

OSH knowledge and its management

Report submitted to the IOSH Research Committee

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Glossary of Acronyms Used

ABPI	Association of the British Pharmaceutical Industry
AGIFT	Australian governments' interactive functions thesaurus
BMI	Body Mass Index
BOHRF	British Occupational Health Research Foundation
BOHS	British Occupational Hygiene Society
BRE	Building Research Establishment
BSI	British Standards Institution
BUPA	British United Provident Association Limited
CBI	Confederation of British Industry
CDC	Centers for Disease Control and Prevention
CIH	Chartered Institute of Housing
CIHR	Canadian Institute for Health Information
CIPD	Chartered Institute of Personnel and Development
COPD	Chronic Obstructive Pulmonary Disease
CORGI	Council for Registered Gas Installers Control of Substances Hazardous to Health Regulations 2002 (as amended)
COSHH	2002 (as amended)
CUD	Communications Usage Diagram
DOH	Department of Health
DoL	Department of Labor (US)
DSE	Display Screen Equipment
DWP	Department for Work and Pensions
EHRC	Equality and Human Rights Commission
EHS	Environment, Health and Safety
ESRC	Economic and Social Research Council
EU-OSHA	European Agency for Safety and Health at Work
FOM	Faculty of Occupational Medicine
FSB	Federation of Small Businesses Discussion forum for the Universities Health and Safety Association
HASNET	Association
HAVS	Hand-Arm Vibration Syndrome
HPA	Health Protection Agency
HSE	Health and Safety Executive
HSL	Health and Safety Laboratory
HWL	Healthy Working Lives
IEHF	Institute of Ergonomics & Human Factors
IIAC	Industrial Injuries Advisory Council
INRS	Institut National De Recherche et De Sécurité
IOM	Institute of Occupational Medicine
IOSH	Institution of Occupational Safety and Health
ISO	International Organization for Standardization
KBV	Knowledge Based Views
KT	Knowledge Transfer



MRC	Medical Research Council
MSDs	Musculoskeletal disorders
NEBOSH	National Examination Board in Occupational Safety and Health
NHBC	National House-Building Council
NHS	National Health Service
NICE	National Institute for Health and Clinical Excellence
NIOSH	National Institute of Occupational Safety and Health
NMC	Nursing and Midwifery Council
OHS	Occupational Health and Safety
OHS Journal	Occupational Health and Safety Journal
OSH	Occupational Safety and Health
OSHC	Occupational Safety and Health Consultants Register
RBV	Resource Based Views
RCN	Royal College of Nursing
REACH	Registration, Evaluation, Authorisation & Restriction of Chemicals
REHIS	Royal Environmental Health Institute of Scotland
RoSPA	The Royal Society for the Prevention of Accidents
SCQ	Safety Culture Questionnaire
SEER	South-East Europe Review
SEPA	Scottish Environment Protection Agency
SHP	Safety and Health Practitioner
SME	Small and medium enterprises
TNO	Nederlandse Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek
TUC	Trades Union Congress



EXECUTIVE SUMMARY

Background to the project

The OSH Landscape project was completed as part of the IOSH research programme, "Health and Safety in a Changing World". The programme was developed to aid in the understanding of health and safety in more complex environments.

The aim of the OSH Landscape project was two-fold, firstly to review and characterise the OSH landscape in the UK and secondly to identify how OSH knowledge is currently used within the workplace by both professional practitioners and non-professional workers tasked with OSH within different organisational models. To achieve this, the project aimed to address the following questions:

- a) Who provides information about OSH interventions and is this in the public domain?
- b) How is the quality of the information controlled by the provider, both in terms of relevance and accessibility?
- c) Does the provider assess who accesses the information and how it is used?
- d) What evidence is available on the successful transfer of knowledge from research to information providers, OSH practitioners and non-professionals involved in implementing OSH?
- e) What lessons can be learned from other fields and disciplines in relation to successful knowledge transfer between research and practice and accessible evidence for a lay audience?

The approach taken by the research team involved a number of different methodologies. In stage one of the project this included a review of knowledge transfer methods applicable to OSH, identification and collation of sources providing information in the UK and a questionnaire survey of those tasked with OSH to identify the sources that they used. Stage two involved the development of a methodology to evaluate knowledge transfer and knowledge flow for OSH interventions which was then used in 12 organisational based case studies evaluating the impact of different OSH interventions.

Who is providing OSH Knowledge in the UK?

OSH knowledge in the UK was found to be created via a variety of sources which differed in their reasons for carrying out research into safety and/or health. A total of 303 online sources of OSH knowledge were identified within the UK including government sources, professional societies, trades unions, employer organisations, charitable organisations and other groups



not directly related to OSH. The knowledge provided by these organisations included guidance, legislation, print and electronic publications, primary research reports, systematic reviews, training materials and presentations.

A large variety of topics were covered by the sources including hazards and health outcomes. However, gaps were identified in relation to health outcomes and this was perceived to be an understanding of “knowing what” in health but “knowing how” in safety.

Sixteen information providers were asked how they quality assessed the information and knowledge sources that they provided. All providers did have processes in place to evaluate information and knowledge before it was made public. Although providers did record how many times a web site was accessed or time spent on the page, due to anonymity, data were not generally collected on who the end-user was.

It was appreciated by participants that there is little control over how knowledge is used once it reaches the public domain. However, there are a number of ways of following this up including feedback after training or OSH intervention.

Who is using what sources of OSH Knowledge?

To identify who is using which particular sources of OSH knowledge in the UK, a questionnaire survey was developed and administered among participants who have a responsibility for OSH. In total 386 individuals responded with 302 OSH employees and 84 external OSH consultants.

The most frequent sources used by participants were government sources (HSE, NHS) and this was due to them being trusted, easy to access and free to access. In relation to accessing websites, HSE and IOSH were used most frequently. The types of material accessed most frequently were guidance and legislation. When asked about updating knowledge, the use of guidance, legislation and internet searches were reported.

Knowledge Transfer and OSH

After identification of who provides OSH information and the sources used by OSH Practitioners, the research team then examined knowledge transfer and its relationship with OSH. Using the Diffusion of Innovations Theory as a framework it was identified that adoption of new knowledge occurs in five stages including knowledge, persuasion, decision, implementation and confirmation. However, there are five constructs that can influence the adoption of knowledge; relative advantage, compatibility, difficulty, trialability and observability.

When examining knowledge transfer in OSH a number of difficulties have been identified in that researchers and practitioners are different in the way they consider knowledge, with researchers focusing on one issue, whereas



practitioners often deal with multiple issues including current and immediate problems. However, the involvement of the end-user is key through the knowledge development process in giving context to the knowledge transfer. Furthermore, increased levels of resources applied to both the dissemination process and linkage with end users, have a positive impact on knowledge transfer. This therefore suggests that having involvement of end users in knowledge production is a vital part of knowledge transfer.

How is OSH Knowledge Used and Transferred in Industry?

To find out how knowledge was used and transferred in industry, 12 organisational based case studies were carried out with companies who had carried out an OSH intervention in the previous 12 months (n=8) or were preparing to carry out an OSH intervention (n=4). A KT evaluation methodology was developed using the Diffusion of Innovations theory as a framework. Using structured interviews with stakeholders and questionnaire surveys with employees, data were collated to evaluate the knowledge flow, the methods used to transfer and the impact of this.

The results identified that key skills required by the knowledge broker (mostly OSH Practitioners) included being able to identify and source authoritative knowledge on particular risks or hazards, understanding of the importance of choice of medium for KT (face-to-face or virtual); the OSH practitioners ability to translate knowledge to local level (language, literacy, technical ability); using existing information frameworks and the ability to evaluate any interventions carried out.

Conclusions

The OSH Landscape project has identified that there are key processes involved in transferring OSH information and knowledge from its source to the end-user. These include having skills to identify authoritative knowledge or seek it out when necessary, understanding that different techniques (virtual or face-to-face) may be more relevant to different groups of staff, having the ability to translate knowledge for particular end-users and ensuring that the groups are at the same level of readiness to adopt new knowledge. Finally being able to evaluate the impact of OSH interventions is also a required skill whether that is through walkthroughs, risk assessments, observation or the use of other data sources.



1 INTRODUCTION

The OSH landscape project was devised as part of the IOSH research programme, “Health and Safety in a Changing World”. This research programme was developed to aid our understanding of the increasing complexity in OSH systems. Including where organisations have become increasingly decentralised and networked, and, at the public level, negative perceptions of “elf and safety” and a perceived lack of common sense in the management of risk. Within the context of the Health and Safety in a Changing World” research programme, this study examined and defined the OSH Landscape in the UK and the mechanisms for OSH knowledge transfer from the providers to the end user.

Figure 1 shows an initial conceptual model for OSH knowledge; and highlights some of the actors involved in creating, interpreting and disseminating OSH knowledge. Actors involved in managing OSH are indicated in blue, those mainly involved in providing knowledge or in knowledge transfer are shown in red, the research base highlighted in green and the summarised OSH knowledge in orange. The lines represent the possible flow of knowledge between different actors.



Figure 1 An initial conceptual model for OSH knowledge and OSH knowledge transfer

1.1 BACKGROUND TO THE PROJECT

The aim of this research project was twofold. Firstly, the project aimed to review and characterise the OSH knowledge base in the UK, describe its current relevance to practice and identify whether a coherent knowledge



source can be established that addresses the varying needs of different groups. The second aim was to identify how OSH knowledge is currently used within the UK workplace context by both professionals and non-professionals in OSH. This was to determine where there were differences between different organisational models; and to examine the barriers and facilitators in translating knowledge into practice.

To achieve these project aims we intended to answer the following questions:

- a) Who provides information about OSH interventions in the UK, and is this in the public domain?
- b) How is the quality of the information controlled by the provider, in terms of both relevance and accessibility?
- c) Does the provider assess who accesses the information and how it is used?
- d) What evidence is available on the successful transfer of knowledge from research to information providers, OSH practitioners and non-professionals involved in implementing OSH?
- e) What lessons can be learned from other fields and disciplines in relation to successful knowledge transfer between research and practice and accessible evidence for a lay audience?

Figure 2 below outlines the different stages of this research project, from developing our understanding of knowledge transfer (KT) in the context of OSH to understanding how knowledge is transferred within organisations. It also identifies which appendix provides further information on the methods and results of the relevant sections of the project.

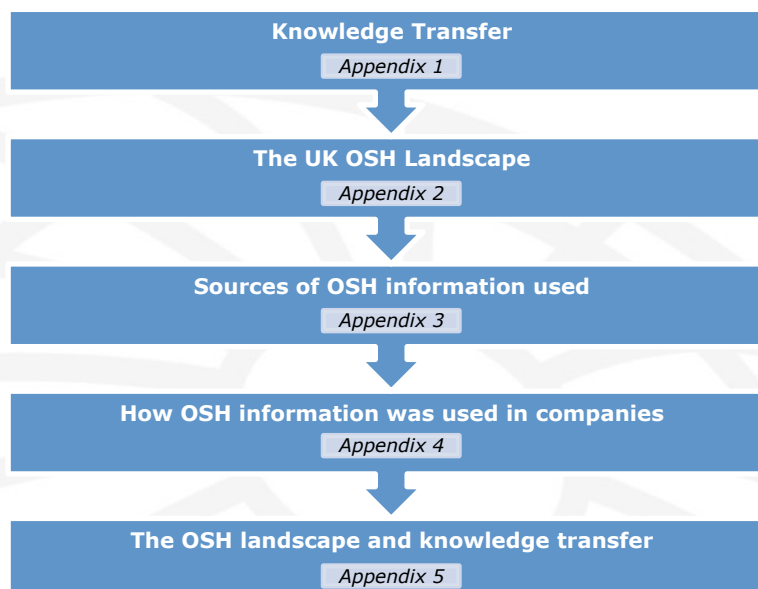


Figure 2 Project Summary



The following sections summarise the project, with more detailed information about each stage of work described in Appendices 3 to 5. Each of the full case study reports is also available as a separate report.

1.2 WHO IS PROVIDING OSH KNOWLEDGE IN THE UK?

To identify who is providing OSH knowledge in the UK a series of focus groups, interviews and searches were completed, the full methods and analysis of these tasks can be found in Appendix 2 of this document. In this section an overview has been presented.

OSH knowledge in the UK was found to be created via a variety of sources, which differed in their funding approach and in their reasons for carrying out research into safety and/or health. This included government departments, who may be required to investigate a particular health effect; universities and independent research organisations that are funded to answer specific research questions; and professional associations involved in safety and health. It was apparent that knowledge and experience in relation to OSH is also created by more informal routes; for example, networked groups, face-to-face meetings or through electronic media.

It was evident from the body of research literature that OSH knowledge is often based on the solution to one research question and, as such, still has to be translated into a usable format. For example, the adoption of new knowledge must occur within the constraints of a pre-existing organisation and culture, with the potential for clashes with its prevailing processes and procedures. This can be seen in relation to the adoption of new legislation where the law is enacted, but codes of practice and/or practical guidance are produced. Knowledge from research sources may be more difficult to transfer into existing organisations in its published form; thus its translation into more practical guidance is likely to improve its usefulness and uptake. Within some organisations, completed research is developed into the more usable format of codes of practice or practical guidance documents.

A total of 303 online sources of OSH knowledge were identified in the UK (between January – March 2012), following which the topics and formats of information they provide were summarised and collated. Various Government sources were identified including departments, agencies, authorities and branches. There are a vast number of trade associations in the UK. However, some were excluded from the collation process by reason of a lack of authority and validity. Professional societies and groups also provide knowledge to their members and, in some cases, to the public. Professionals involved in OSH can have a requirement to achieve personal accreditation; further training opportunities and other professional support can be provided through their associations. Some trade unions provide specific OSH knowledge in the UK and some employer organisations provide knowledge and guidance to their members. A number of charitable or 'not for profit' organisations were identified covering a range of sectors. There were a few voluntary organisations identified within the search and also a number of private companies which provided OSH knowledge; however



these private companies often required a membership subscription. Magazines were also identified as providing OSH knowledge and information for those involved in OSH. Within the 'other' category, some organisations were directly linked to OSH issues. Others were not directly linked but did provide information to people in relation to OSH, for example the Equality and Human Rights Commission.

