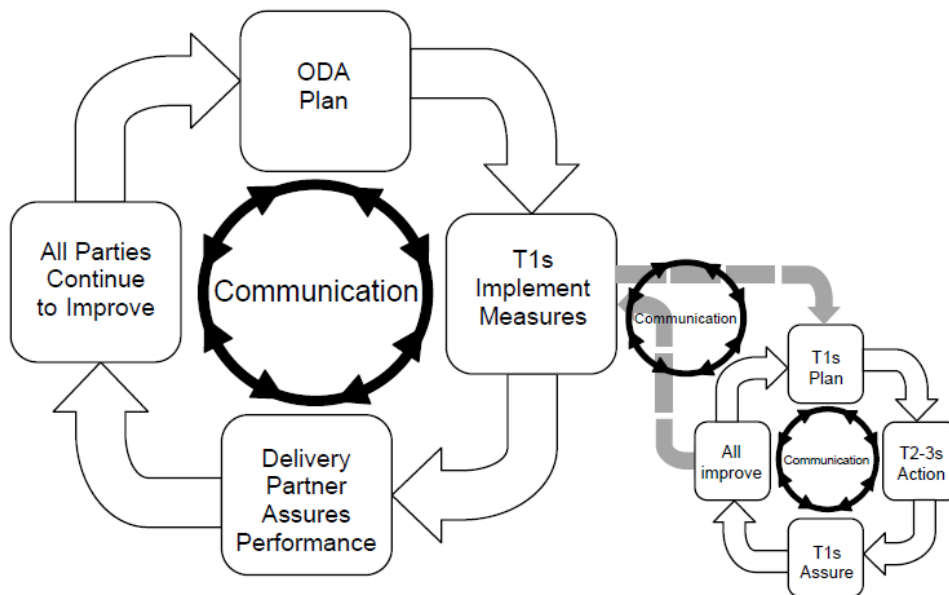
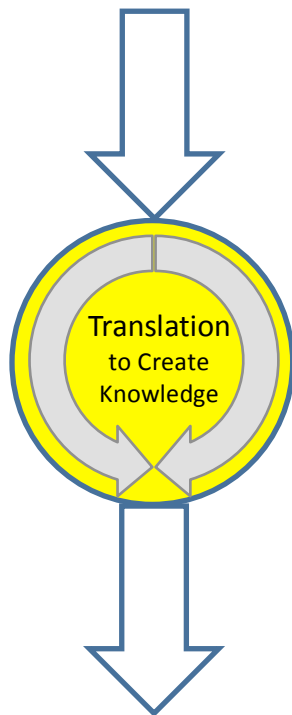


Figure 4.3 Communication loops on the London 2012 Olympic Park construction project

Translation



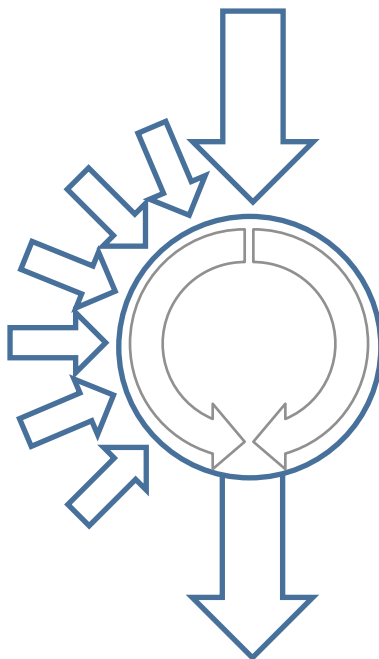
In the P-COK flow model, translation refers to what goes on 'inside the head' of the receiver of the message. This includes C-HIP's *comprehension* and aspects of *attention* but not *attitudes/beliefs* & *motivation*, as these are covered in the P-CKF model as part of the filter or membrane. This also excludes the influence of external information sources, both explicit and implicit.

In the context of this model, it is information that flows and knowledge is only created by each individual by translating the information for themselves.

Effective translation depends largely on the cognitive abilities of the receiver being matched to the channel chosen for the communication.

This aspect of the model is included for completeness but was not studied in detail as it was outside the scope of this project.

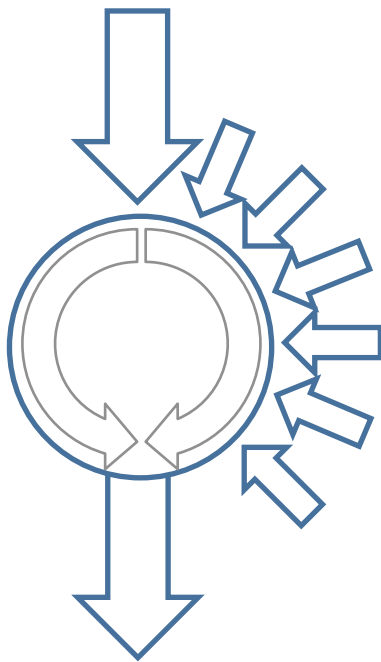
Explicit non-task-specific input



The model distinguishes the main task-related OSH input, typically from the employer, with other inputs. This part of the model covers the explicit non-task specific input and typically includes:

- Previous education
- Previous training
- Employer training (not task-specific)
- Trade/profession-based skills training and publications
- On the job training
- Written guidance (not task-specific)
- Generic method statements
- Generic OSH rules
- Trades Union guidelines
- Magazines / newsletters
- Blogs / discussion forums
- General media coverage of OSH or the industry or site
- Insurance company or claims advisor adverts
- Advice from friends and colleagues

Tacit Subliminal Input and Influence

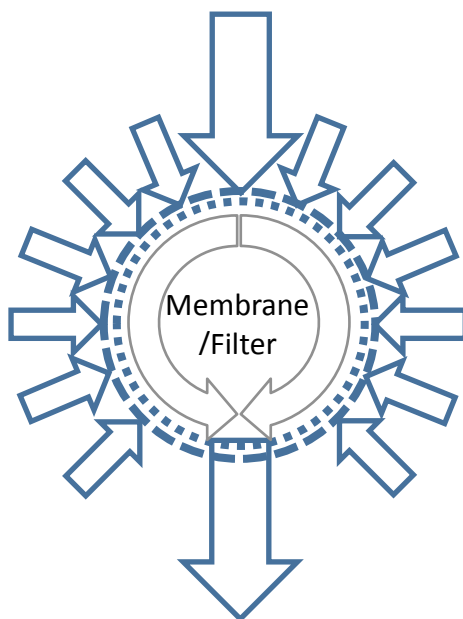


This includes all the inputs that are not obvious to the receiver. Often, when asked how they knew what to do or how to do it safely, interviewees said that they ‘just knew’ or that it was ‘common sense’. However, many unseen, unacknowledged factors will contribute to a person’s knowledge and understanding. These include:

- Industry / trade culture
- Employer /project culture
- Perception of own role and ‘worth’ in the network
- Co-worker example
- Peer pressure
- Historical experience of task and OSH
- Witnessing accidents
- Family situation and background
- Life philosophy or religious beliefs

Many of these inputs will impact on the C-HIP model’s *attitudes/beliefs* and *motivation* categories.

Membranes / Filters



- Situational filter
- Individual filter

The membranes or filters are a way of describing the conscious or subconscious action of the individual to either welcome or resist the explicit and implicit inputs and the conscious or unconscious action to do or not do what they KNOW is right.

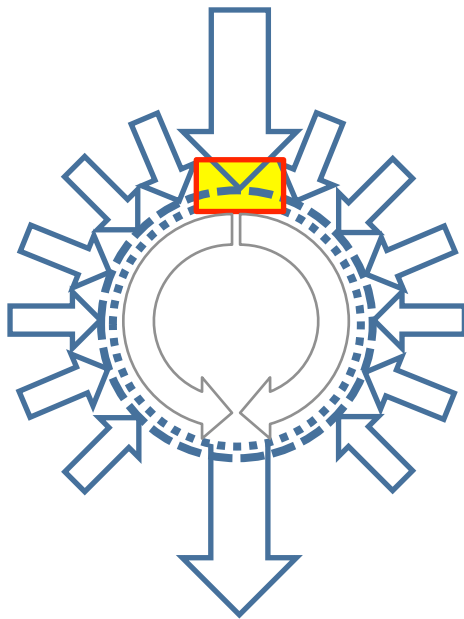
These include some of the C-HIP model’s *attitude/beliefs* *motivation* and also aspects of *attention*

However, it is important to differentiate between what happens at the membrane (i.e. when the information is taken in) and the person’s ability to translate or process the information to turn it into knowledge and enactment.

For the sake of clarity, we have shown two specific filters or membranes: individual and situational. These attempt to describe the fact that different individuals will interpret the same set of information prompts differently and also to

acknowledge the situated nature of knowledge. Obviously, in reality, these membranes do not exist as separate entities but are used here merely to represent the influence of the individual, the task and the situation or environment.

Employer Membrane

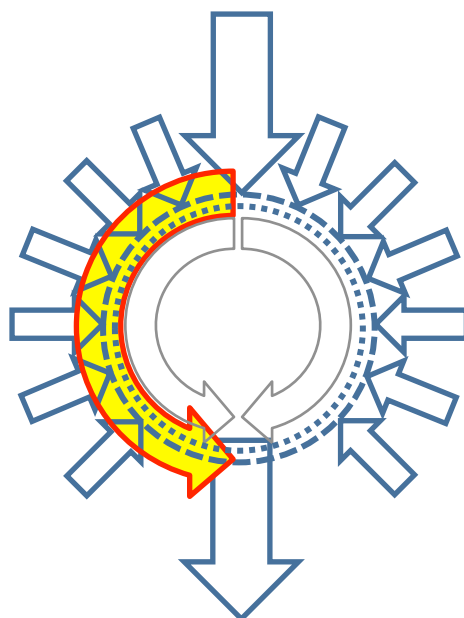


The 'employer' membrane or filter represents the conscious or unconscious action of the individual to either welcome or resist the instruction from the employer. This will be affected by such things as the receiver's relationship with the employer in general, or their agent (i.e. probably their immediate line manager or supervisor), their perception of the credibility of the line manager (for example an older, more experienced worker with a younger, less experienced supervisor).

This can also be influenced by how the individual identifies with the employer or their agent; or rather how important it might be to identify with the communicator

Explicit Non-Task-Specific Information Membrane

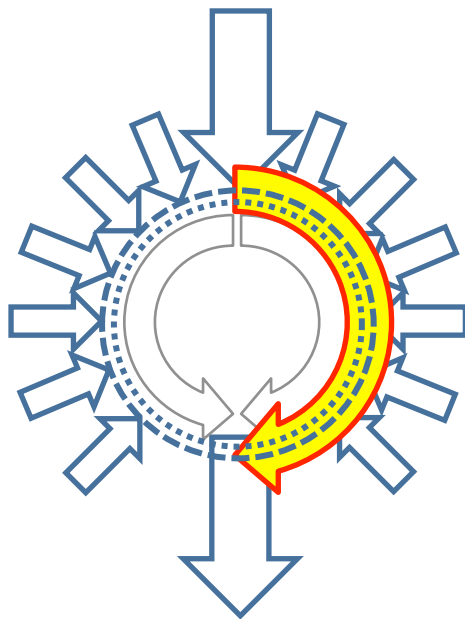
This membrane represents the conscious or unconscious action of the receiver to be influenced by non-task-specific inputs.



This is affected by such things as the trustworthiness of the source, the appropriateness and impactfulness of the channel of the information and the individual's personal engagement or past experience with the source. For instance, a person who is strongly supportive of the trades union is likely to pay more attention to information from the union. A younger person, more familiar with the internet may be more inclined to be influenced by web-based information.

Furthermore, there may be some social pressure to accept these influences on the creation of knowledge and enactment, workers could become more certain of issues that they have to rehearse explicitly and possibly justify publically (Cowan and Hodge, 1996).

Tacit / Subliminal Membrane

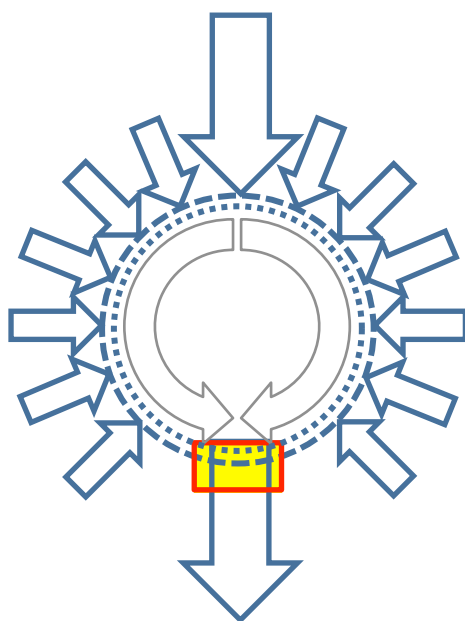


This membrane represents the conscious or unconscious action of the individual to either welcome or resist the subliminal inputs and influences.

It could be argued that, as these are subliminal inputs, the person cannot choose to filter them. However, strongly held belief systems, such as religion, can create an effective filter to inputs which do not accord with the belief system, or, alternatively welcome inputs that do.

There is some evidence to suggest that peripherally processed messages (where the recipient is not paying full attention) rely on certain cues (like attractiveness of the communicator and reactions of other recipients) (Wood and Kallgren, 1988).

Enactment Membrane: Why do people not do what they know they should do?



This is one of the questions that most troubles practitioners: “Why do people not do what they know they should do?”

This membrane represents the conscious or unconscious action of the individual to either do or not do what they know they should do. It is affected by such things as cost, time, lack of resources, boss bullying and ego. These aspects are covered in more detail in the Third Way Continuum (Section 4.2)

This project did not specifically measure behaviour and therefore field data to describe this membrane is limited to comments made and attitudes displayed by the interviewees.

As most of us choose to ignore certain laws where we consider that they are inappropriate or overly restrictive – perhaps one example for many of us would be the 70 mph speed limit on

motorways in good weather – so, we should not be surprised when some workers choose to not obey ‘to the letter’ all of the rules that we set, especially where they consider them inappropriate.

The P-COK Flow Model

Figure 4.5 shows the completed model. In this version, the size of the arrows denoting inputs have been varied to indicate that the influence of different inputs will vary according to the person, situation and task and

also vary over time. Furthermore the significance of the main 'employer' task-related input is also likely to vary considerably and may actually be indistinguishable from the other inputs.

4.6 OSH message flows across the network

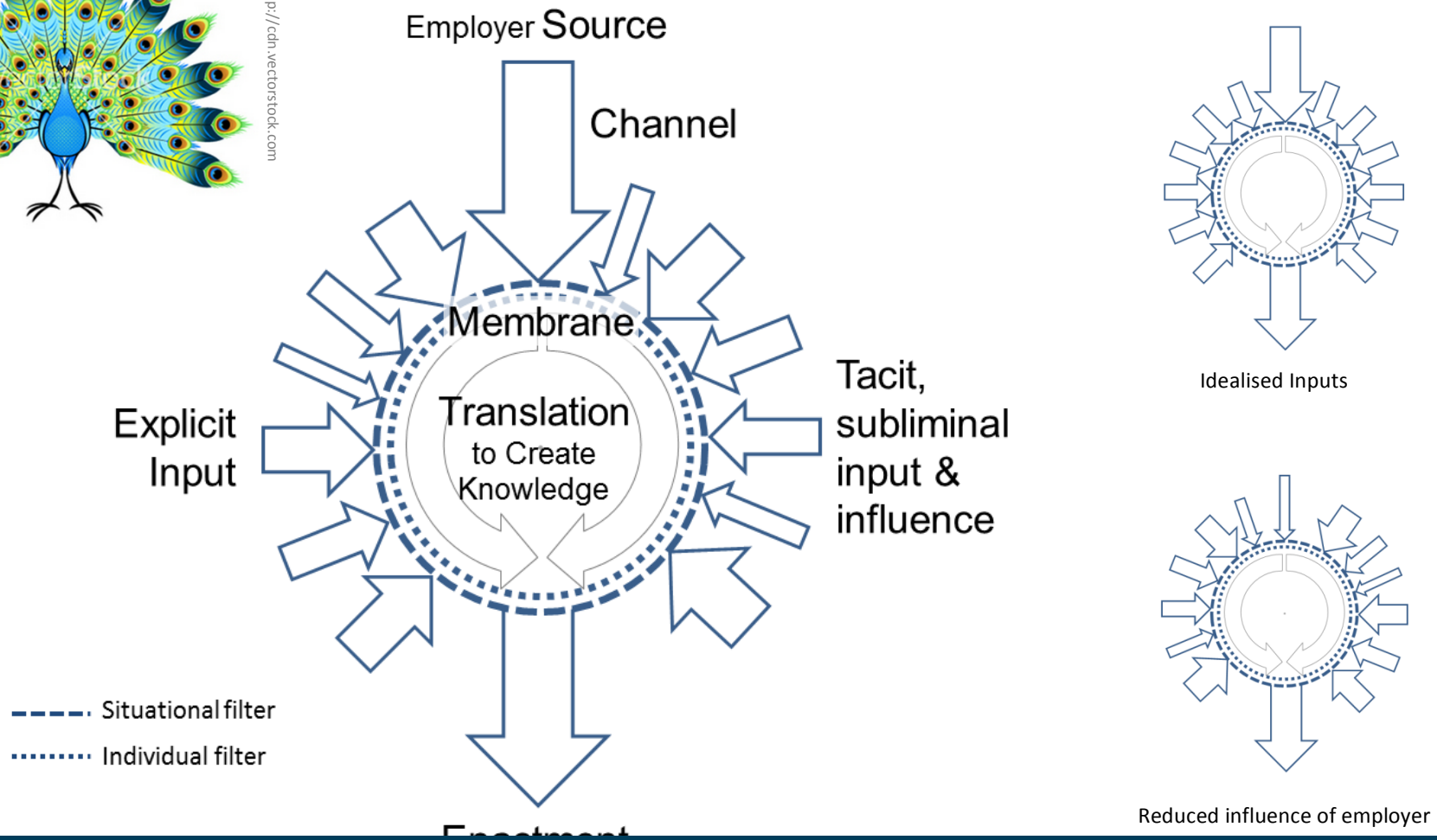
4.6.1 Impact of a complex network

Throughout this report, we have shown that much OSH knowledge is experientially constructed and actually does not flow. However, we have also argued that some messages do flow and therefore it is important to consider the extent to which the network helps or hinders this flow.