The types and formats of the OSH knowledge provided by these sources included guidance, legislation, print publications, web publications, DVD/video, leaflets, posters, primary research reports, systematic evidence reviews, training materials and presentations. The OSH topics covered by these online sources can be categorised into 'hazards', such as electrical safety and working at height; 'health outcomes', including musculoskeletal disorders; and finally, 'other issues' including health promotion and construction (**Figure 3**). Through the completion of focus groups, gaps were identified in the online knowledge base in relation to health outcomes. It was suggested that this was a matter of understanding 'knowing how' to do something in the safety arena versus the 'knowing what' in health. This may reflect the prescriptiveness of the safety disciplines.

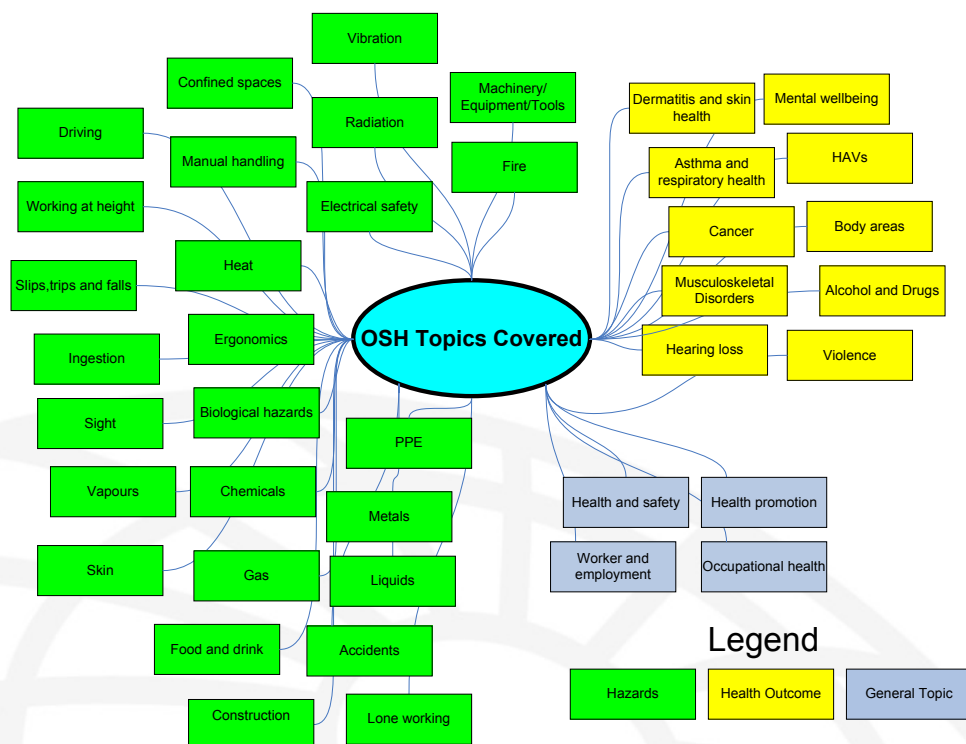


Figure 3 Map of the topics covered by the information providers

A sample of 16 providers of OSH knowledge was asked about the quality assessment of the information and knowledge that they provide. The aim of this was to find examples of how quality assessment was implemented, rather than to source a representative sample of providers of knowledge. On the whole, the collated responses identified that processes are in place to evaluate information and knowledge before it is made public. It was suggested that information written by official sources, such as HSE, IOSH,



TUC and academic journals, is automatically trusted to be accurate and of high quality. Information from other sources would be checked by people associated with the website/organisation providing the information, checking for relevance to the intended audience, sensibility and validity.

A number of methods were used by organisations to record how many times a website was accessed or how long individuals spend on a particular theme. However, this type of information is generally anonymised and no further information on the end-user is obtained. As noted, some web sites required registration to download or access specific areas. This information has the potential to be collated. At the time of this task such information is used by the provider to guide them on content and “hot topics” in the field.

Although it is appreciated that there is little control over how knowledge is used once it has been made available in the public domain, the responses to this question did identify that there are a number of ways of following-up. These include feedback after training and workshops; identification of how processes and procedures have changed due to new knowledge provision; and other forms of engagement including help lines for further information to be obtained.

This again suggests that consideration is given to the audience, the media used and the potential to follow-up users by the providers of OSH knowledge. It is apparent that tracking information is used to inform the providers about the information that they present, rather than identifying who is accessing it and how they use the knowledge provided.

1.3 WHO IS USING WHAT SOURCES OF OSH KNOWLEDGE?

To identify who is using what sources of OSH knowledge an online survey was designed and implemented, further details on the methods, results and conclusions can be found in Appendix 3 of this report. The present section provides an overview of this survey work.

After identifying the sources of OSH information available in the UK, a survey was implemented to identify the sources that were being used by those that have a responsibility for OSH. The respondents included 386 individuals, comprising 83 OSH consultants and 302 OSH employees (**Figure 4**). OSH employees were defined as individuals who are employed as safety or health practitioners or individuals tasked with OSH within their organisations.



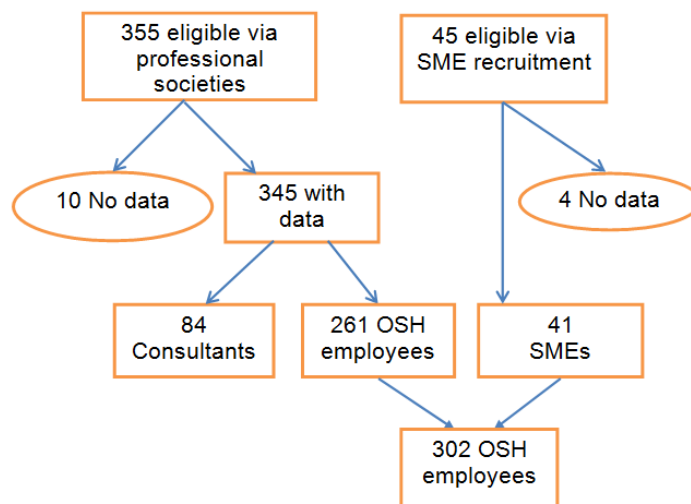


Figure 4 Distribution of eligible survey respondents

Amongst the OSH employee respondents, 65% were professional practitioners in their own workplace and 80% of the consultants had 11 or more years' experience in OSH, compared to 62% of OSH employees. The results show that 91% of consultants and 84% of OSH employees that completed the survey were members of at least one professional organisation, with the most frequently reported being IOSH, BOHS and the International Institute of Risk and Safety Management. Most OSH employees and consultants had one or two OSH qualifications, most commonly, a NEBOSH National General Certificate (n=145) and/or a NEBOSH Diploma (n=144).

In the survey, Government sources, (e.g. NHS, HSE) were the source of the OSH knowledge used most in the UK, by both the consultant and OSH employee respondents, when obtaining information on new hazards or safety issues. The reasons mentioned for using this source included it being a trusted source, there is easy access to OSH information, there is no charge to use the information, and its content is easy to understand. This perhaps indicates that there was an understanding amongst the respondents of the importance of seeking authoritative information so that they can advise their organisations correctly.

From a total of 128 individual websites identified by OSH consultants and OSH employee respondents, the HSE and IOSH websites were reported to be used most often. The reasons given for these preferences were that they are relevant, informative, up-to-date, trustworthy, authoritative, professional and unbiased. It was also mentioned that, in general, internet searches were used as they are quick, relevant and present a choice of information to read and follow.

When looking for new information on OSH, the format of information most often sought, by both OSH employees and consultants, was guidance documents (see **Table 1**).



Table 1 Formats used to find information about a new hazard or health outcome

Formats	Number of OSH Employees	Number of OSH Consultants
Guidance	249	71
Legislation	224	67
Professional magazines	185	57

Guidance documents and legislation are used most by OSH employees and consultants in relation to keeping up to date with regulations and best practice (**Table 2**).

Table 2 How respondents keep up-to-date with OSH information and knowledge

How they keep up to date with OSH	Number of OSH Employees	Number of OSH Consultants
Guidance	224	67
Legislation	223	65
Internet searches	175	44
Magazines	166	55

Respondents identified that the accessibility of OSH knowledge can be impacted upon by various issues, including font type and size, language, content, terminology and communications used. At an individual level it could be that the sources of information that they would use reflects an individual's progression within their career. With growing expertise, they would know who to ask and may have further personal contacts within the industry with whom to discuss issues.

The survey also asked participants about how they communicated OSH information. This identified that for the hazards listed, meetings, emails, training courses and toolbox talks were used by OSH employees. OSH consultants were less likely to use toolbox talks.

The survey identified that respondents were likely to use different communication methods for different groups. **Table 3** presents these data. This indicates an understanding of what is likely to work in communicating OSH messages with email and meetings more commonly used for senior and middle management but courses and face-to-face interaction for employees and new starts.



Table 3 Methods used by OSH employees and consultants to communicate OSH information to different levels of employees. Each cell shows percentage of those responding to each question.

Method	Level of employee							
	Senior Management		Middle Management		Employee		New Start	
	E	C	E	C	E	C	E	C
Meetings	87%	83%	88%	80%	62%	52%	50%	52%
Email	83%	85%	85%	83%	58%	50%	36%	34%
Courses	44%	32%	65%	52%	78%	73%	86%	86%
Internet	43%	37%	51%	37%	50%	32%	37%	36%
Newsletters	27%	24%	34%	22%	42%	33%	31%	30%
Toolbox	14%	7%	27%	15%	66%	52%	50%	45%

E = OSH Employees, C = Consultants

When asked about evaluating the impact of OHS knowledge transfer in the workplace, the most common responses for both OSH employees and OSH consultants are presented in **Figure 5**. These data highlight the most frequent methods were talking to employees, safety inspections and regular risk assessment.

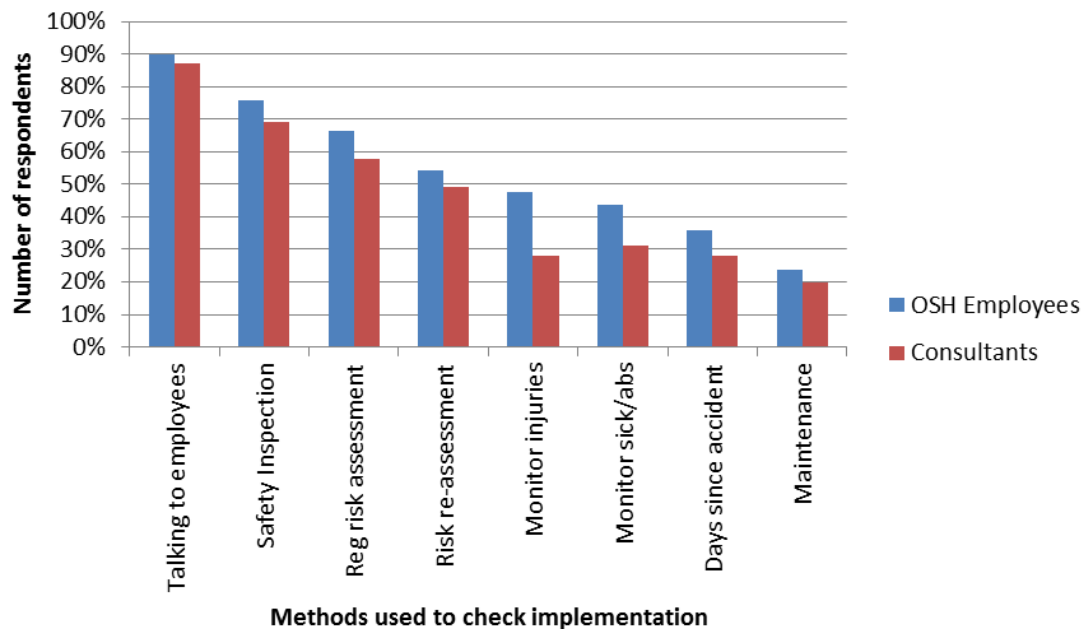


Figure 5 Methods used to check implementation of information. The Figure shows percentage of respondents reporting use of each format.



Barriers to implementing OSH knowledge in the workplace were also explored within the survey and out of 48 identified by OSH employees, the most common were; time constraints (n=18), literacy and language barriers (n=18), the workforce culture (n=17), lack of management support (n=17) and the geographical spread of the workforce (n=11).

There were a number of limitations in relation to this work in that the vast majority of participants were OSH practitioners rather than other types of OSH professionals. Different routes to acquiring knowledge may be available or preferred by other professionals including occupational physicians, ergonomists or occupational hygienists. However, the results do indicate that the most frequently used websites were HSE and IOSH which provide readers with explicit and embedded information which can be easily shared and transferred to others.

Face-to-face communication was also highlighted as being both the most frequent and the preferred method through toolbox talks and training session both of which require adaptation of knowledge and tailoring to specific audiences. This is an important factor as Roy et al (2003) identified with researchers and practitioners in OSH having different roles in the way that they consider knowledge and practitioners having the understanding that knowledge must be translated and adapted to the particular audience.

1.4 KNOWLEDGE TRANSFER AND OSH

To gain an understanding of the literature around KT and OSH a review was undertaken, the full results of this are presented in Appendix 1 of this report. This section provides an overview of the findings.

The Diffusion of Innovations theory (1983) originates from the work of Rogers in the field of sociology. Originally designed around the diffusion of new forms of technology among different cultures, the field of KT identified with many of its core principles, replacing 'technology' and 'innovations' with 'knowledge'. The theory is based around the four elements of the content of the knowledge; the communication channels; the time span; and the system through which knowledge is communicated.

The decision process of adopting the new knowledge occurs in 5 stages: knowledge, persuasion, decision, implementation and confirmation.