Section 3.4 has shown the complexity of the movement of OSH messages across large multi-organisational networks. Figure 4.6 provides a generic representation of the Person-Centric OSH Knowledge (P-COK) Flow model as part of a networked construction organisation. This also demonstrates the complexity of direct 'employer' inputs to many of the receivers in the network. This generic network is also much simplified as, in virtually all construction organisations there will be many separate project sites and many subcontractors and suppliers working on each site. Furthermore, the OSH relationship with other actors, such as the client, designers and other external bodies, has been omitted.



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Primary Explicit OSH 'Knowledge' Flow Networked Organisation (Construction)

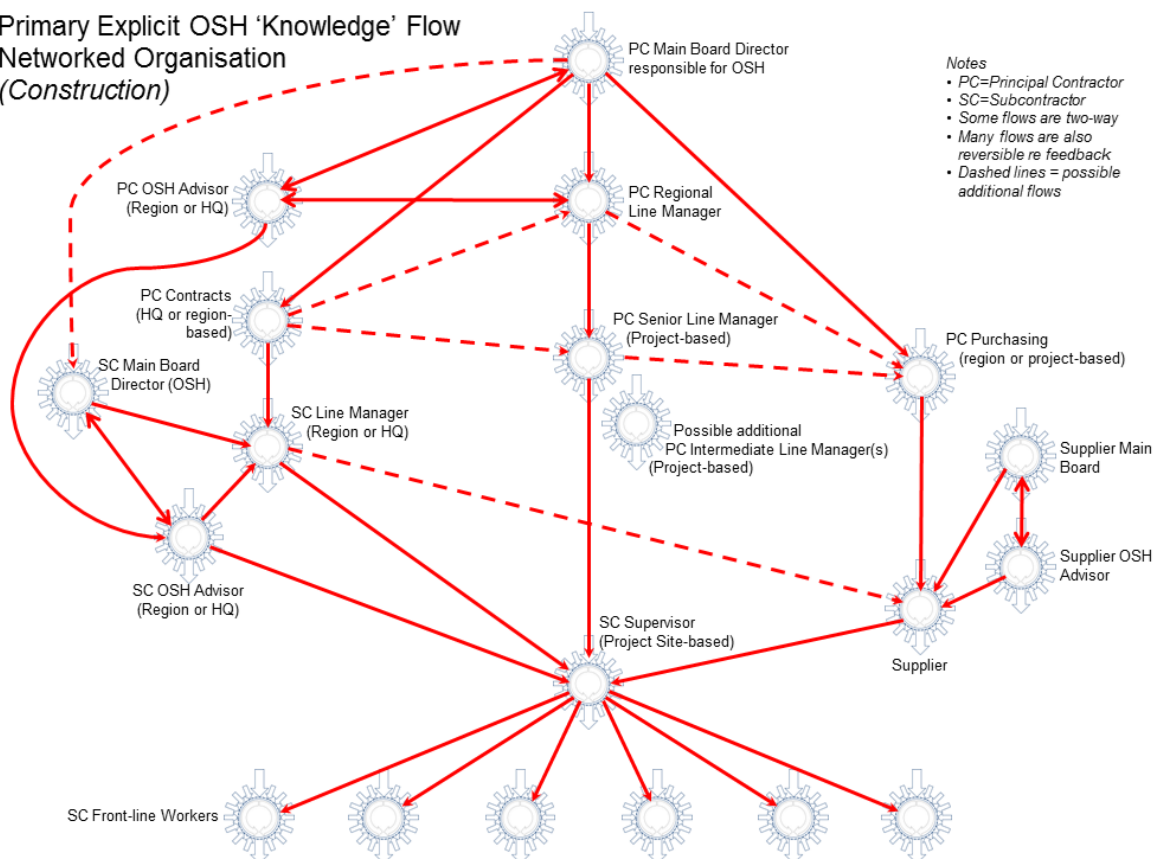


Figure 4.6 Networked representation of the Person-Centric Osh Flow Model (construction)

As discussed previously most actors in the network receive messages and pass them on to others, with the frontline workers being the ones who are generally most at risk and most affected by the accuracy of communication across the network.

The red lines in Figure 4.6 show the primary communication routes, most of which are shown as one way, top down. This does not deny that there is some two-way discussion and feedback of OSH knowledge up the network, but the predominant flow is downwards. The links shown as two-way are generally between OSH professionals and the person or group that they report to. This reflects that practice that they will typically both advise their superiors regarding OSH issues and take instructions from them to pass on through the network. The dashed lines indicate secondary communication links for example between the main board directors of the principal contractor and the subcontractors. These lines can be taken to represent the main employer task-related input as shown in the P-COK flow model (section 4.5). Each actor will also be receiving additional explicit and tacit inputs which will affect their translation and enactment, whether that be passing on the message or doing the ultimate task.

The network shown in Figure 4.7 is actually a series of sub-networks which add layers of complexity to the already challenging route for top down OSH messages and OSH feedback up through the network.

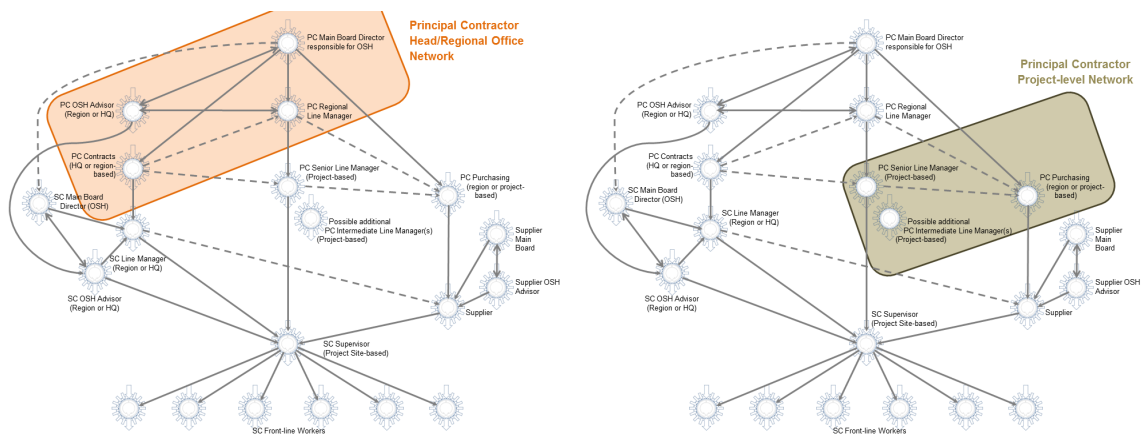


Figure 4.7 Principal Contractor Head Office/Regional Office and Project-based Networks

Figure 4.8 shows the principal contractor (PC) networks both at head office or regional office and also at project level. Typically in construction, discipline heads will be centrally located and site-based professionals will relate both to a site management structure and to a functional structure linked to head office. On larger projects more disciplines will be based on site, whereas on smaller ones they will visit several sites.

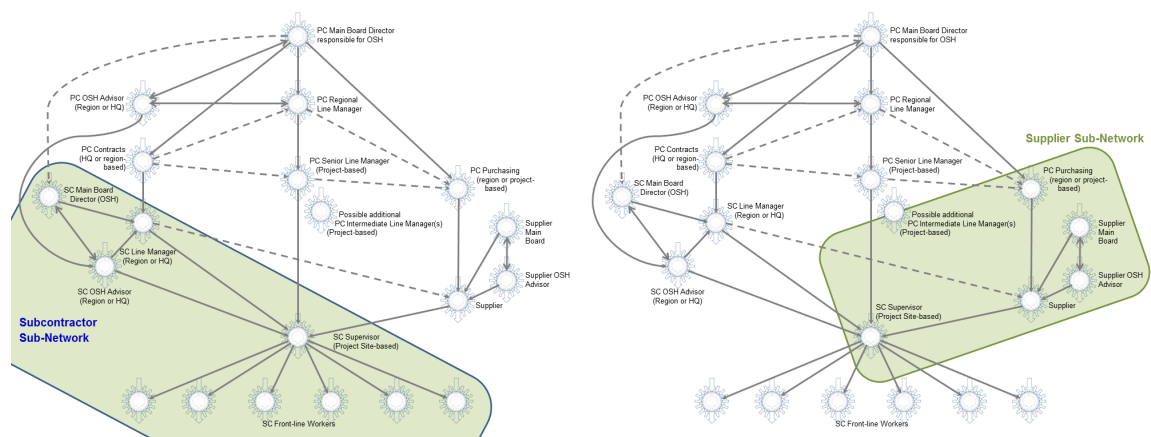


Figure 4.8 Subcontractor and Supplier Sub-networks

Most large construction contractors employ subcontractors to do the work. On large projects there may be several layers of subcontractors. In addition, some will also use labour-only providers for certain tasks. Typically the first line supervisor will be employed by the subcontractor but will be directly linked in to the PC's site management team as well. Similarly, suppliers will communicate directly with the subcontractor supervisor but also the purchasing staff of the PC who may be based on site or at head office.

Figure 4.9 shows the site-based network involving the PC and subcontractors (of which there will be several) and also the interactions with the supplier and subcontractor networks both on site and off site.

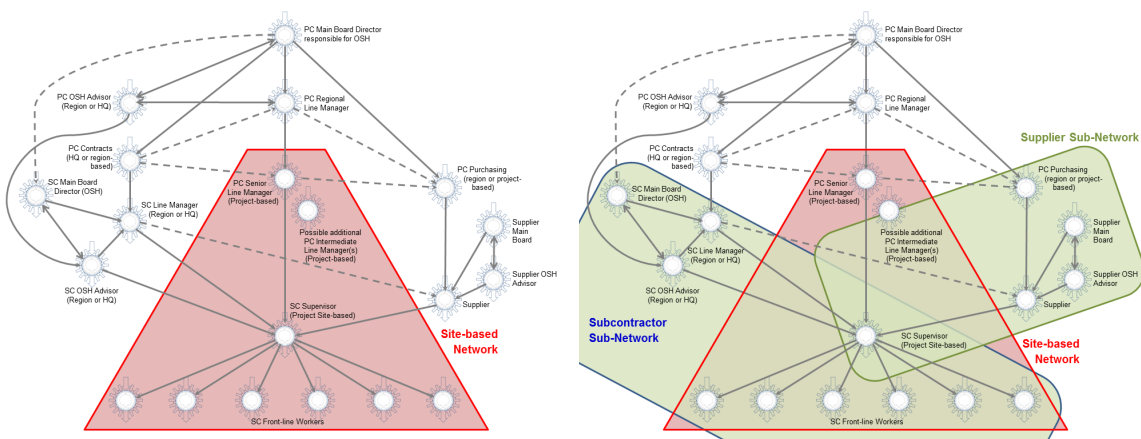


Figure 4.9 Multi-company site-based network and interactions with subcontractor and suppliers

Finally, Figure 4.10 brings the various sub-networks together, indicating the complexity at the interfaces and the multiple routes for OSH messages to flow to the frontline workers. In recent years the key role played by the construction supervisor has been recognised (Cheyne et al, 2012). These diagrams show how many different sub-networks the supervisor relates to and how many different, potentially conflicting OSH messages that the supervisor must process.

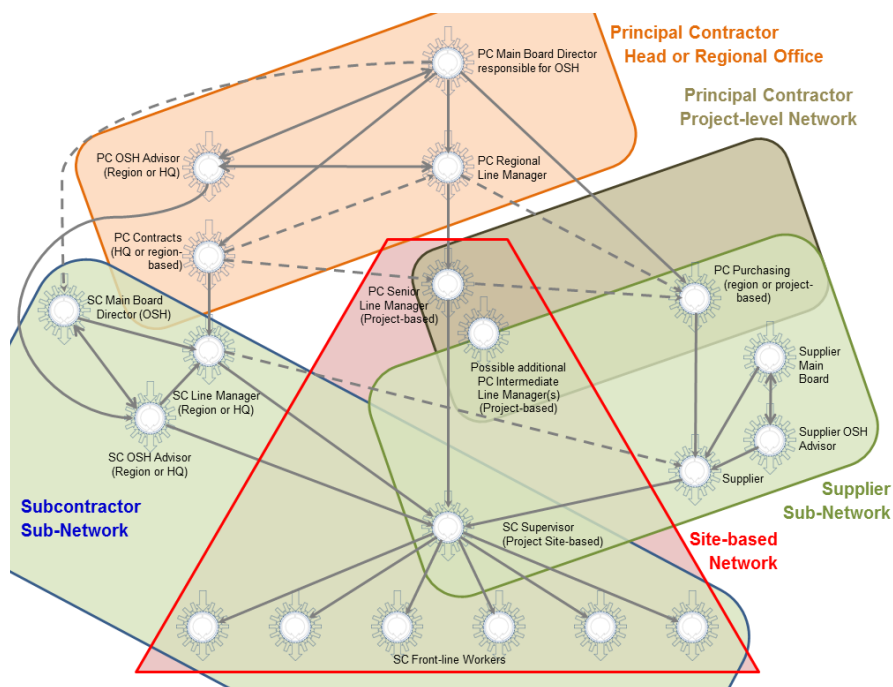


Figure 4.10 Simplified sub-networks for a typical construction project

4.6.2 Impact and influence of non-task-related inputs

The P-COK flow model distinguishes direct, task related inputs from other explicit external and implicit tacit inputs. This section introduces some of these inputs and shows how they will almost certainly vary across the network. Figure 4.11 shows typical inputs to a main board director of a construction contractor. The main 'task' input relating to a particular project would be from the client/funder of the project and the design team. Actually, the detail of this input may be given directly to more junior managers who then would need to brief the director. Clearly there are a large number of additional explicit inputs, many relating to how the company is performing, or would be affected by OSH should an incident occur. Tacit inputs will include organisational and personal factors and almost certainly 'what the competitors are doing'. There have been some interesting legacy impacts from the OSH success of the London 2012 construction work: many large projects are saying 'we want to do better than the Olympics!'

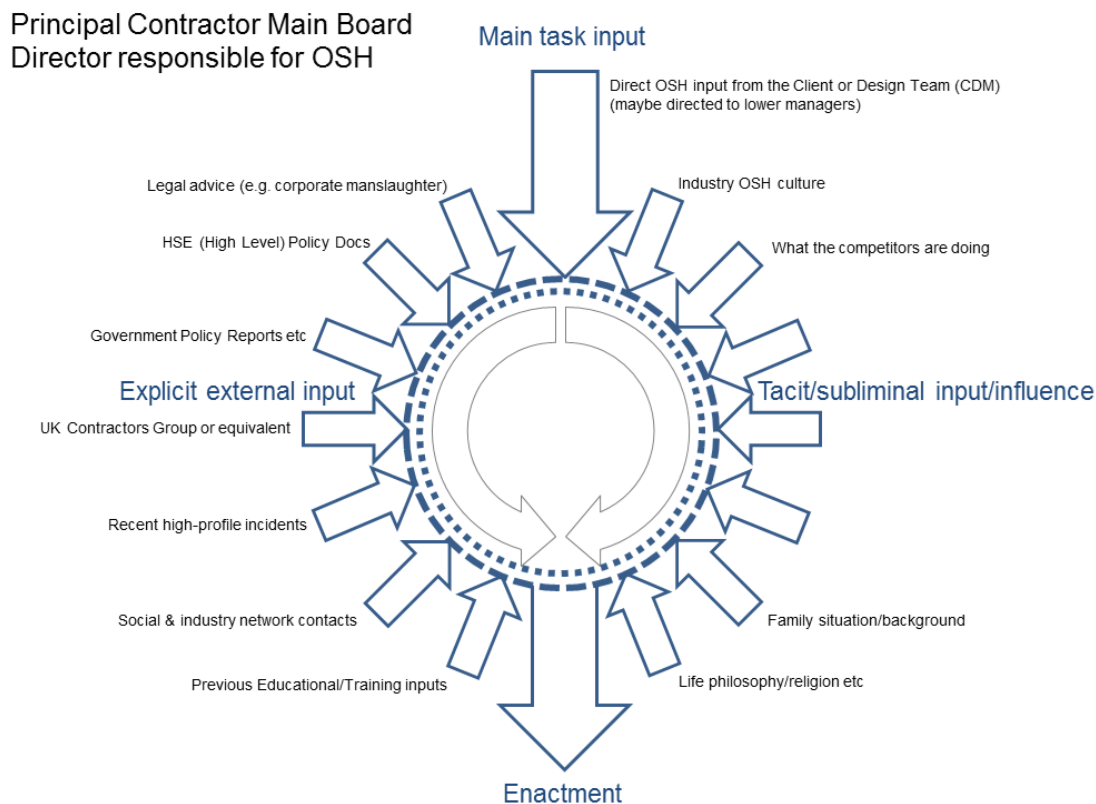


Figure 4.11 Typical knowledge inputs: Construction Main Board Director

The frontline worker is likely to be given the main task-related OSH message from the line supervisor.