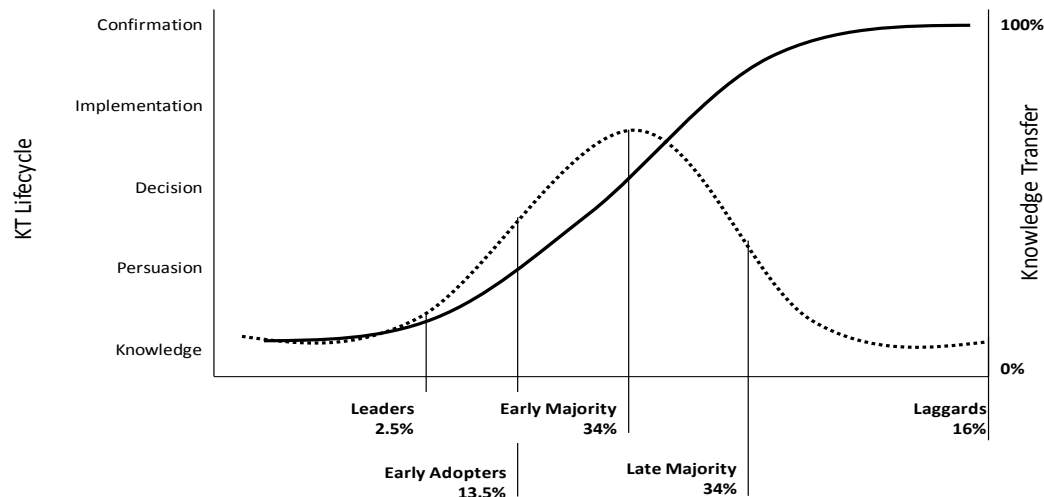


Figure 6 Diffusion of Innovations Approach

In the decision stage there are five core constructs that can influence the adoption of the knowledge:

- What does the transferred knowledge contribute? (relative advantage)
- How easy will it be to assimilate the new knowledge? (compatibility)
- Is the effort involved in using the new knowledge worth it? (difficulty)
- Can end-users experiment with the knowledge? (trialability)
- Is the new knowledge visible to others? (observability)

Factors that can influence the adoption decision also affect the speed at which the knowledge communication process takes place.

The Diffusion of Innovations theory is not identical to knowledge transfer as knowledge is not necessarily the same as 'innovation'. The relationships expressed in the model are also derived from a particular setting and foreground, reflecting the role of sociology in terms of underpinning principles and processes. Diffusion of Innovations is however conceptually appropriate to KT.

The KT perspective represented a shift in emphasis towards knowledge-based views of organisations and their resources and capabilities to ideas about knowledge and how it could be used to gain competitive advantage against other organisations.

There have been several large studies in relation to knowledge translation and knowledge transfer within medicine. However, there is currently only limited information on the application of knowledge theories to safety and health at present. The work by van Dijk *et al* (2010) gives an indication of the importance of having a knowledge infrastructure available for OSH for professionals involved in its practice and implementation. However, this does not include the non-professional who is involved in implementing OSH initiatives in the workplace, or the tools that they need to use for effective knowledge transfer.



Some of the issues identified in relation to OSH knowledge transfer have been summarised by Roy *et al.*, (2003). These include the fact that the roles of researchers and practitioners in OSH are separated by the way in which they consider knowledge. For example, researchers discover things; take a neutral stance; and deal with few variables. Contrastingly, the practitioner is concerned with: solving current and immediate problems; comparing knowledge with their experience; and dealing with multiple variables in a larger system. Furthermore, the importance of involving the end users of knowledge through the knowledge development process is identified as a key factor in knowledge transfer.

The development of Knowledge Networks across Canada, to support the research and practice of OSH, has been a key resource in understanding the importance of linking the research knowledge produced and the end user (CIHR, 2006). This can be supported by the work of Laroche and Amara (2010) who examined the outputs of Canadian researchers in OSH and the transfer of research outside the research communities. This study, of 217 researchers, identified that although researchers were actively transferring their research knowledge through publications, the levels of knowledge transfer increased as the number of research reports published increased. However, the number of peer-reviewed articles published by the researchers did not have an impact on their assessment of knowledge transfer activities. The key findings of this paper are that the adaptation of knowledge; the level of resources dedicated to its dissemination; and linkage to the users all have a significant impact on knowledge transfer. Thus the research community, in considering these factors, can have an impact on the effectiveness of transfer to the practitioner group.

1.5 HOW IS OSH KNOWLEDGE USED AND TRANSFERRED IN INDUSTRY?

By identifying the available providers of OSH information, and the sources used by those with a responsibility for OSH in the previous sections, the project team then designed implemented and evaluated case studies within organisations. The full methodology and results of these can be found in Appendix 4 of this report. This methodology was informed by the review of KT literature which can be found in Appendix 1 of this report. The following section looks at how information in the case studies was transferred to others once it had been obtained.

Twelve organisational-based case studies were carried out to aid our understanding of the process that is undergone when trying to translate OSH knowledge in the workplace. In each of the twelve organisations, an OSH intervention was being undertaken. The exploratory methodology developed for the case study data collection was a series of interview and survey questions, based on the Diffusion of Innovations Approach, in order to evaluate knowledge transfer.



The skills needed by the knowledge broker

The knowledge broker in the interventions is the person that implemented the change and initiated the intervention. This person needs a variety of skills in order to successfully obtain information from OSH sources and then transfer this effectively to a target audience.

Within the case studies for this project, the knowledge-brokers for the interventions were OSH professionals who worked in various OSH specific roles, including health and safety managers and safety officers (see appendix A4.11). This therefore demonstrates the levels of experience, expertise and specialisms that the individuals had. On the one hand, this high level of expertise increases the knowledge that the individuals have learned through their careers, which they can apply within an intervention. In addition to this, their level of experience means that, when the knowledge-broker needs new or updated information, they have a knowledge-base of knowing where to look or who to speak to; in the form of individuals (both internally or externally to their current company), companies, or suppliers.

For those earlier in their careers, more use may be made of text books or course materials, with non-professionals being more likely to use the media as a source of information. For smaller companies they may rely more on trade media, suppliers or publicised campaigns from sources such as HSE. Within the health arena, health professionals are taught the skill of finding authoritative knowledge and assessing the quality of the knowledge, to ensure that they are able to evaluate evidence before taking it in to practice. At the current time it is perceived that these skills are still developing within OSH professions of safety, ergonomics and occupational hygiene.

From the obtained information, the knowledge-broker then used their skills and previous knowledge to transfer this into policies and strategies that could guide the intervention in the company. As part of this transfer of knowledge and the general safety culture at the company, the knowledge-broker aims for the knowledge to be accepted as a shared understanding by the target audience.

How to transform/translate knowledge for effective transfer

In the case studies completed for this project, organisations used both virtual and face-to-face processes in their transfer of knowledge (see appendix A4.13). In smaller organisations, more face-to-face orientated informal routes were taken. This was perceived to be due to the close connections and easy contacts with employees that are often available in this context, so virtual processes were not required. Other larger companies, that were spread across national geographic locations, primarily



used only virtual processes (such as emails and presentations) to transfer knowledge.

What are the success criteria for knowledge transfer in OSH?

The success of knowledge transfer can depend on various factors, as demonstrated in the case studies (see appendix A4.12). All twelve of the case study organisations had developed a plan before implementing the intervention although some of these were more informal than others. However the implementation team discussed to differing extents how they were going to take the intervention forward.

The experience of the knowledge-broker can impact on the success of the transfer, as it can affect the understanding the knowledge-broker has and how effectively they can change and adapt the format and content of the information. The effectiveness of the knowledge-transfer relies heavily on the target audience's understanding of the information being disseminated to them. Therefore it is important that OSH professionals have an understanding that they need to translate knowledge into an accessible language, context and reading skill level. This also applies to the technical level of the information in relation to what the employees already know about the topic and whether the information is meant to be understood as standalone new information or as additional information for an individual's OSH knowledge.

Where possible, effective existing frameworks for communication should be used including: following procedures, branding, and current routes of communication. The rapport that the OSH professional has with the target audience and the visibility of OSH can impact on the effectiveness and how well the information is received. The involvement of employees can aid in the success of knowledge transfer, the case studies for this project used a variety of methods such as employees: trialling new tools and equipment; piloting an intervention; taking part in a working group or committee; and being workplace safety champions. These routes can increase the visibility and involvement of the intervention for employees by having employee representatives participating in the process. The information communication method can impact on the success of the transfer, as there needs to be an understanding of the target audience.

What needs to be considered when disseminating information – audience, format, language?

The size of the company needs to be considered. For example, in the case studies, as the OSH professional provided the information, the larger companies used similar information structures. In smaller companies, although the OSH professional provided information, their closer connections with employees facilitated a more two-way process.

The safety culture of the company needs to be considered in relation to the dissemination of information (see appendix A4.14). In the case studies



used for this project, the safety culture identified for the OSH professionals was similar to that identified for the employees. This demonstrated that the OSH professionals understand how to translate information to employees as there is a positive safety culture.

Other issues which need to be considered include: the target population, the type of work they do, who will be disseminating the information and how will it be disseminated? In addition to these, both the topic of the intervention and the level of risk associated with the subject matter are important.

What needs to be considered when evaluating interventions and knowledge transfer?

When evaluating how an intervention could be assessed and confirmed it is important to think about the intervention content (see appendix A4.15). The intended change is important to consider, for example in two of the case studies it was intended that the target audiences were made aware of a new health and safety committee and of a new electrical appliance policy. However, these did not require a direct or immediate change for the target audience, but rather aimed to increase awareness of what needs to be done, either in relation to using the committee or what to do with a new appliance.

For other case studies, there were more physical changes being implemented which could be visually checked, such as seeing that hearing protection was being worn or that face masks were being used correctly. These interventions were both in smaller companies, where visual checks are obviously more practical. This highlights the importance of company size in relation to confirmation of the intervention implementation. Some companies used more informal routes in the short term such as asking employees for feedback on new induction methods that were implemented, and a re-designed intranet.

1.6 LIMITATIONS OF THE CURRENT PROJECT

The knowledge sources identified within the project focused on online sources provided by websites and not electronic sources which may be held offline. It was also limited to a specific time period during which the researcher carried out the searches. As the researchers were searching for information on websites, some information could have been missed as the structures of some websites did not allow easy searching.

The survey of knowledge use was made available electronically online. Although different groups were approached the majority of respondents were safety practitioners. Thus any findings from the research may not be applicable to different users of OSH knowledge or those tasked with OSH in smaller businesses.



The case studies were restricted on the basis of timing and convenience sampling. It is inevitable that those that volunteer are organisations that are doing something in relation to OSH so are likely to be organisations with an interest or skill within OSH. Although the case study research cannot necessarily be applied to all organisations, the synthesis of the data collected does allow a broader picture of the skills of stakeholders in the OSH process. Additionally, the employee surveys were distributed by the stakeholders as they knew who the target audience of the interventions was and this could have had an impact on responses. The use of pre-paid envelopes directly back to the research team allowed the employees to contribute confidentially in relation to the intervention and the safety culture of the organisation.

Recruitment of SMEs was difficult for both the survey and the case studies. Other work has continued with SMEs within the research programme,

1.7 CONCLUSIONS

Key factors in the process of how OSH information and knowledge is transferred from its original source, to an individual with a responsibility for OSH, and on to end users have been identified.

The importance of the origin of the information has been identified. With the large numbers of information sources available online, those with a responsibility for obtaining OSH information require skills in knowing where and how to search, and how to assess information. Consideration must also be given to their target audience in relation to formats and languages of the information.

Knowing which sources provide translated research knowledge, which is already in the form of guidance and codes of practice, is important, as is knowledge of how to do this when this format is unavailable, and when to seek further advice. Interestingly, guidance was identified as the most frequently used format. Quality assessment processes for sources were identified, thus it would be hoped that these would reflect any legislative or regulatory requirements to provide up to date information.

The coherence of topic coverage was less comprehensive for health topics than for safety. This may be a reflection of the ongoing maturation of prevention methodologies relating to health topics. The use of evidence-based practice in relation to health issues has a broadening knowledge base but in some places still needs to translate into usable documents for practice.

There was an understanding from respondents in the survey, and those leading the knowledge transfer in the case studies, that face-to-face methods result in more effective knowledge transfer. Virtual communications were felt to be less effective, for example emails were perhaps not always read, and precluded two-way communication to check that knowledge had been transferred. These rely on the knowledge-brokers



having the skills and knowledge required to identify the format required and whether or not the sourced information needs to be translated to meet the needs of their target audience and the topic. In the case studies it was also observed that the communication methods reported depended on the company size in relation to geographic locations of multiple offices and also the number of end-users the target information is targeted at. The absorptive capacity of the audience and the prevailing safety culture is relevant in relation to the level of knowledge the company end-users have on health and safety.

The body of research presented within this work has highlighted the importance of having a key individual (knowledge broker) who manages the process of knowledge transfer from source to employee within an organisation. A skill-set has been identified below, but the knowledge broker also has to be able to manage the flow of knowledge ensuring it is up-to-date and relevant as well as being able to translate and engage with the employees. Thus when identifying a need for intervention, up-to-date knowledge must be identified and then translated into a format acceptable to the audience and a decision made as to the best way of disseminating the knowledge. Although face-to-face interaction for more complex OSH issues may be the most effective way of engaging with an audience this work has identified that for larger organisations geographically spread this cannot always be done. However, by understanding concepts of media richness and the design of messages, and having an understanding of the safety culture in an organisation the knowledge broker should be able to improve this process.

Table 4 presents the skills required by the OSH practitioner to aid them in successful knowledge transfer in relation to safety and health.

Table 4 Collation of skills required by the OSH Practitioner

Topic	Skills Required by the OSH Practitioner
Identification of knowledge	Search skills, ability to assess quality of knowledge
Persuasion	Understanding of the context of the intervention, face-to-face communication often better for new starts and training situations. Virtual contact may be required depending on the size and geography of the organisation; consideration of how to evaluate this is vital.
Decision	Understanding that face-to-face interaction is often better. For larger organisations having a network of expertise across the organisation to support decision



	making can help.
Implementation	Ensuring that the employees are at the same level of readiness as those involved in implementing change – evaluation of safety culture can help with this process.
Confirmation	Vital to be able to evaluate whether the change has had an impact, through walkthroughs, risk assessments, observation, or other means of data collection including accident or incident rates.