However, Figure 4.12 indicates the plethora of additional explicit and tacit inputs.

Further work is required to develop these representations and to establish the relative influence of the different sources and channels. However, it is clear that this is a complex topic deserving careful consideration.

SubContractor
Front-line Workers (*Site-based*)

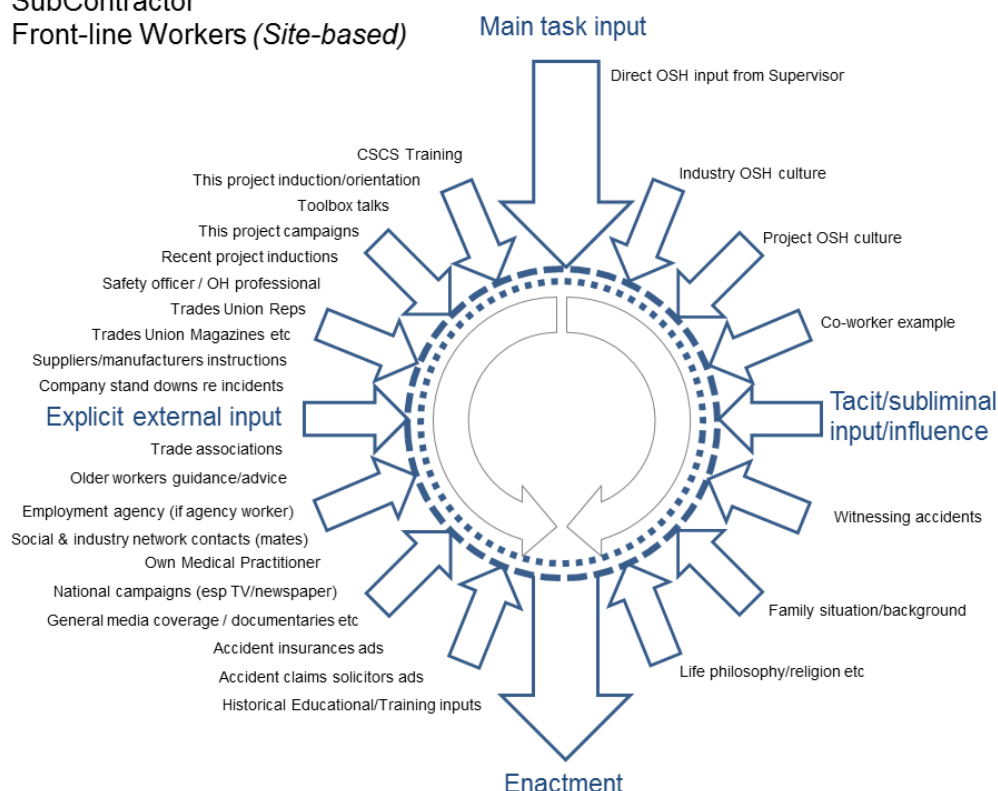


Figure 4.12 Typical knowledge inputs: Construction Subcontractor Frontline Worker

Table 4.1 provides a generic construction example of how some of the main explicit sources differ across the network and, in particular at the different seniority levels in the network for both principal contractor (PC) and subcontractor (SC) personnel. As discussed in Section 3.2, some of these sources are internal to the organisation and some external. There will obviously be specific variations depending on the nature of the organisation or project. More work is needed to explore these issues further as they are key to the effectiveness of the flow of OSH messages and OSH knowledge.

Looking first at sources which have the most coverage across the network. In theory at least, every player will have some direct instruction regarding their role which includes OSH, in particular in construction due to the significant increase in the profile of OSH over recent years. Also, everyone is affected by their previous educational or training and to some extent by the social or industry circles in which they move. With recent high profile incidents, it depends on how recent, how high profile and how relevant to the person's job or interests. 'Everybody' knows about Deepwater Horizon, but how many know more detail about the links between process safety and near miss reporting that were unearthed in that high profile incident.

The PC OSH advisor is likely to have their 'fingers in all the pies', but may not have any direct involvement with some of the site details such as material specification sheets. The SC OSH advisor may be similar or may have slightly less links to the policy and procedural aspects that are often more relevant to larger organisations. The precise role of the OSH advisor is relevant here. In some cases they just 'advise' in a very generic sense, setting policy and auditing performance but leaving the detail operationalization to the line managers. In other cases

they will be involved in the detail as well. More work is needed to explore this aspect to provide advice on good practice and the pros and cons of each approach.

Table 4.1 Explicit Sources differ across the network (construction example)

Explicit Input Sources (Construction)		PC Main Board	PC OSH advisor	PC Procurement	PC Purchasing	PC Regional manager	PC Project manager	PC Section manager	SC Main Board	SC OSH advisor	SC Regional manager	SC Supervisor	Supplier Main Board	Supplier OSH advisor	Supplier	SC Frontline worker
Internal	Direct OSH instruction	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Specific risk assessments		X				X	X		X		X				
	Material specification sheets		??					X		??		X		X		X
	Site campaigns		X				X	X		X		X				X
External	Legal advice	X	X	X		X			X	X			X	X		
	HSExec Policy	X	X						X	??			X	X		
	HSExec Practice		X					??		X		??		X		
	Government Policy reports	X	X						X	??			X	X		
	UK Contractors Group etc	X	X						X				X	X		
	Federation of Master Builders etc		??						X	X	X					
	Construction Products Assoc etc		??							??			X	X	??	
	Recent high profile incidents	X	X	??	??	??	??	??	X	X	??	??	X	X	??	??
	Industry campaigns		X			X	X	X		X				X		
	Social/industry networks	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Previous educational inputs	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

KEY PC: Principal Contractor SC: Subcontractor

Some individuals, such as procurement or purchasing staff, are often considered to be peripheral to site-related OSH. However, emphasis over recent years on ‘prevention through design’ and related legislation such as the Construction Design and Management regulations, should really not only concentrate on architects and design engineers, but on anyone who influences the work or workplace, including those who decide what the contracts say or which materials or products will be bought. In a similar way, suppliers of materials or equipment also have a role (e.g. see Gibb et al, 2005 and 2006). The extent to which these more peripheral individuals or organisations acknowledge this role has not been established in this study.

The influence of campaigns will again very much depend on how well they are devised and executed. However, in general, site campaigns seem to have an effect only on site-based people and industry-wide campaigns seem to miss out those who are more involved in practical, workplace issues rather than policy.

Unsurprisingly, industry bodies tend to 'look after their own' in that they have a reasonable influence over their own members but often less so over others. The key here therefore is that these bodies need to be communicating with each other at a high level to ensure that their individual messages are complementary.

5 CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

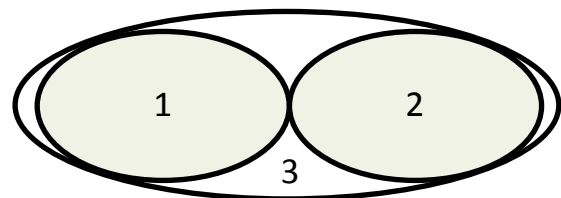
5.1.1 To flow or not to flow

Collectively our work has questioned the extent to which OSH knowledge flows in a linear sense, or even if it flows at all (as raised especially by the ethnographic research in Section 3.9). What unites the various strands of our study is that OSH knowledge is shaped and reshaped through the process of enactment; at times it is appropriated, while at others it is augmented through its situated application and re-application elsewhere in the network. It is, therefore, mutating as it travels through time and space, both ‘picking up’ and ‘leaving behind’ aspects of the message.

The ways in which formal and informal OSH knowledge interact and mutually shape each other is a product of both the complexity of the networks within and across which it must travel, and the nature of the hazard context and regulatory environment for which it has been designed. In some cases formal knowledge will gather tacit practices as it travels, growing in terms of its scale and complexity. In other situations it will remain largely intact, shaping and determining the processes and behaviours it is designed to govern. The challenge for the OSH practitioner community is to understand the role of the institutional context in shaping this pathway, deciding when to accept localised contingent practice as being equally valid to formalised knowledge, and knowing how to harness the power of emergent practices alongside those of codified approaches to achieving positive OSH outcomes.

This is not OSH as an internalisation of rules or the addition of knowledge to action, but rather a way of knowing that emerges incrementally through interactions between social, spatial, temporal, material, sensory features of workplace contexts. We argue that this blended perspective on OSH represents a ‘model 3’ perspective for OSH research in that it simultaneously accounts for formal, codified and explicit OSH knowledge (itself enshrined in OSH professional practice), as well as informal, emergent and tacit knowledge.

The changing nature and context of OSH environments presents a radically different vision of the OSH professional’s role in shaping OSH outcomes, particularly in how risk is considered in dynamic work-based assessments. Specifically, a ‘model 3’ perspective



encourages OSH professionals to go beyond conventional approaches to safety management and practice. Responding to Hale and Borys’ (2013) plea for the pressing need to find a middle ground for safety-rule management, this perspective paves the way for developing understandings that blend ‘model 1’ and ‘model 2’ aspects including (as they characterise): the need for safety rules to cope with diversity and dynamism

(model 2 'flexibility') but also for these to be grounded in principles of transparency, consensus, and the explicit identification and communication of non-negotiable 'golden rules' (model 2 'standardisation').

A 'model 3' perspective moves away from instrumental approaches to OSH-knowledge or a focus on examining how OSH rules, regulations, and procedures are (or could be better) managed and/or improved. In some contexts, the extent to which workers are aware of OSH regulations and the ways in which they apply them can be easily measured. However, in others there are aspects of OSH that need to be addressed in new ways – especially in contexts (as our findings have revealed) when routes to safe working, and the configurations of knowledges, objects, persons, and circumstances that shape safety, require that OSH regulations are adapted or added to when contextualised through workers' own experience-based and culturally specific knowledge of contexts or processes. This requires a rethinking of the expectations and approaches that are taken to OSH. By attending to the more difficult question of *how OSH is enacted and known in practice as part of specific workplace environments and contexts*, a 'model 3' blended perspective offers a productive avenue for understanding how OSH is *actually* done and how it might be effectively designed in the future.

5.1.2 So, what DOES flow and HOW?

Notwithstanding our argument above that assuming linear knowledge flow is simplistic and inappropriate; there is still evidence of the both formal and informal flow of messages with some remaining largely intact across and through the networks. But, even here the network and sub networks, each with their own subculture, add complexity to the flows and pathways to eventual enactment. There are many enablers and obstructions to this flow; filters or membranes through which information and knowledge must pass before enactment. Effective social networks and OSH knowledge hubs, whether acknowledged or not, acting as 'political reflective navigators' have a very significant positive effect on knowledge flow, both as sources and channels, often providing 'arenas' for shared learning. Increased stability and structure within organisations, as well as diffuse responsibility within a culture of OSH ownership were likely to ease the transmission of, and promote, appropriate information. However, some OSH knowledge structures are so fragile that the influence of the OSH knowledge hub can be negated. 'Absorptive capacity' is the process where valuable external knowledge is assimilated at multiple levels within an network, involving several processes that shape the way that newly acquired knowledge is combined with existing knowledge.

The transmission of knowledge and its final enactment can be inhibited by lack of stability, time pressures, priorities, social groups, or sub-cultures within organisations, conflicting messages from different sources, over-bureaucratic committee structures and the interface between organisational departments.

Most actors in the network receive messages and pass them on to others, who see them as the source and may or may not acknowledge the original source. The frontline workers are generally most at risk and most affected by the accuracy of communication across the network. The interaction between the various sub-networks is also key in successful movement of OSH messages – effective management of these interfaces is crucial for OSH message transfer.

5.1.3 How do people receive and process OSH messages?

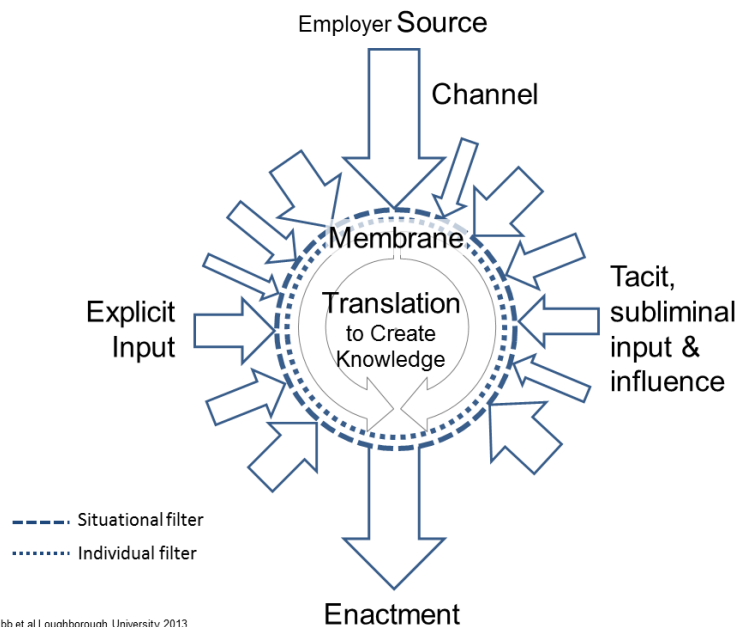
Our work has identified multiple sources for OSH messages across the network, with people closer to the workplace often having several different formal sources as well as the many informal sources and the unknown or unrecognised sources of tacit knowledge. The more formal sources tend to be used by OSH professionals and managers whereas the workers tend to rely more on additional informal sources for OSH knowledge. However, there is much more “know what” than “know how”.

The best combinations of channels for OSH knowledge will depend on the nature of the message, the people and the nature of the hazard context or situation. The most common and effective channels for OSH knowledge were face-to face (meetings, training and verbal

communication), electronic (internet, intranet and emails) and written media (notices, leaflets and posters). Some organisations were failing to adjust to the opportunities and challenges of technological advances such as smart phone internet access.

Managers should understand the individual nature of workers and how knowledge can be translated and transformed based on factors that affect them specifically along with the task and hazard environment that they work in. There are also tensions between apparently conflicting goals such as patient safety and occupational safety in healthcare or productivity and worker occupational safety in construction or logistics.

We have developed the Person-Centric OSH Knowledge (P-COK) flow model, building on previous work, to help explain the explicit and tacit sources and channels for OSH messages. The model also imagines filters or membranes depending on the situation, the hazard context and individual that consciously or subconsciously prioritise, encourage or discourage the taking in of the different messages.

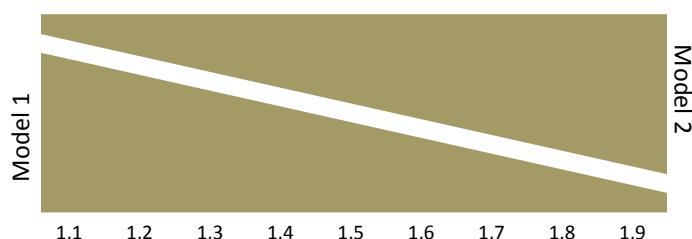


5.1.4 Rules or experience? The Third Way Continuum

Previous authors have introduced two types of knowledge or knowing: model 1 (formal, top-down, rules-based) and model 2 (social, bottom up, contingent, experientially constructed). Arguably, the pursuit of the rule-based, model 1 approach in the OSH domain has led us to undervalue or mask out the complex social order and the sophistication of the OSH practices used by workers when they work safely. There is a need to

balance out model 1 and model 2, where model 2 is not necessarily unsafe and actually may be 'more safe'. This is sometimes what would be called the 'enactment of safety'.

We have introduced and defended the Third Way continuum as a representation of the combination of these two models, arguing that there are never situations where either model is fully employed, but that there



are variations in the proportion of each model. The extent to which individuals rely on formal and informal knowledge can be a function of experience, familiarity with the work environment and instruction from their organisation and our research has empirically revealed influencing features on such decisions. Dynamic work environments and changing hazard contexts suggest a level of flexibility in the interpretation of formal information as well as the use of more individually and/or socially constructed practices.

Individual's and group's tendency towards either rule based or experientially constructed understanding of OSH knowledge will depend on entwined and interacting factors including the experience and competence of the individual or group, the nature and complexity of the task and the influence of the environment. There is always a combination of the two models and organisations should recognise the fact and harness the opportunities rather than bemoan the reality.

5.1.5 What about enactment? Dynamic risk assessments, workarounds and behaviour

We acknowledge that there is a clear need to properly consider all tasks and to establish appropriate, safe and healthy methods to complete them. It is also important to ensure, as far as possible, that all tasks are completed in a safe and healthy manner. For high risk tasks, great care should be taken to avoid inappropriate alteration of the agreed method, although, in dynamic high-risk situations, it is essential that those involved are able to assess the risk 'in the field' and to take appropriate action. Many contemporary OSH management systems stress the need for workers to be empowered to stop any task or process that they consider is not safe. We also acknowledge that, for a small number of situations or tasks, 'stopping' the task is not an option and there could be a need for action to be taken immediately to prevent a catastrophe. Where such tasks are envisaged, individuals should be properly trained to be able to make good decisions under extreme pressure, for example using scenario-based training mentioned earlier.