The intervention process in the case studies also relied on the knowledge-broker's understanding the process of health and safety interventions in that planning is key, as is using existing information routes and translating knowledge effectively. Once an intervention has been completed, it is also important to evaluate the impact it has had, either formally or informally, and then feed this back into the organisational knowledge-loop.

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APPENDIX 1. KNOWLEDGE TRANSFER

A1.1 REVIEW OF KNOWLEDGE TRANSFER

The primary goal of this review was to relate the extant work in the KT arena to the practical problem of OSH knowledge. This includes its generation, dissemination and outcomes within the wider OSH landscape. The specific objective to which this work also relates is to learn lessons from other fields and disciplines in relation to successful KT between research and practice, in a way that is accessible for a lay audience.

The ill-defined nature of the KT field requires certain boundaries and constraints to be set. Because of work occurring in parallel to the current project this review will not focus heavily on individual level KT and the concomitant literature on social networks, transactive memory and associated concepts from cognitive psychology. This review will also not focus on the wider policy/strategic level, and therefore will not deal in depth with issues around communities of practice. Instead, this review is intended to provide insights at an inter-organisational level of KT, examining KT related concepts that refer to how OSH knowledge is created and exchanged with end-users.

A1.1.1 Search Strategy

Stage 1: Initial Search

Knowledge Transfer was used as an initial search term within Heriot-Watt University's Discovery database system, and a high-level list of references generated. This first stage review, combined with domain expertise, enabled a more detailed list of terms to be generated, as shown below in **Table 5**.

Stage 2: Generation of Search Term List

The list of terms developed in Stages 1 and 2 represent those that are most applicable to the OSH landscape. The terms 'communities of practice', 'social exchange theory' and 'transactive memory' represent topics that will not be dealt with in detail, but nevertheless represent an interface with parallel work.



Table 5 List of core and peripheral search terms

Core Search Terms	Peripheral Search Terms
Knowledge Transfer	Knowledge Management
Knowledge Utilization	Institutional Memory
Knowledge Implementation	Communities of Practice*
Knowledge Translation	Social Exchange Theory*
Technology Transfer	Transactive Memory*
Transfer of Learning	Diffusion of Innovation
Organisational Learning	
Population Learning	

* Work on these topics exists on the boundary of the current review.

Stage 3: Literature Search

These terms were then used to perform a search within two reference databases: RefWorks and Discovery. Refworks is an online research management and bibliographic tool and the search within it was performed by staff at the Institute of Occupational Medicine. Discovery is Heriot-Watt University's unified search system that grants access to the Institute's entire stock of on-campus and on-line resources. Constituent databases include major sources such as Web of Science and Science Direct, along with direct access to relevant peer-reviewed Journals such as Administrative Science Quarterly, Organization Science and the Academy of Management Review, within which the KT literature resides. All major subject relevant journals/publications are available through this porthole, and the search terms generated in Stage 1 and 2 were applied.

A1.2 BACKGROUND TO KNOWLEDGE TRANSFER

Knowledge Transfer (KT) can trace its origins to the late 1960s and the work of Rogers (1962) into the diffusion of innovations in society (Rogers, 1983). In turn, this work informed the development of conceptual frameworks to enable better use of research, for example, turning theory into practice. There were two significant drivers in this process, the explosion of scientific knowledge and the increasing expectation by policymakers, governments, business and society that scientific knowledge should be useful to society. Furthermore in the 1970's the phrase "technology transfer" was also used to describe the transfer of things such as production lines or other technologies and capabilities to different contexts or environments. The driver for this was globalisation and expansion of overseas manufacturing. However, work in technology transfer sprung from a wider theoretical framework, including contingency theory and socio-technical systems, all of which worked at the interface of organisations and their technologies. The driver in this case was rapid post-war expansion in technological capacity and the need to understand better its role in how firms operated.

One of the first papers to use the term Knowledge Transfer was published in 1995 by Zander and Kogut in Organization Science (Zander *et al.*, 1995).



The KT perspective represented a shift in emphasis towards Knowledge Based Views (KBV) of firms and their resources and capabilities to post-industrial ideas about knowledge and its potential for competitive advantage.

Knowledge based views of organisations are highly relevant to the wider OSH landscape because “knowledge transfer leads to the integration and coordination of specialised knowledge [and] makes replication possible” (Prevot, 2008). Replication, in turn, “involves transferring or deploying competencies from one concrete economic setting to another”. This goal is shared with OSH.

What is clear is that KT emerged as a response to a new way of dealing with expanded levels of knowledge creation and increasing levels of complexity within organisations and as a method of trying to impart best practice in relation to “know how” rather than “know what”.

The advantage that KT confers upon the OSH domain is access to an underlying body of foundational knowledge in the management sciences. This knowledge has been used to respond to underlying drivers such as globalisation, technology and the emerging role of knowledge and its use in organisations: drivers which also apply (in some measure at least) to OSH.

Figure 7 presents a theoretical process of how knowledge may be transferred in the OSH context.

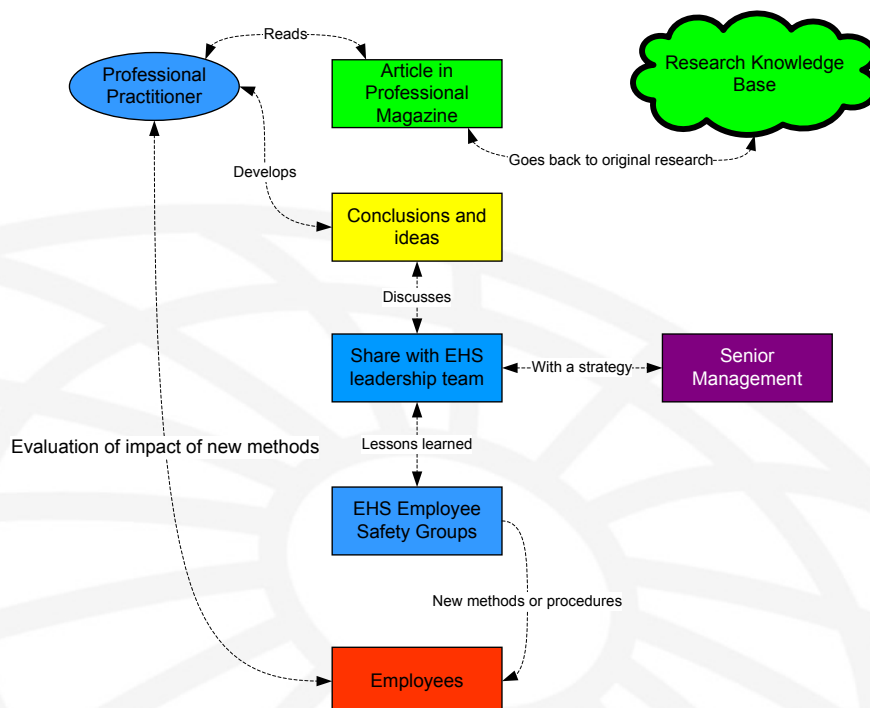


Figure 7 Conceptual model of KT within the OSH Context



A1.3 THEORIES OF KNOWLEDGE TRANSFER AND THEIR APPLICATION

Defining Knowledge

Knowledge is more than isolated pieces of information, if it were, then existing OSH practices would guarantee 100% knowledge transfer. It is possible to identify six themes concerning the definition of knowledge, around which there is broad agreement within the KT literature:

- Knowledge is more than merely data or information
- Knowledge is credible
- Knowledge exists in many forms
- Knowledge is dynamic
- Knowledge must be shared to be useful
- Knowledge is contextual

Knowledge is more than merely data or information:

Senapathi (2011) suggests that, when data are processed into information, value is added and again, when this information is applied to new contexts, it gains further value as it becomes transformed into enterprise-specific knowledge. **Figure 8** presents this continuum that Senapathi suggests, from gathering unconnected items of data, through to forming that data into a coherent whole which relates to a specific context.

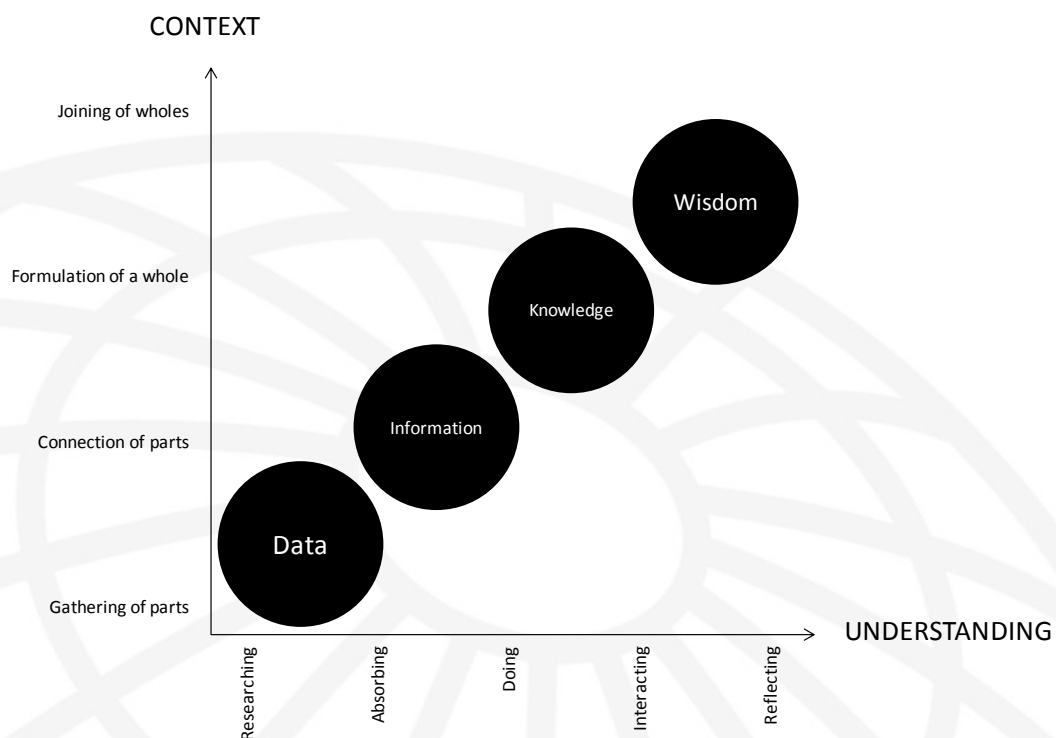


Figure 8 Continuum of understanding (Source: Senapathi, 2011).



Unconnected items of data can become connected by various means. These connections can be logical (e.g. of the form of operators such as IF, THEN, AND, OR etc.), semantic (e.g. has, is, causes) or relational (e.g. proximity, correlation etc.). Through these unconnected parts connecting together, the number of links between elements of information increase and therefore the interconnectedness increases, this therefore results in the creation of knowledge rather than unconnected information and data.

Knowledge is credible:

Knowledge is information whose validity has been systematically tested, therefore differing from opinion, beliefs or speculation (Murray *et al.*, 2007). In other words, "it must actually be true" (Senapathi, 2011).

If knowledge is more than mere data then it is necessarily made up of propositions and beliefs. These combine together to add experience, contextual information, value and expert insight that then provides a framework for evaluation (Davenport & Prusak, 1998). Evaluation is key, as it allows for the beliefs within the context of KT to be tested, through experience, to become best practice, as opposed to being mere opinion, speculation or assertion. A representation of this is shown in **Figure 9** in which knowledge resides at the intersection of 'truths' and 'beliefs'

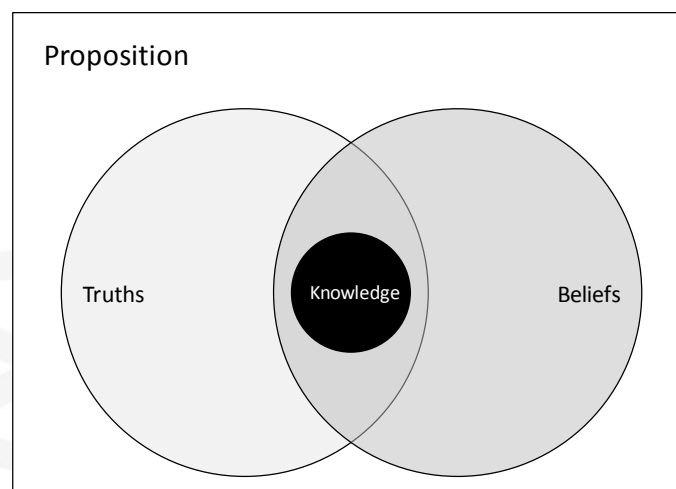


Figure 9 Knowledge, as distinct from data or information, incorporates beliefs as well as facts (Source: Senapathi, 2011, p. 88).

Knowledge exists in many forms:

Collins (1993) describes the levels where knowledge resides between a continuum of explicit and tacit forms of knowledge, presented in **Table 56**. Tacit knowledge tends to reside at the level of embrained, embodied and encultured knowledge. Embedded and encoded knowledge tends to be explicit in nature, meaning that it is codified, written and stored. Knowledge is dynamic; embedded and encoded knowledge may have previously been embrained, embodied or encultured knowledge. Likewise,



what is currently embrained, embodied or encultured may in future become embedded and encoded.

Table 6 Five levels at which knowledge resides (Collins, 1993).

	Knowledge Type	Explanation	Example
Tacit 	Embrained	Conceptual and cognitive skills	High level OSH knowledge
	Embodied	Action orientated	Safe interactions with environment and people
	Encultured	Shared understandings and norms	Language and safety culture
	Embedded	Routines and guidance	Formal OSH / Health and Safety procedures
Explicit	Encoded	Stored knowledge	OSH databases and knowledge repositories

Knowledge is dynamic:

When knowledge is initially created it is strongly tacit which means it is difficult to articulate and subconsciously understood. This knowledge is then gradually transformed into codified and explicit knowledge through social coordination processes, as the more explicit the knowledge is the more it can be shared and transferred within an organisation (Kang *et al.*, 2010).