Notwithstanding, in the majority of cases, particularly for lower-risk tasks, although safe working methods may have been agreed, there may be several alternative methods to do the task safely. Furthermore, the task environment may change such that the previously planned method is inappropriate. It is in such cases that acknowledging that the enactment of OSH messages is rarely completely in line with the intention of the original source can actually improve OSH management and increase the likelihood of unwanted consequences.

Dynamic risk assessments are partial enactments of the message because the individual considers, rightly or inadvisably, that the conditions and environment that they face makes the message inappropriate, at least in part. Such insitu assessments – as the ethnographic research particularly enabled us to understand – were more likely where the situation was constantly changing or more unpredictable rather than in static, relatively unchanging work environments. Shortcuts or cutting corners sometimes suggested that the worker was not doing the job properly and may have a, usually negative, effect on the quality of the work or on OSH. Bending the rules often suggested the idea of pushing the limits as far as possible without actually breaking the rules, or interpreting the rules in a way that was probably different to their initial intention. Workarounds however were more often talked of as pragmatic ways of doing the job which could not be done exactly in the way that was initially planned. Workarounds would be the result of a conscious or subconscious dynamic risk assessment and in most cases the OSH implications of the new method would have been considered before making the change. Workarounds were also more likely where the worker, rightly or wrongly, considered that the risk resulting from the new method was not great, probably because they considered that the risk from the original task was not great either. Thus, workarounds were considered less likely for high risk tasks.

There were differences between an individual worker deciding to use a workaround (which was not advisable) and a team discussing the issue and coming to the same conclusion, whether or not an official ‘supervisor’ was present and whether or not the workaround was subsequently acknowledged and adopted as standard (and by implication ‘safe’) practice.

Workarounds will happen – they must be managed. Typically managers cannot measure the success of workarounds as they only tend to hear about the ones that fail. This suggests a pressing need for practitioners to better recognise the range of everyday (and often unnoticed) adaptations of practice and OSH guidelines that are directed towards safe working. Workers will always make changes to ‘formal’ procedures as a normal part of human behaviour and should not automatically be seen as negative. While adaptation and improvisation is inevitable, we would go beyond this assertion to suggest that it may also be considered a *crucial* component of effective OSH practice if it is approached as providing reflexive opportunity for individual and organisational learning and growth. Thus, rather than trying to increasingly regulate against uncertainty, efforts may be more productively directed towards better supporting and enabling workers to improvise towards and through safety. Yet, notwithstanding this claim, some workers still take significant risks ‘because they can’, ‘because it’s quick’ and ‘because no one is watching’. However, many people are thoughtful, ingenious and attentive, most of the time using their cognitive and physical abilities to get the job done and get the job done safely. We should harness this behaviour as a resource rather than seeing behaviour just as a liability. One implication of this perspective is that managers and organisations need to actively seek deeper understanding of how and why such improvisations take place, and on the basis of this understanding should therefore be able to determine the best ways to harness this tendency to improvise in ways that will produce safer working practices. In making this claim we reiterate that OSH guidance is, of course, necessary and vital. Yet, given the impossibility of regulating for *every* scenario and future uncertainty, it must be ‘open’ and

'flexible' enough to permit worker improvisation while remaining precise enough to ensure that are directed towards creating safer working environments and practices. This remains the key challenge for those tasked with designing effective OSH futures.

5.1.6 Sectoral and Organisation-size differences

Our sample size and research approach does not make it possible to provide a formal comparison between the three sectors studied. Furthermore, as all of our case studies were, by definition, large, networked organisations, we have not sought to identify the transition between 'simple' and networked organisations. This aspect is explored further in our companion report for IOSH (Gibb et al, Awaited) on occupational safety and health in micro, small and medium-sized enterprises.

Notwithstanding, there are some obvious differences between the sectors which have some impact on the way that OSH messages and knowledge emerges and moves:

- Healthcare has the major challenge of the potential tension or even competition between occupational health and safety of the staff and patient safety. There are shadows of this in 'customer care' in logistics deliveries but not to the same extent.
- Healthcare involves greater interaction between different levels of staff with different backgrounds (e.g. doctors, nurses, support staff, facilities management staff).
- There are also different typical entry levels across the three sectors, with construction generally having the lower academic requirements at the worker level.
- The training approaches and expectations are different across the three sectors.
- Community healthcare and logistics home deliveries both have a strong interaction with the public in their homes. The larger construction organisations studied do not, whereas micro construction organisations do (See Gibb et al, Awaited).
- Organisations in all three sectors were networked, but there were more external organisations (i.e. subcontractors) involved in construction.
- There is a significant difference in environment between warehouse and deliveries in logistics than between the different contexts in the other sectors.
- The workplace environment in construction changes more rapidly than the other sectors and influences such as the weather are more prevalent.

These factors do affect how OSH messages and knowledge are handled. However, this report has drawn lessons from each sector and shown where they cross over or are particularly relevant for specific work environments. There are more similarities and opportunities for cross sectoral learning than is often given credit. We encourage those involved with each of the sectors and other sectors beyond these three, to read the whole report and, rather than dismiss findings thinking that they are not relevant to them, to review their own environment and situation to look for ways in which the lessons can be adapted and applied to improve the occupational health and safety of all involved, particularly those who are more likely to get hurt.

5.2 Recommendations

5.2.1 Recommendations for OSH practitioners and line managers

There is a difference between OSH as imagined and OSH as actually done. Therefore, as an **OSH practitioner** or **line manager**, we recommend that you:

- read this report and carefully considers its findings – they are not straight forward and could easily be misinterpreted
- promote a more thoughtful understanding of OSH knowledge flow across your network, in particular of:
 - how OSH knowledge is co-created and interpreted socially, both in informally and formally, leading to workers ‘picking up’ knowledge either explicitly or tacitly
 - how embodied, sensory, affective, intuitive and experiential ways of knowing are crucial to how workers make OSH ‘feel right’ or ‘work in practice’
 - how OSH knowledge moves across networked organisations often in informal, subtle, and less direct ways
 - do not imagine that an OSH message will reach its destination in a straightforward manner and intact
 - effective transfer of knowledge will need to use several channels, requiring ‘retuning’ and ‘recalibration’ activity as the knowledge moves around networks
 - how formal and informal, internal and external explicit knowledge sources and tacit knowledge will influence your staff
 - how the ‘fog’ created by OSH-philic and OSH-phobic filters will help or hinder OSH messages getting through to the individuals
 - do not assume that what appears to be a straightforward OSH instruction will be enacted in the way intended, once it has passed through the various channels and filters
- use the 3rd Way Continuum to consider task planning, taking the individual and environment into account to choose the appropriate position on the continuum between top-down, rule based approach and a bottom up, contingent approach
- use the Person-Centred OSH Knowledge (P-COK) flow model to improve your and your staff’s understanding of how individuals take in explicit and tacit OSH messages that affect their translation and enactment
- work with your people:
 - identify, support and cultivate your OSH hubs, especially those near to the frontline workers (often ‘keenies’)
 - concentrate on training and supporting in particular those who instruct frontline workers (e.g. supervisors)
 - consider behaviour as a resource
 - use people’s behaviour as a positive influence to avoid accidents in the real world
 - identify and support routine, taken-for-granted, or ‘quiet safety’ practices that have been devised by your workers to ensure their own and other’s safety
 - develop effective processes to hold people accountable for their decisions and actions
 - some workers still take significant risks ‘because they can’, ‘because it’s quick’ and ‘because no one is watching’ – intentional unsafe behaviour should be responded to
- when planning training:

- avoid a 'one size fits all' approach for all sectors, all network types, all individuals and all situations
- work to minimise repetition and bureaucracy in site or workplace inductions, especially where individuals are likely to attend multiple similar events
- complement standardised and generic training with locally specific methods and information
- develop training schemes and approaches that acknowledge and exploit learning as an ongoing and incremental process which is situated, practical, and socially co-constructed and which happens not only from what people are told or from what they see, but also the embodied, physical, and sensory experience of doing
- design training to equip workers with the skills and confidence to understand the principles and not just to understand the rules, so they can adapt their practice as appropriate to specific contexts, yet make it precise enough to ensure that decisions taken by workers are directed towards safe working
- improve training to help all workers understand what risk is and how to assess it rather than just telling them to obey the approved method statement
 - e.g. use scenario training methods to help workers gain an improved understanding of risk in the field so that they are better able to make good decisions if required in changing situations
 - focus on individuals who may need to make immediate decisions under extreme pressure to alter an agreed safe working method to avert a catastrophe
- encourage worker involvement in the design of safety strategies:
 - develop strategies to enable workers to openly discuss, reflect on, evaluate, and share decision-making processes, while recognising and seeking to alleviate the power and status differentials, or fear of reprimand, that may result in reluctance to talk about OSH issues and innovations
 - identify and build into systems locally generated innovations that have emerged from the experiential learning of workers
 - use worker engagement initiatives (e.g. feedback cards, rewards-scheme, worker representatives)
 - develop techniques to capture safety innovations as they are ongoingly experienced and occur in normal work activities
- when developing safe work method statements and risk assessments:
 - involve frontline workers in proposing methods whenever possible, ideally directly, or, if not through worker feedback means, OSH committees etc
 - be realistic and don't over-state the level of risk - try to avoid 'making a fuss' over minor, low-risk or very low likelihood hazards (e.g. try to avoid the 'Bonkers, Conkers' trap)
 - if it is a lower-risk task, seek to provide as many alternative methods as possible
 - choose appropriate mitigating action should the worker decide that the method cannot be followed when 'in the field'
 - where possible, avoid just saying 'stop' if you can't follow the method precisely, because you know that the worker probably will not follow that instruction unless they consider they are at a high risk
- take workarounds and dynamic risk assessments seriously:

- acknowledge that dynamic risk assessments, leading to workarounds will occur and should be specifically managed
- carefully consider likely workarounds and plan to make them safe¹⁰
- don't condemn workarounds without consideration
 - We can't measure the success of workarounds – we only hear about the ones that fail
- understand the role of the institutional context in shaping OSH knowledge, deciding when to accept localised contingent practice as being equally valid to formalised knowledge, and knowing how to harness the power of emergent practices alongside those of codified approaches to achieving positive OSH outcomes

5.2.2 Recommendations for OSH researchers

We recommend that the OSH research community:

- develops and tests the theoretical concepts presented in this report around the bottom-up, contingent nature of OSH knowledge
- continues the evidence-based investigation of dynamic risk assessments and workarounds
- extends this work to compare and contrast low-risk and high-risk tasks and sectors
- seeks evidence-based evaluation of Hollnagel's Safety I and Safety II approach, moving from 'everything' going right to 'enough' going right, from 'avoiding failure' to 'ensuring success'

5.3 Limitations

By its very nature, all research has limitations. In this case we have studied a number of organisations across three industry sectors. We consider that this has provided some significant insights into how OSH messages and OSH knowledge works in networked organisations. We have noted some important differences across the sectors (see section 5.1), but our sample size and approach does not enable us to make sector-wide conclusions. Furthermore, our case studies were all large, networked organisations and therefore we are not able to draw specific comparisons with non-networked organisations. This aspect, to some extent at least has been explored in our companion IOSH-funded report (Gibb et al, Awaited) on occupational safety and health in micro, small and medium-sized enterprises.

¹⁰ An example was given where construction workers were fixing the reinforcing steel for an insitu concrete wall. There was a scaffold at each side, but to move from one side to the other, the initial safe working method statement assumed that the worker would climb down the ladder to ground level, go around the end of the wall to the other scaffold and then climb up the ladder. The obvious workaround was that the workers would climb up the reinforcement cage and step through to the other scaffold. The sensible action from the supervisor was to create a safe access directly across the reinforcement cage.

The initial intended method was that our ethnographic work would follow the first phase of interviews and focus groups in each sector. This was the case for the Logistics sector and, to some extent the construction sector. However, for the healthcare sector, both approaches were applied concurrently. However, have carefully reviewed the work, we consider that this did not significantly alter the findings from either the ethnographic or interview phases in any of the sectors.

We adopted an interdisciplinary approach which was a principal feature of the project. Five different disciplines were involved: human factors and ergonomics, organisation studies, safety science and ethnography were used as 'lenses' to interpret the data gathered. We consider that this is a significant strength of the work, but has also had implications such as our difficulty in demonstrating simple linear connections between the data collected and the conclusions. The conclusions were reached following close consideration of the various data sets and considerable debate amongst the multi-disciplinary team to strive to achieve a reasonable balance between the views through the different methodological lenses. Specific perspectives from the different disciplines have been and will be published in other journals and conferences as appropriate.

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6 APPENDIX

6.1 Interview inventory

Introduction and overview for participants – We are interested in the management of Health and Safety within your organisation or anyone else your organisation deals with. More specifically we are interested in how health and safety flows, and is understood.

Introduction (not recorded)

- Thank you for agreeing to be interviewed
- Researcher(s) introduce selves/roles/group
- Brief reminder about the focus of the study – identify the main goals/objectives of the meeting
- Time available

Permission to tape - **Interview questions: (recorded with participants consent)**

- Permission to quote / Confidentiality / Anonymity
- Saying things off the record
- Access to the report
- We are interested in your perspectives on health and safety there are no right or wrong answers!
- **Focus Groups – try not to talk over each other.**

Thank you for agreeing to participate in this research!!

Interview questions: (recorded with participants consent)

Warm up:

Focus Groups – Go round the table getting respondents first name and background information.

- Briefly - I'd like to start by getting some background information: who you work for, what you do, where you work, how long you have worked here and if you have previous experience within this industry or other industries. Can you tell me about the health and safety here? Is it different to previous jobs you have worked on? How?

1. Networked organisations (your organisation and others)

Can you tell me what you think a network is?

What do you think a network is in relation to OSH?

Can you draw this for me?

Do you think the structure of your organisation affects OSH flow?

2. Flow

Can you tell me about OSH flow at the company as you understand it? How do you find out about OSH? Is there anything that hinders or helps this?

3. Translation

Do you think the OSH information is easy to understand? Is there anything that inhibits or enables your understanding of OSH? Do you think that there are any particular methods that help you understand?

Which types of information are the best for improving your understanding of H&S?

What is the best way of finding out about H&S?

What is the least effective way of finding out about H&S?

What H&S information sources do you trust the most? Why?

4. Enactment

How do you respond to the OSH information you receive?

Can you translate the information you receive to do your job safely?

Which types of information are the best for improving your motivation to behave safely?

Which types of H&S information have had the most influence on your behaviour? Why?

Do you ever take short-cuts / use workarounds? Under what circumstances / Why? Could/would these workarounds affect your ability to do your job safely?

Professionalising Questions:

When there is a work practice which conflicts with H&S what do you do?

Have there been new H&S rules or practices which make it difficult for you to do your job? What was done about this?

Have you worked with the H&S managers to solve a H&S problem?

5. Scenario and Critical Incident Technique: - Case studies

6. Could you tell me about a time when the OSH knowledge or information flow and use affected (positively or negatively) your ability to do your job safely?

In particular could you think of examples that relate to:

- a. Manual Handling
- b. PPE
- c. Working in the home
- d. Equipment

Pointers for Critical Incident Technique (Please use these as a guide)

1. Creating a detailed timeline
 - a. **Ask** the interviewee to give a quick run-through of the incident.
 - b. **Listen** for areas to probe further.
 - c. Identify decision points, gaps in the story, conceptual leaps, errors, or shifts in situation assessment.
 - d. When an interviewee mentions, "I just knew x would happen," or "it was just a gut feeling to choose that COA (Course Of Action)," **Flag** those points for further probing.
2. Deepening on Decision Points
 - a. Ask key probes that investigate flags you have noted in creating the timeline.
 - b. Probes for investigating decision points and shifts in the situation assessment may include:
 - i. What was it about the situation that let you know what was going to happen?
 - ii. What were your overriding concerns at that point?
 - iii. How would you summarize the situation at that point?
 - c. Probes for investigating cues and expert strategies, and goals may include:
 - i. What were you noticing at that point?
 - ii. What information did you use in making this decision?
 - iii. What knowledge did you have that was absolutely necessary?
 - iv. What are you hoping/intending to accomplish at this point?
3. Probing with "What-If" queries
 - a. **Ask** about other alternatives that the interviewee may have considered.
 - b. **Ask** if someone else, perhaps with lesser experience, might have taken the same position. Determine what influence the interviewee's experience had on the chosen course of action.

Cool down:

- Do you have any questions for us or anything you would like to add to this discussion?
- Are there any questions that you found difficult to understand or didn't make sense to you?

THANK YOU FOR TAKING PART IN OUR RESEARCH!!!

IOSH is the Chartered body for health and safety professionals. With over 50,000 members in more than 130 countries, we're the world's largest professional health and safety organisation.

We set standards and support, develop and connect our members with resources, guidance, events and training. We're the voice of the profession and campaign on issues that affect millions of working people.

IOSH was founded in 1945 and is a registered charity with international NGO status.

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