Knowledge must be shared to be useful:

By itself knowledge is not a useful resource that creates value and competitive advantage, this happens as it is shared and transferred within organisations (Kang *et al.*, 2010). As a result of the potential competitive advantage it is thought that knowledge is a critical aspect of an organisation's success. Four key reasons for this success have been identified:

1. **Creating new knowledge is effortful** and potentially expensive, and the need to avoid 're-inventing the wheel' confers a significant cost advantage to those who can avoid it.
2. "Knowledge transfer enables organisational members to identify and to respond appropriately to critical environmental situations and to **adapt more quickly**",
3. KT enables **better decision-making**.
4. KT facilitates the process (as seen above) of creating **new knowledge** through organisation and population-level learning.

Knowledge is contextual:

As identified previously, knowledge is a fluid mix of experience, contextual information, value and expert insight. Therefore the context of the knowledge itself is part of the content of the knowledge (Yakelf, 2007).



The six key themes mentioned above highlight that knowledge is more than unconnected data; and that knowledge that can exist in many forms which, when shared and transferred, can create value.

A1.4 GENERIC FORMS OF KT

The transfer of knowledge spans a broad sweep of work, from the simplistic (i.e. “getting the word out”) to an “all-encompassing focus on seeing new knowledge or products from creation all the way through to implementation by intended users” (Senapathi, 2011, p. 89). **Table 7** shows KT in these most generic forms.

A long standing model of KT, which expands considerably on generic ideas around spread, choice, exchange and implementation, is a process-based model called Diffusion of Innovations Theory (Rogers, 1962).

Table 7 Four Generic Types of Knowledge Transfer (Klein & Gwaltney, 1991)

Type	Definition
Spread	“the one way diffusion or distribution of information”
Choice	“actively helps users seek and acquire alternative sources of information and learn about their options”
Exchange	“involves interactions between people and the multidirectional flow of information”
Implementation	“includes technical assistance, training, or interpersonal activities designed to increase the use of knowledge or R&D or to change attitudes or behaviour of organisations or individuals” (Klein & Gwaltney, 1991).

A1.5 DIFFUSION OF INNOVATIONS

The Diffusion of Innovations theory originates from the work of Rogers in the field of sociology. Originally designed around the diffusion of new forms of technology among different cultures, the field of KT identifies with many of its core principles, replacing ‘technology’ and ‘innovations’ with ‘knowledge’. Diffusion of Innovations Theory is based around four elements suggested by Rogers (1962):

- The content of knowledge;
- The communication channels along which knowledge travels (or transfers);
- The time span to pass through the innovation-decision process;
- The social system knowledge is communicated through.



Decision Levels and Process

The Diffusion of Innovations theory is a process-based model involving a decision of the form 'shall I adopt this knowledge'. These decisions occur at three levels as presented in **Table 8**.

Table 8 Diffusion of Innovations decision levels

Levels	Decisions	Applied to OSH
Individual level	Optional	Personal best practice
Collective level	Made by all members of a social system	Arrived at through consensus building or to do with organisational culture
Authority level	Decisions made for an entire social system by a few individuals in positions of authority	Regulatory bodies and legal constraints as a driver

The decision process referring to whether the decision is made voluntarily, and who makes the decision, is shown in **Figure 10**

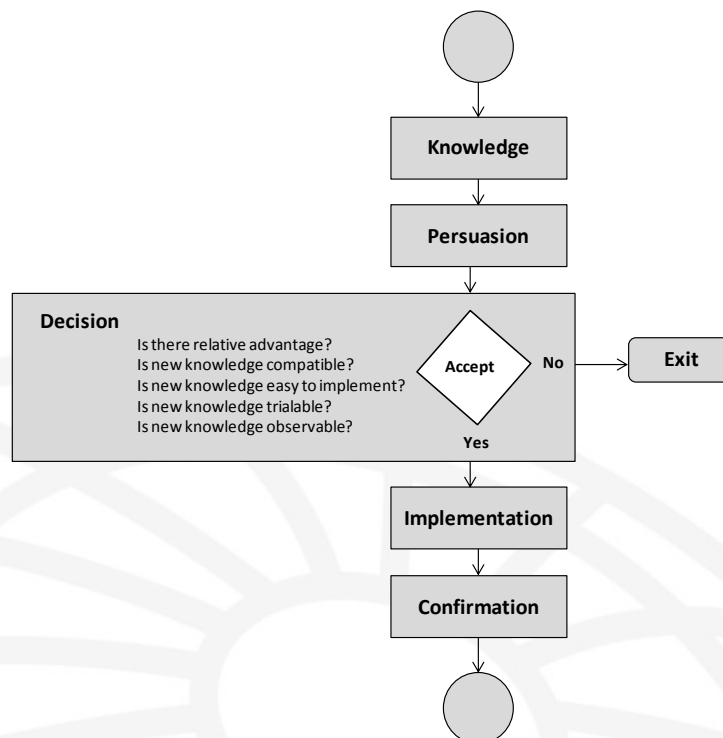


Figure 10 The diffusion of innovations decision process

Rogers (1962) defines five core factors that influence adoption decisions in relation to what works in practice, these are:

1. **Relative advantage:** what does the transferred knowledge contribute (in terms of improved performance, compliance, safety



etc.) over the existing status-quo? Significant perceived advantages increase the probability of successful KT.

2. **Compatibility**: how easy will it be to assimilate new OSH knowledge (and concomitant processes/behaviours etc.) into existing structures, modes of operation etc.? OSH knowledge that is easy to assimilate will be more likely to be adopted.
3. **Difficulty**: is the effort involved in using new OSH knowledge worth the alternative adverse effects (perceived or actual)? OSH knowledge which is easy to use and implement will transfer more quickly and successfully.
4. **Trialability**: can the end-users of new OSH knowledge experiment with it, or test it out in order to discover what it offers and how it might contribute in practice? OSH knowledge that can be trialled will be more likely to transfer.
5. **Observability**: is the new OSH knowledge visible to others in terms of its contribution or effect? The more visible the OSH knowledge, the more it will drive communication among the social system.

Types of KT adopters

The factors that influence adoption decisions also effect the speed at which this process takes place. This in turn gives rise to certain categories of 'adoption', as measured by the percentage of people within a social system who adopt new knowledge within given time frames. Rogers (1962) defines five time frames and therefore five 'adopter types', as shown in **Table 9**.

Generally speaking, KT operates more quickly for 'innovators' and 'early adopters' than it does for 'laggards', and clearly, the actions that need to be performed to achieve successful OSH KT will differ depending on these end-user groups. For those where this process is quicker, successful KT will often occur where Roger's five factors are less than optimal however, for laggards, the highest performance on Roger's five factors will be required.

Table 9 KT adopted Types

Type of adopter	Speed of KT	Rogers five factors	Definition
Innovators/ Leaders	More quickly ↓	Low presence ↓	They have close contact with the sources of OSH knowledge and high status within a group
Early adopts			Have highest opinion leadership and/or status within a social system
Early majority			They will have contact with the early majority but will not hold positions of opinion leadership
Late majority			They will have more sceptical orientation than those in early majority that they have contact with
Laggards	More slowly	High presence	Show little or no opinion leadership, and will value established status-quo more highly than change



Figure 11Figure 11 presents a visual representation of the Diffusion of Innovations process, showing how the five groups of adopters contribute to an S-curve that travels to 100% knowledge transfer, or full adoption. It is fair to say that a sixth group of 'non-adopters' also exists, which means that KT rarely achieves 100% in practice.

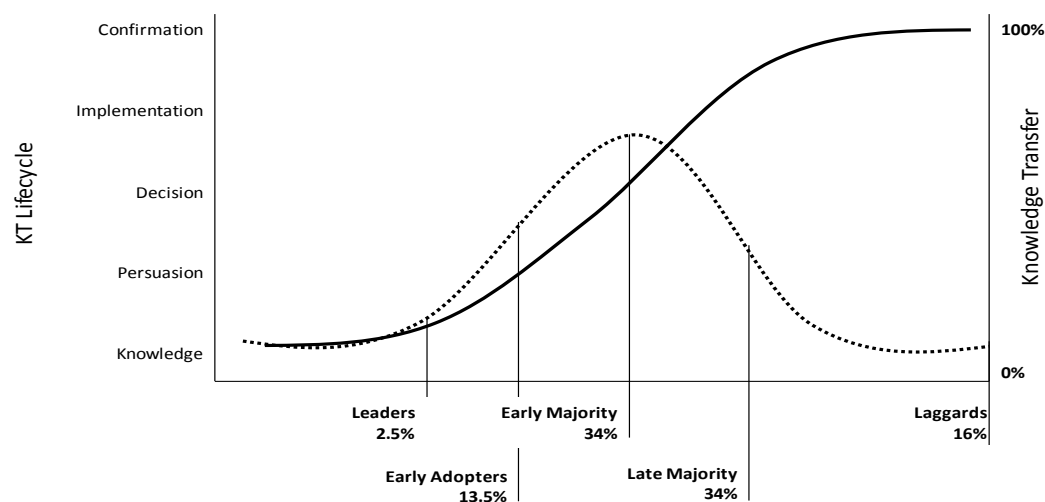


Figure 11 Graphical representation of the Diffusion of Innovations process, showing how different populations of ‘adopters’, each with differing characteristics, contribute towards an S-curve of knowledge transfer.

It is important to state that Diffusion of Innovations is not identical to KT, and that knowledge is not necessarily the same as ‘innovation’, the original purpose of the theory. The empirical relationships expressed in the model are also derived from a particular setting and the role of sociology in terms of underpinning principles and processes. Diffusion of Innovations, therefore, is conceptually appropriate to KT, but there are limitations. Alternative models of organisational KT include those shown in **Table 10**.

Table 10 Alternative models of KT based on organisational innovation research (source: Estabrooks et al., 2006)

Model	Explanation
Model of Territorial Rights and Boundaries	New OSH practices are perceived as threats to existing organizational practices and interests
Dual Core Model	OSH innovations originate from internal cores that serve different purposes (i.e. the health and safety function will have different objectives to the sales or production functions). The purpose of the core will determine how OSH knowledge is diffused.
Ambidextrous Model	Organisation types that facilitate innovate OSH practices may not be best matched to diffusing or implementing such knowledge. In the former case low formalization and low centralization are required; in the latter the



Model	Explanation
	reverse tends to be true.
Bandwagon Models	Organisations are driven to adopt new OSH knowledge through fear of other obtaining benefit (or avoiding punitive measures). In this case adoption occurs regardless of how the OSH knowledge is perceived, the driver coming from external peers.
Desperation Reaction Model	OSH knowledge intended to address desperate situations (such as the aftermath of an industrial accident) will diffuse differently than OSH knowledge created and disseminated in less pressured situations.

The model of territorial rights and boundaries describes a widely held view of OSH among certain populations, that it is a 'threat' to existing practices. The dual core model explains well the internal conflicts and constraints that can impact on the diffusion of OSH knowledge when it comes into contact with competing pressures. The ambidextrous model places the role of context once again into the foreground, suggesting that what has been developed in one setting may not diffuse effectively into another. The bandwagon and desperation reaction models describe well the more authoritative and compliance led nature of some OSH products, and the pressures to adopt certain practices regardless of the practices themselves.

A1.6 ROUTES TO SUCCESSFUL TRANSFER OF KNOWLEDGE

Successful transfer of knowledge within an organisation requires that knowledge travels from a source, through a medium to a user. Senapathi (2011) defines four critical elements in this process and the potential issues for effective dissemination; these are presented in **Table 11**.



Table 11 Senapathi's critical elements for successful KT (2011)

Term	Definition	Issues in effective dissemination
Source	The dissemination source, that is, the agency, organization or individual responsible for creating the new knowledge	Perceived competence: credibility of experience and motivation Sensitivity to user concerns Relationship to other sources trusted by users
Content	The message that is disseminated (tacit/explicit)	Credibility of research and development methodology: Credibility of outcomes Cost effectiveness Relationship between outcomes and existing knowledge
Medium	The ways in which the knowledge is described and transmitted	Accessibility and ease of use, user friendliness: Flexibility Reliability Cost effectiveness
User	User or intended user	Perceived relevance to own needs: User's readiness to change Information sources being trusted Dissemination media preferred

Thus, to transfer knowledge successfully there are a number of considerations. In addition to the source, content and medium, other considerations include media richness, organisational culture, and organisational structure, these are described below.

Media richness

Media richness can be understood by considering knowledge that is low (or lean media) such as rules, procedures or relatively impersonal content in the OSH context. Rich media tends to be personal in nature involving multiple cues and immediate feedback such as that found in face-to-face contact. Both lean and rich media are relevant depending on context and **Figure 12** highlights this.



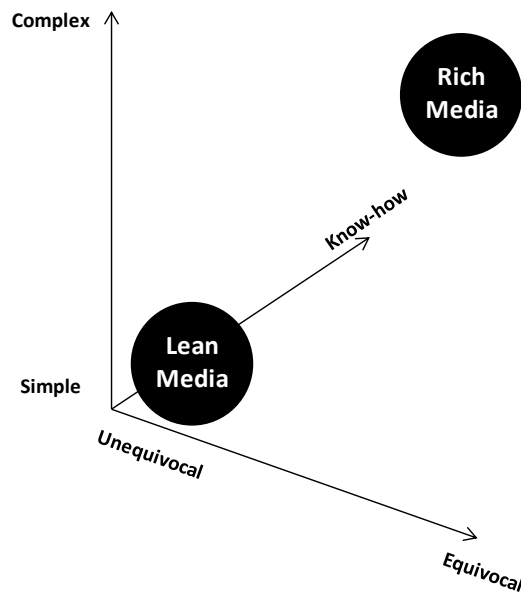


Figure 12 Model of contingency factors and their relationship to lean and rich media

As presented in **Figure 12**, unequivocal messages can be adequately used as lean media through documents or procedures (know what). However, for more equivocal information (know how), rich media such as face-to-face contact or other training scenarios may be a more effective way of transferring knowledge. This highlights the potential problem of using inappropriate media to transfer knowledge and using lean media to transfer know how may not be the most effective way of doing this.

Context

The role of context in knowledge transfer is also important as, if knowledge is thought to be more than unconnected items of data and is embedded in best practice, then KT will alter the context into which it is transferred. Within the context of OSH, knowledge will transfer more effectively if those receiving the knowledge have the absorptive capacity and willingness to take the knowledge on and the knowledge itself is easily applied in its new social and cultural context.

Organisational Culture

The role of organisational culture, as a component of KT context, is regarded as particularly critical. Allied to this is the notion of safety culture, a concept which binds KT to the OSH domain. As suggested by Cooper (2000) safety culture comprises three interrelated aspects; psychological aspects, behavioural aspects and situational aspects. The internal psychological aspects of the model refer to how people within organisations feel about safety and safety management systems. The behavioural aspects are concerned with what people do within the organisation and the



situational component reference to policies, procedures and measures the organisation has in place.

Organisational Structure

The organisational structure within which knowledge is being transferred also has an impact on transference. For example, in a highly centralised network of a hierarchical form, knowledge implementation can be very efficient as one individual can direct the activities to other individuals within the network. However, peer-to-peer networks, in which decision making is devolved, show a better structure for knowledge generation.

It has been identified within OSH that informal networks or clusters of communities of practice are important. These include social networks (personal contacts, professional networks, social media) which are described as scale free because they can increase in size dramatically. Such networks have been found to influence favourably knowledge transfer (Tang, Xi & Ma, 2006; Lin & Li, 2010).

A1.7 EVALUATING KNOWLEDGE TRANSFER

As defined in the previous sections KT is often referred to as knowledge that is transferred from one place to another with the aim of improving performance and or changing behaviour. However good knowledge does not necessarily lead to good performance and good performance does not necessarily always rely on good knowledge. There are methods and practices which detect, understand and evaluate different aspects of KT, with particular emphasis on their ability to 'transfer' into the OSH domain.

A1.8 KNOWLEDGE TRANSFER IN OSH

Numerous mechanisms exist through which to transfer knowledge. Many, such as procedures, instructions, training etc. will be familiar to the OSH audience. Others, such as communities of practice, video conferencing, online forums etc. are technologically mediated (e.g. Rodgers & Negash, 2007). Still others will be scarcely recognisable as communications methods at all, such as organisational culture and context. Methods that have been used in relatively enlightened OSH contexts, methods which go beyond staple means such as leaflets and guidance documents, include those shown in **Table 12**, which is drawn from recent research conducted by the Canadian Institute for Health Information (CIHR, 2006). These in turn have been tentatively mapped onto Diffusion of Innovations Theory in regard to key factors which drive adoption decisions. This helps to identify 'why' such interventions should work.



Table 12 KT mechanisms used in OSH settings (CIHR, 2006)

KT mechanisms used	Mapping to Diffusion of Innovations Theory
Visual descriptions of project objectives and activities	Poster presentations to stakeholders, visually based material in order to enhance compatibility and reduce difficulty.
Toolkits	Context sensitivity achieved through multiple methods, with those most appropriate being selected for application to stakeholder groups. Increases compatibility.
Agreements to participate	Semi-formal commitments/contracts for participation in KT activities and the expectations therein. Relates to observability and relative advantage amongst stakeholder groups.
Control and participation	Stakeholder involvement in KT initiatives. Relates to compatibility, trialability and observability of OSH intervention.
Health information systems	IT mediated knowledge management system with a focus on broadening access and a 'produce once – use many times' philosophy (i.e. avoid repetition of data gathering and conversion into knowledge). Increases observability.
Long term relationships	Work with stakeholders and other partners over a long time period. Encourages relative advantage, compatibility, observability and reductions in difficulty.
Co-creation of KT model(s)	Users help to define optimum KT strategy, thus would rate highly on compatibility and trialability.
Questionnaires and surveys	Data collection activity aimed at defining gaps in OSH knowledge. Relates to trialability (i.e. does it work?)
Roundtable sessions	Bringing together decision-makers in a face-to-face environment. Increases compatibility and observability.
AGMs / conferences	Hosting of events increases observability and diffusion among social group.
Media relations	Production of material to wider audience increases observability.
Outreach / local engagement	Face-to-face interactions with diverse stakeholder groups aids compatibility, observability and trialability.

A1.9 KNOWLEDGE TRANSFER RESEARCH

The literature in relation to knowledge transfer research related to OSH is an area that has only been developing in the last 10 years. There have been several large studies in relation to knowledge translation and knowledge transfer within medicine, but the application of knowledge theories to safety and health only provides limited information at the current time. The work by van Dijk *et al* (2010) does give an indication of the importance of having a knowledge infrastructure available for OSH for professionals involved in its practice and implementation. However, this does not include the non-professional who is involved in implementing OSH



initiatives in the workplace and the tools that they need to use for effective knowledge transfer.

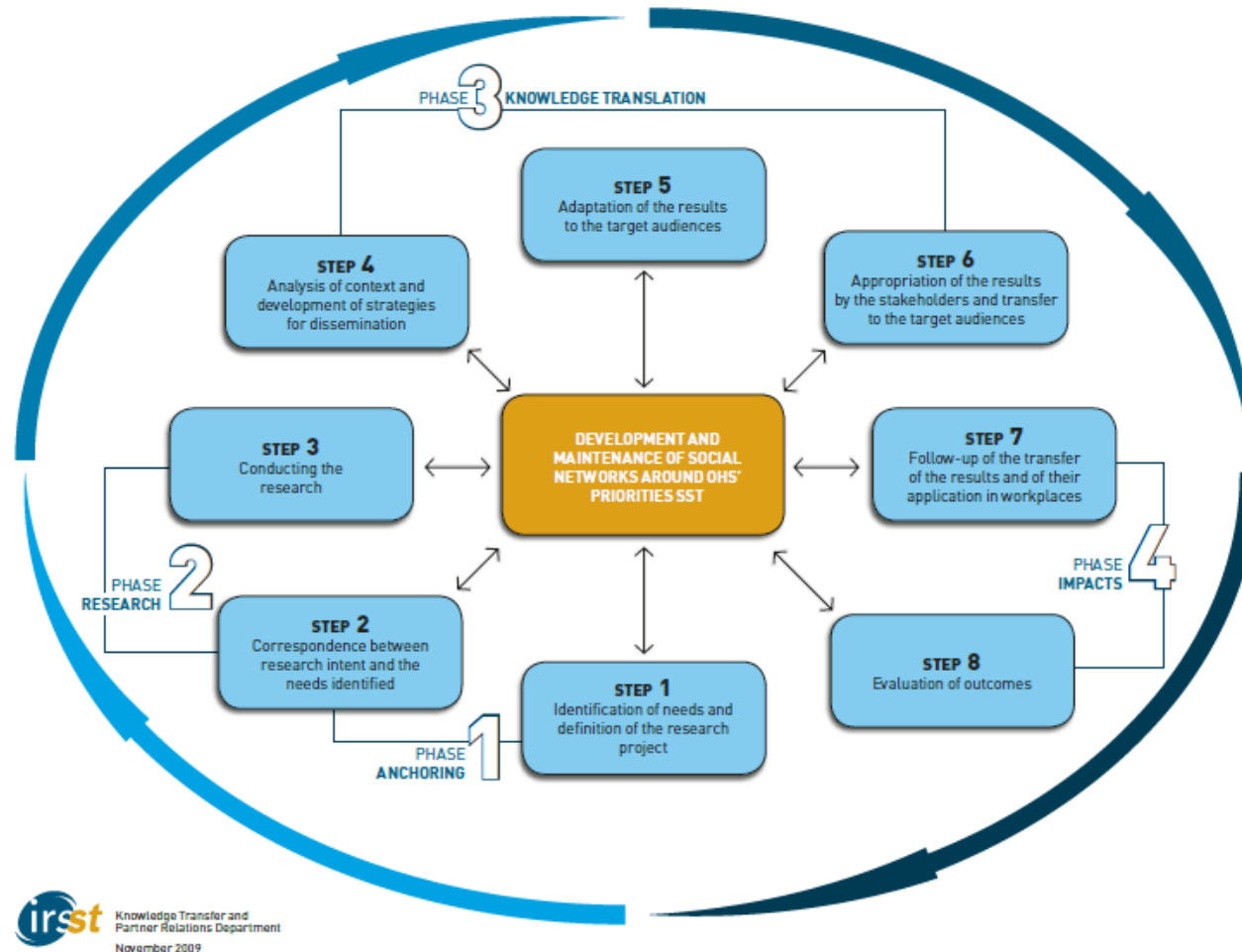
Some of the issues identified in relation to OSH knowledge transfer have been summarised by Roy *et al.*, (2003). These include the fact that the role of researchers and practitioners in OSH are separated by the way in which they consider knowledge. For example, researchers discover things, take a neutral stance and deal with few variables. Whereas, the practitioner is concerned with solving current and immediate problems; comparing knowledge with their experience; and dealing with multiple variables in a larger system. Furthermore, the importance of involving the users of knowledge through the knowledge development process is identified as a key factor in knowledge transfer.

The development of Knowledge Networks across Canada to support the research and practice of OSH has been a key resource in understanding the importance of linking the research knowledge produced and the end user (CIHR 2006). This can be supported by the work of Laroche and Amara (2010) who examined the outputs of Canadian researchers in OSH and the transfer of research outside the research communities. This study of 217 researchers identified that, although researchers were actively transferring their research knowledge, the levels of knowledge transfer increased as the number of research reports increased. However, the number of peer-reviewed articles published by the researchers did not have an impact on their assessment of knowledge transfer activities. The key findings of this paper are that the adaptation of knowledge, and the level of resources dedicated to its dissemination and linkage to the users have a significant impact on knowledge transfer. Thus, by considering these factors, the research community can have an impact on transfer to the practitioner group.

Figure 13 presents a diagram from CIRST in Canada describing the process of knowledge development, research and dissemination of research and evaluation of the impact of new knowledge. Central to this process is the central network where there is constant information flow between this network and the researchers. One of the core roles of this network is identifying the priorities for OSH research and intervention. However, as described in a circular way, the continued flow of information and evaluation is key to identifying if knowledge has been transferred and this has had a positive impact on the hazard identified.



The Research and Knowledge Translation Cycle



irst Knowledge Transfer and
Partner Relations Department
November 2009

Figure 13 Research and Knowledge Translation Cycle (CIRSST 2009)



A1.10 CONCLUSIONS

In summary:

- KT is relevant to OSH as a means of improving methods of translating and transferring OSH knowledge in the workplace.
- A number of different considerations should be made in relation to KT to improve the uptake of OSH interventions, including translating the knowledge to local language, understanding the audience to whom the knowledge is being transferred, understanding the need to transmit complex information differently to simple messages and having a means to evaluate impact.
- KT and OSH research has focused on the importance of better understanding of the different needs of researchers and practitioners and how to bridge that gap; the use of knowledge brokers has been identified as important in this process.



APPENDIX 2. THE UK OSH LANDSCAPE

A2.1 PREPARATORY WORK

This work comprised a number of different stages that were carried out, including a review of the knowledge transfer literature but also identifying the methodology to be used to identify sources of knowledge within the UK and who is able to access such information. The initial stages of the work included a brainstorming session involving the project team with the aim of identifying the different OSH sources available, who the end-users were and how that information could be presented into a usable format. During the brainstorming session the research team tackled the questions below:

- Who provides authoritative information?
- What media formats are available?
- Who are the consumers of OSH knowledge?
- What hazards are employees exposed to?
- What health outcomes are an issue in relation to work?

This initial discussion included focus on the use of the word 'authoritative' as much of the information available, especially from the internet, can be difficult to judge in terms of the quality and credibility. Initial discussions allowed a breakdown of categories as shown in Appendix 6.

This session also allowed a free-form discussion in how best to collate the knowledge sources and to develop the outline structure of the database for storage of information.

A2.2 FOCUS GROUP AND INTERVIEWS WITH ADVISORY GROUP

An Advisory Group was convened at the start of the research project and its members are listed in Appendix 7. A meeting with the Advisory Group was convened in November 2011. The aim of the meeting was to draw together the members and, using a focus group methodology and a sub-set of the advisory group, identify their opinions and perceptions in relation to knowledge transfer, sources of OSH knowledge and methods of transfer. During the meeting, a transcription was made of the responses to the questions. Individuals unable to attend the meeting were followed up using the same question set in a telephone interview format. The transcribed material was then thematically analysed to identify the main themes and constructs from the focus group and interview sessions. During the analysis of the interview scripts, the ethical issue of confidentiality was considered; and this was achieved by not naming or identifying individuals or organisations within the analysis.

The meeting allowed a discussion of the main topics highlighted in the brainstorming session and, during the day, the following topics were discussed

- OSH knowledge sources and access points.



- OSH knowledge – how is knowledge transmitted and to which groups?
- Transferring OSH knowledge.

The complete question set is available in Appendix 8.

The qualitative research design chosen for the meeting and follow-up interviews was the use of open-ended questions and a number of prompt questions. This allowed the respondents to express their ideas freely on the issues raised. The participants within this procedure were nine of the advisory group members from the OSH Landscape project.

A2.3 THEMATIC ANALYSIS

The themes identified from the transcripts whilst undertaking the thematic analysis from the meeting and interviews are listed below:

- Barriers
- Research
- Access
- Authority
- What people want information on
- Transfer of knowledge into practice

A2.3.1 Barriers

When examining barriers to knowledge transfer in occupational safety and health, three themes were identified: experience, audience and funding.

In relation to experience, this was related to both organisational and individual level. Organisational maturity was noted as important, as a more mature industry is likely to have encountered OSH problems before and documented the process of resolving them. Newer or less mature industries may not have had the opportunity or need to do this.

At an individual level, the advisory group suggested that an individual's progression within their career reflects the sources of information that they would use. For example, someone at the start of their career might use a text book to find information as they are not an expert and they may not know where or who to go to. With more experience they would know who to ask and may have further personal contacts within the industry to discuss issues with. As well as knowing where to search there is also reliance on searching abilities, although this is becoming less of a problem as increasing numbers of people are using computers. A further factor raised was the potential barrier to information by gatekeepers. Depending on the gatekeeper and their attitude towards an issue, information may not always be forthcoming.

In the context of barriers, the audience that knowledge is aimed at can be a barrier. The examples identified by the advisory group included SMEs,



where the knowledge base is different to those in OSH practice; and for non-professionals, where information may not be accessible because it is behind paywalls and the language is technical. It was noted during the meeting that NHS documentation is apparently presented for a reading age of 11 to increase its accessibility.

The audience itself can act as a barrier due to cultural differences, knowledge clashes and common sense knowledge of what people know and what they think they know, as this will affect what and how information is adopted. On the other hand, when an organisation doesn't have any prior knowledge of a problem, they then do not know how to identify it in their company. This was suggested by the advisory group to be the case for a lot of small businesses as they do not realise that they need health and safety information.

Funding sources in the research to practice pathway were also identified as a barrier by the group. Funding is required to drive research and access to published research also requires financing. Examples of this included British Standards, each of which requires paying for. In reference to SMEs, they cannot afford the time to perform searches nor pay for the publications, which can result in just-in-time knowledge rather than proactive risk management.

A2.3.2 Research

The theme of research was summarised into: who is providing research and how research is brought into the knowledge base?

In relation to provision of knowledge this depended on the discipline; for health and safety information the recurring theme was that HSE was one of the main providers. However additional providers included: HSL, IOSH, BOHRF, Clinical Effectiveness Unit, Ergoweb, OHS Journal, RoSPA, SHP, Safety Management, CIPD, the research organisations of HSL, IOM, NIOSH, TNO, INRS, UK ABPI; and research journals.

In identifying how research is brought into the knowledge base, the advisory group mentioned that it is usually filtered down through guidance. The advisory group mentioned journals, peer-reviewed epidemiological research, HSE and other regulatory authorities, suppliers and trade associations

A2.3.4 Access

The theme of access was sub-divided into: what are people accessing, where do professionals get their information from, and where do non-professionals get their information? Responses included:

- Legislation
- Codes of practice
- Research results, studies and papers



- Journals
- Newsletters, magazines, news, newspapers
- Films, videos, YouTube and DVDs, video clips, TV
- Guidance and advice
- Encyclopaedias, thesaurus, glossaries and handbooks
- Datasheets and fact sheets
- Books, reports, theses
- Standards and specifications
- Statistics
- Posters
- Translations from information produced in other languages
- Databases, databanks and CD-ROMs
- Websites, portals, publishers, authors webinars, blogs
- Mass media sources including social media sources; Facebook, twitter, MySpace and Flickr
- E-learning material
- Computer based training and software programs
- Organisations' information such as insurance companies, associations, federations, banks
- Training organisations, courses, workshops, mentoring, conferences, consultations, committee meetings
- Toolbox talks
- Reading/topic lists
- Flip Charts
- iPhone

The Advisory Group suggested that professionals obtain information and knowledge from a variety of sources and this is reflected in the diversity of professional groups involved in OSH. Sources included; HSE, professional bodies, magazines, journals, SHP, Barbour, IOSH, Fire Prevention, BSI, the Safety Council, professional societies, BOHS, NICE, BOHRF, CIPD, EHRC IEHF, occupational practitioners in the workplace, IIAC and Hunters Diseases of the Occupations. The HSE was highlighted as being more applicable than other sources which are available. Again, the issue of experience and progression of career was mentioned, as this would directly affect where someone would go to find out information, from colleagues to contacts in other companies they have previous experience with.

Furthermore, the advisory group suggested that non-professionals would use the media as a source of information for a primary reason of having easy access to it. Examples are using The Daily Mail for information on issues such as mobile phones and cancer, or using the BBC News, as it is seen by non-professionals as being authoritative. More specifically trade media sources such as Farming Today were mentioned, rather than a farmer reading a journal article. The HSE campaigns were pointed out as being useful for non-professionals, however there is now a restriction on the number of these occurring. Internet methods of access to information such as Google were suggested, for reasons such as it being anonymous. However, a non-professional may not have the knowledge or experience to be able to filter the information in the way that a professional would.



It was also suggested that SMEs use suppliers as consultants, for example in the construction industry they may use equipment hire companies to provide advice and information on how to use the specific equipment. Also whilst doing work for an organisation there may be a pre-qualifying questionnaire for businesses before they can go onsite, this would act as an information source as it may inform them if they aren't currently complying with the regulations. They are also likely to use TV, trade bodies and banks in terms of when they get loans. Insurance companies were also mentioned as they may distribute newsletters to draw attention to problems. However, they don't advise on how to solve them unless you pay.

A2.3.5 Authority

In relation to authority in the field of OSH, the topics covered including who or what is an authoritative source and why that is. The list below includes organisations and groups that were identified as authoritative:

- HSE
- IOSH
- BOHS
- RoSPA
- HPA
- NIOSH/CDC
- Consultants
- Legislation
- Peer-reviewed Journals

The HSE website and guidance was considered to be the most or one of the most authoritative sources of health and safety information. It was suggested that the HSE act like a stamp of approval to industry guidance, so that people will then see the information as authoritative. Other organisations were also mentioned as being competent and endorsing other material; IOSH BOHS and RoSPA. It is thought that the source of information is irrelevant to people as long as they see that it has been endorsed by a competent body to assure them that it is reputable. It was mentioned that the HSE has a list on their website of authoritative bodies, which could help people in determining what information is authoritative. However, if they do not know about the list they will not know where to find it. As well as legislation, peer review journals were also suggested to be authoritative as they have gone through filtering by an editorial board.

Consultancy was seen to be a quality source of information. However, there are so many consultants that people do not know who is authoritative and who is not. Testimonials from others can be an issue in this context, as people may not know who they can trust. As noted by the advisory group, the reputation of an organisation is usually based on its age; however this is misleading as it doesn't convey experience.



A2.3.6 What people want information and knowledge on

This section was divided into health issues and safety issues. In relation to health issues, this varied across the advisory group as they represented different professions and groups.

Personal health was mentioned, with use of health assessment tools and wellness points at which people can get measurements for their body fat and BMI, as well as information on how to make changes. Other issues included eyesight and glasses in relation to DSE assessments and prescription safety glasses, blood pressure, cholesterol, heart disease, rocks, asbestos, sickness absence, musculoskeletal disorders, chronic disease, diabetes, long term effects, acute effects and litigation. Other aspects of health issues mentioned by the advisory group were about health education and health promotion, to encourage people to change their behaviours in and out of work. It was suggested this could be done by informing people of the risks and how these can be avoided.

As with health issues, a variety of safety issues were suggested by the Advisory Group, but this again reflected their sectors of work and professions. The safety issues included risks and risk assessments, working at height, DSE assessments, electrical safety, road risk, driver safety, retirement age, vision and manipulation, lone working, medical assistance, rucksack survival and medical emergency procedures.

This variety of safety issues demonstrates that it is dependent on the organisation and the hazards within individual organisations or industry sectors.

A2.3.7 Transfer of knowledge into practice

The theme of transfer of knowledge into practice was sub-divided into communication and examples mentioned on how organisations transfer knowledge.

It emerged that, for the transfer to be successful, there must be a two way communication. It was specifically stated that one-to-one chats were the most efficient method for effective communication. Furthermore, using this method of communicating could be tailored to the recipient for example, to permanent or transient workers. One-way communication was not thought to be an effective route; an example of this was emails which are easily disregarded. Similarly to this, one-way conferences were suggested to be monotonous and inefficient.

The method of one-to-one communication can be applied to the process of communication from the health and safety practitioner through to operators throughout an organisation. Although training material could be thought of as one-way communication, if there is a competency test at the end then it becomes more of a two-way process. Specifically in relation to SMEs it was



mentioned that they need to be communicated with through a communication strategy for effective knowledge transfer.

How knowledge is transferred is dependent on the individual and if they think it is applicable to their organisation. The experience and best practice mentioned was one-to-one chats rather than group training. This was thought to be more effective. Particularly mentioned in relation to this was the use of a one-to-one induction training sessions for short-term workers. For longer-term staff and people who have been there a while it is more of a nurturing process. Toolbox talks were also mentioned as good methods for knowledge transfer, and emails were criticised as recipients disregarded them.

In the UK, knowledge is often translated through guidance. Examples mentioned were the BOHRF website and Asthma guide for employers and employees. However, it was also noted that SMEs may not know such information exists, so they would be likely to use different routes such as HSE campaigns and media. It was suggested that there is a differentiation between active and passive transfers of knowledge. Active transfer of knowledge was expressed as not being a solution but being about teaching people where to look and how to learn and use the information they may find. Passive transfer was explained as being the planting of the seeds so that people may know if there is a risk. With this basic knowledge they are more likely to go to passive forms of knowledge transfer such as the internet. An example was given that the most effective method for knowledge transfer in relation to asbestos was the HSE campaign 'The Hidden Killer' as this transferred knowledge and subsequently changed behaviours.

Knowledge transfer is all part of communication, being in the loop and knowledgeable. An example was given of the trade press 'The Grocer' as it has a large readership so therefore reaches a lot of people. Also mentioned was the transfer via toolbox talks as an effective method.

A2.4 SUMMARY

The thematic analysis and open-ended interview methodology allowed for discussion of the concepts in relation to knowledge transfer in OSH as well as the identification of authoritative sources within the knowledge base. However, one of the main criticisms of the material is that there was little input from small businesses into this process. The issue of consultants and their credibility was also raised during this session.

The work enabled the further development of a search strategy for sources of knowledge and aided in the development of inclusion and exclusion criteria for this stage of the work.



A2.5 SEARCH STRATEGY DEVELOPMENT

From the brainstorming session and the thematic review, the research team were able to develop a search strategy to identify authoritative sources of knowledge within the UK. The search strategy is outlined in Appendix 9. One source of guidance was the Mapping report created by RoSPA (Fidderman 2007). Further consideration was also made of the inclusion criteria for the desk based study. These were developed to include the following:

- English language
- Relevant to the UK context
- Occupational safety
- Occupational health
- In the public domain

Further exclusion criteria were added during the searches including:

- Domestic health and safety
- Environmental Regulation
- Unrelated to the UK context

A2.6 SEARCHES

Based on the search strategy, searches were carried out to identify the authoritative sources of occupational health and safety knowledge within the UK context. The searches included organisations, journals, magazines and trade magazines. Initial collation work involved summarising the information from these agreed sources. Searches were carried out between January 2012 and March 2012. These have to be seen as representing a specific point in time, as material can change quickly especially when released in electronic format.

The searches identified approximately 350 sources of knowledge across a number of different categories including government, organisations, universities, journals and trade magazines. This information was initially collated and then transferred into an Access database to allow for knowledge mapping.

The searches performed were not systematic. While every effort was made to include all authoritative sources of knowledge, due to the vast number of sources available, it is possible that some may have been missed. Due to the large amount of information provided by some organisations, it is also possible that some topics covered by them will have been missed. Additionally, for practicality purposes, only those sources with an online presence have been searched.



A2.7 DATABASE DEVELOPMENT

A Microsoft Access database was developed to store the substantive information collected by the research. An iterative approach to its design was taken, allowing on-going modifications to be made to its structure, and the data items being recorded, as work progressed and the knowledge collection evolved.

The database itself was set up to code for the name of the source, a short description, accessibility to the site (free or via subscription), the topics covered and the formats that information was published in. The last category included guidance, training, tool-box talks, print and/or web publications, books, standards or journals, magazines, newsletters, posters, leaflets, presentations, safety incidents or alerts, DVD/videos and survey templates. The use of the database facilitated the indexing and collation of the search material into a knowledge map. This included being able to identify the different sources, the topics covered (hazard and/or health outcome) and whether there are barriers to accessing material. The database also assisted the researchers in identifying if there are gaps in the knowledgebase. An example of part of the data gathering interface is shown in **Figure 14**.

The screenshot shows a Microsoft Access form titled "Sources". It has several input fields: "Source ID" with the value 20, "Source Type" set to "Government", "Establish Date" set to 1975, and "Free" set to "Yes". The "Source Name" field contains "Health and Safety Executive". Below this is an "About" text area with the following text: "HSE is the national independent watchdog for work-related health, safety and illness. They are an independent regulator and act in the public interest to reduce work-related death and serious injury across Great Britain's workplaces. They cover the vast majority of health and safety topics such as".

Below the "About" field are two lists. The "Topics" list on the left includes: Asbestos, Asthma, Back Pain, Regulation, Biosafety, Occupational Cancer, Chemicals, CHIP, Chronic Fatigue Syndrome, Compressed Air, Confined spaces, COPD, COSHH, Disability, Drugs and alcohol, Electrical safety, Ergonomics, and Expectant Mothers. The "Format" list on the right includes: Guidance, Legislation, Print publications, Web publications, DVD/video, Leaflets, Posters, Primary Research Reports, Systematic Evidence Reviews, Training Materials, and Presentations.

At the bottom of the form, there are record navigation controls. On the left, it says "Record: 1 of 56". On the right, it says "Record: 1 of 11". There are also buttons for navigating between records.

Figure 14 Data gathering interface

A2.8 RESULTS OF THE SEARCHES

In total 303 information sources were included on the database. A number were withdrawn due to the age of the source, lack of updates in the last five



years, a change in organisation, or a cessation of the source. The inclusion of the sources into the database allowed for further analysis of their types, the topics they cover and accessibility using pivot tables. **Table 13** presents a summary of the sources and a breakdown of their type.

Table 13 Summary of sources identified

Source Type	Total	Behind Paywall
Government	25	1
Trade Association	89	22
Not for Profit/Charitable	33	3
Employers Organisation	5	0
Voluntary	13	9
Trade Union	7	1
Private Company	11	4
Professional Association	32	10
Academic Journal	40	35
Professional Journal	4	2
Magazine	16	9
Research Organisations	4	0
Other	24	5

Further details of the identified sources are presented in Appendix 10. The tables are intended to provide a snapshot of what was available.

A2.9 KNOWLEDGE MAPPING

The aim of the knowledge mapping process was to identify who was involved in knowledge creation and production in the OSH arena as well as those who provide knowledge but may not create it. To support the information provided here, there is a separate standalone Access database, which contains more detailed information on the knowledge providers listed and the topics and formats that they produce.

A2.10 KNOWLEDGE CREATORS

The creation of knowledge in OSH in the UK is via a variety of sources. Research funding via UK Research Councils is limited in providing funding for OSH issues, which are generally more applied, but has in more recent years become involved in areas such as population-ageing, resulting in more practical aspects of research being studied. This includes the New Dynamics of Ageing programme; a multiple council ESRC-led initiative that has funded a large grant to examine different factors in relation to ageing and work including occupational health, safety and ergonomics.

Major contributors to the OSH knowledge base have been through government departments including HSE and DWP-funded research projects. This includes the work of Health and Safety Laboratory (HSL) for HSE, and



the work of other contracted research teams. The work funded by HSE and DWP for example is often carried out after competitive tender, so a large variety of different research groups have been involved in the development of the knowledge base. These include research institutes such as HSL, IOM and the Institute for Employment Studies, but also numerous researchers within Universities and teams put together for specific studies. All research reports are made freely available electronically by HSE and DWP.

The work of the Industrial Injuries Advisory Council is facilitated by DWP. This includes systematic reviews to inform the knowledge base for prescription of industrial diseases and injuries. All research work funded and published by government departments is made freely available to the public. The NHS also funds research into OSH and again this is made available publicly.

A number of the professional associations including IOSH also provide a funding route for research. This allows researchers the opportunity to bid for research funding through either specified topic areas or open calls for research. This suggests that risk factors are either already known about by the association or that, in developing the knowledge base, researchers are aware of the risks or potential health effects and go through a process of developing research questions.

A number of charitable organisations have also been included in the knowledge process. In particular the British Occupational Health Research Foundation has had a major impact in relation to health outcomes including, for example, occupational asthma and women working through the menopause. The research funded by this group has always been applied in nature whether it is by topic or industry sector. However, it is currently being closed down. A further charity, the Colt Foundation also fund research into Occupational and Environmental Medicine but have not been included as, although providing research funding, the outputs are generally disseminated by the funded researchers through academic publishing.

A large number of universities and independent research organisations have been involved in contributing to the knowledge base for occupational safety and health. This has been through funded research opportunities, the majority of which have been calls for proposals, and at times through identification of potential risks in industry resulting in agreed research funding. A further route for those involved in research is industry-funded research or consultancy. In this case a particular sector or group identify a problem which is then addressed by a research team. One of the drawbacks of industry-funded research and consultancy is that it may not be published in the public domain and therefore not be accessible to practitioners or others involved.

The outputs of research are often published as reports to the client, as peer-reviewed research papers, or both. As mentioned previously, reports to government departments are generally made publicly available.



However, reports to industry may be confidential and are not automatically made publicly available.

For those involved in research, specifically in the university environment, one of the main assessments made is that of the impact of research. This has involved the publication of journal articles in peer-reviewed journals. During the searches, a list of academic journals was collated and is presented in Appendix 10. The main issue with publication of research in this way is that the majority of journal articles are behind paywalls and so are not freely available in the public domain. Research by Shorrocks and Chung (2010) reported on the difficulties in Ergonomics of managing the gap between what research finds and what happens in practice. The main barriers included the research literature not being available in one place; the implications for practice not being made clear; the practitioners did not have time to read research and the research was not thought to be relevant to practice. This study highlights the issue of transfer of research information into practice in one specialist group and it could be hypothesised that similar situations are happening with other specialist groups in OSH.

What is difficult to quantify is the collation of internal company routes of knowledge creation. For example, for large multinational companies there is a move to standardise procedures at an international level. As identified this has resulted in working to approved standards internationally rather than to local legislation. This does not mean that legislation is ignored, rather the standards are of a high enough quality to reach legislative requirements at a global level. However, there is little research evidence at the current time as to the effectiveness of this method.

The creation of OSH knowledge within business sectors is also seen as a potential route for positive action. What is again unclear is the impact that this has across different industry sectors. There have been positive reports of knowledge transfer across the construction industry, specifically in relation to the London 2012 Olympic building work, but evaluation of translation and the impact of knowledge transfer have not been thoroughly assessed at the moment.

There is little known about less formal routes for OSH knowledge creation such as interventions within companies without the input of professional practitioners. This is not to infer that such actions do not exist, rather identifying and tracking them is difficult, especially in the small business sector.

A2.11 KNOWLEDGE TRANSLATION

As mentioned in the previous section, the production of knowledge is from a variety of different sources. However, the research knowledge created is often based on the solution to one research question and as such still has to be translated into a usable format. When consideration is made of HSE within this arena, the research that has been funded is often taken further



and informs practice or guidance in a more user-friendly format. The same is carried out for legislative change, where documents and guidance are produced for use by those involved in problem solving. This was seen with the introduction of EU legislation in 1992 and the introduction of the “six-pack” of legislation to the UK. Each was accompanied by a document which covered the legislative requirements and provided guidance on risk assessment and management of the topics. These were of varying status as Approved Codes of Practice, Codes of Practice, or Guidance, although not all readers would be aware of such distinctions. Since 1992, these have been updated and further legislation introduced, often with similar supporting material.

Other research funders including BOHRF and IOSH also produce usable guidance at the same time as the research report is published. This is produced in a more usable format to explain what the research means and how it can have an impact. This was carried out for the topics of back pain and occupational asthma by BOHRF and is regularly carried out for all IOSH research outputs; both these providers allow free access to such publications.

A2.12 KNOWLEDGE PROVIDERS

In identifying those involved in providing OSH knowledge, a total of 303 websites and information sources were collated. These were categorised in the database into different source types, government, trade associations, professional associations, trade unions, charitable organisations, private companies, magazines and others. Detailed lists of sources identified in each category are provided in Appendix 10 and summarised below.

Table 14., presents government sources of knowledge of OSH and their accessibility.

Table 14 Government Sources

Name	Free Access
Business Gateway	Free
Department for Education	Free
Department for Innovation Business and Skills BIS	Free
Department for the Environment, Food and Rural Affairs	Free
Direct Gov	Free
European Agency for Safety and Health at Work EU-OSHA	Free
Health 4 Work Adviceline (part of NHS Plus)	Free
Health and Safety Executive	Free
Health and Safety Executive of Northern Ireland	Free
Health and Safety Laboratory	Free
Health Challenge Wales	Free
Health Protection Agency	Behind Paywall
Health Protection Scotland	Free
Industrial Injuries Advisory Council	Free



Name	Free Access
Local Authorities	Free
Marine Accident Investigation Branch	Free
Maritime and Coastguard Agency	Some information is free
National Health Service	Some information is free
National Institute of Health and Clinical Excellence	Free
NHS Health at Work	Free
NHS Health Scotland	Free
Police	Unknown
Scotland's Health at Work	Free
Scottish Centre for Healthy Working Lives	Free

In addition to government sources, there are approximately 1000 trade associations in the UK at the current time. However, when authority and validity of information is considered, the trade associations listed in Appendix 10 are those that are linked to HSE and from the work of Fidderman (2007). These were accepted as being from an authoritative source. Again, as with research journals, much of the information was either behind a paywall or not available freely unless the individual was a member of the group.

Professional societies and groups also provide information to their members and some information to the public. The professional associations in the UK at the current time who have some involvement in OSH are presented in Appendix 10. In the UK in 2011, the Occupational Safety and Health Consultants Register (OSHCR) was set up. This has allowed the registration of professionals who have reached a specific competence level within each of the professional groups to be registered on a national database. The professional groups involved include the Chartered Institute of Environmental Health, the British Occupational Hygiene Society, the Institution of Safety and Health, the Institute of Ergonomics and Human Factors, the Royal Environmental Health Institute of Scotland and the International Institute of Risk and Safety Management. The OSHCR was set up to allow individuals some confidence in the expertise of a professional practitioner when selecting a consultant.

For professionals involved in Occupational Medicine and Health, again there is a requirement to achieve professional accreditation through either the Faculty of Occupational Medicine for physicians or through the Nursing and Midwifery Council for occupational health nurses. The professional associations including the Society of Occupational Medicine and the Association of Occupational Health Nurses provide further training opportunities and other professional support.

The Trade Unions listed in Appendix 10 are not a complete list of UK Trade Unions but rather a list of unions that provide knowledge about occupational health and safety to their members and at times more widely. As can be seen



seen, accessibility to information is varied, with some being freely accessible and others limiting access. Employers Organisations identified as providing information and or guidance to their members are listed in Appendix 10.

A number of charitable or “not-for-profit” organisations were also identified within the searches. These cover a wide range of different organisations in different sectors. All of those listed provide publications, research reports or guidance documents that can be made available. However, again accessibility can be an issue for individuals trying to find information on a particular health or safety issue.

A number of voluntary organisations were also identified within the searches. These organisations were listed as volunteer organisations but one of the difficulties is in identifying whether information or guidance is given free, however the majority of them were behind a paywall.

A list of private companies within which occupational health and safety information is collated and a number of different sources and media used to provide articles, newsletter and or web-based advice is presented in Appendix 10. The Barbour Index and Croners both collate and publish information for their end-users. However, the service they provide is via a paid subscription. Further sources listed provide information electronically but again the issue of access is raised for some of them.

A number of magazines and e-publications were also identified as providing knowledge and information for those involved in OSH. Again, many publications were behind paywalls.

The final breakdown of information sources within this section was identified as “other” sources. As can be seen from the listing, some are directly linked to OSH issues but others such as the Equality and Human Rights Commission are not directly linked but do provide information to people in relation to OSH.

One of the areas that could not be tackled at this stage of work was the use of informal knowledge networks or informal knowledge sources. These include, for example the use of colleagues in the same field for professionals or the use of colleagues from other similar companies for non-professionals involved in OSH. These are areas that were addressed at a later stage of the project through identification of the sources that individuals use when trying to address an OSH problem.

Figure 15 Figure 15 presents a diagram of the types of knowledge providers and the types of materials that are produced by the providers.



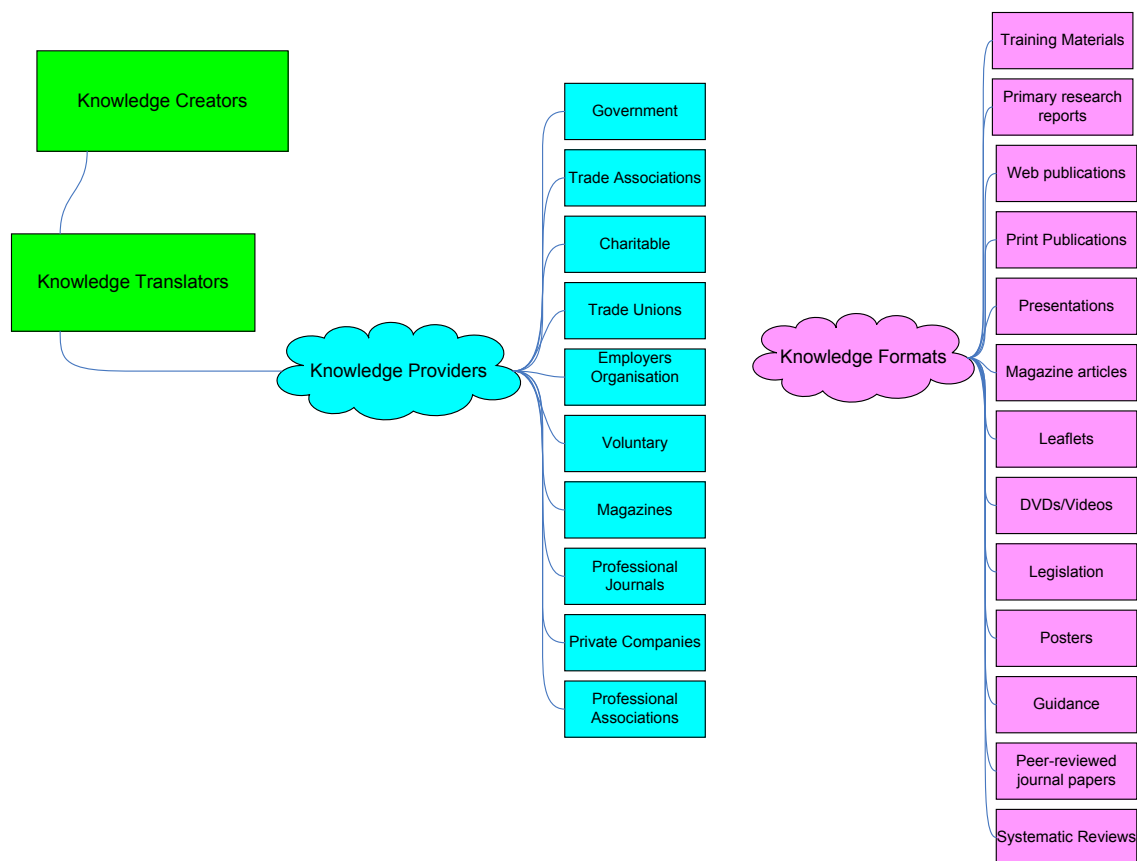


Figure 15 Sources of translated knowledge and outputs



A2.13 HAZARDS AND HEALTH TOPICS COVERED

The use of the database to collate sources also allowed the identification of over 1500 different hazard or health outcomes covered. However, by building heading categories for the topics covered, the overall categories are presented in **Figure 16**. From initial categorisation during the brainstorming and the first advisory group meeting, the only information that was suggested that was missing was that of travel medicine, as in looking after individuals who have to travel for work.

The formats that are available in relation to the topics covered are many and varied. These range from peer-reviewed journal articles, including systematic reviews, research reports, legislation and guidance, codes of practice, information sheets, posters and training materials. Much of the information is available electronically but several sources still allow for the supply of paper and audio-visual publications.

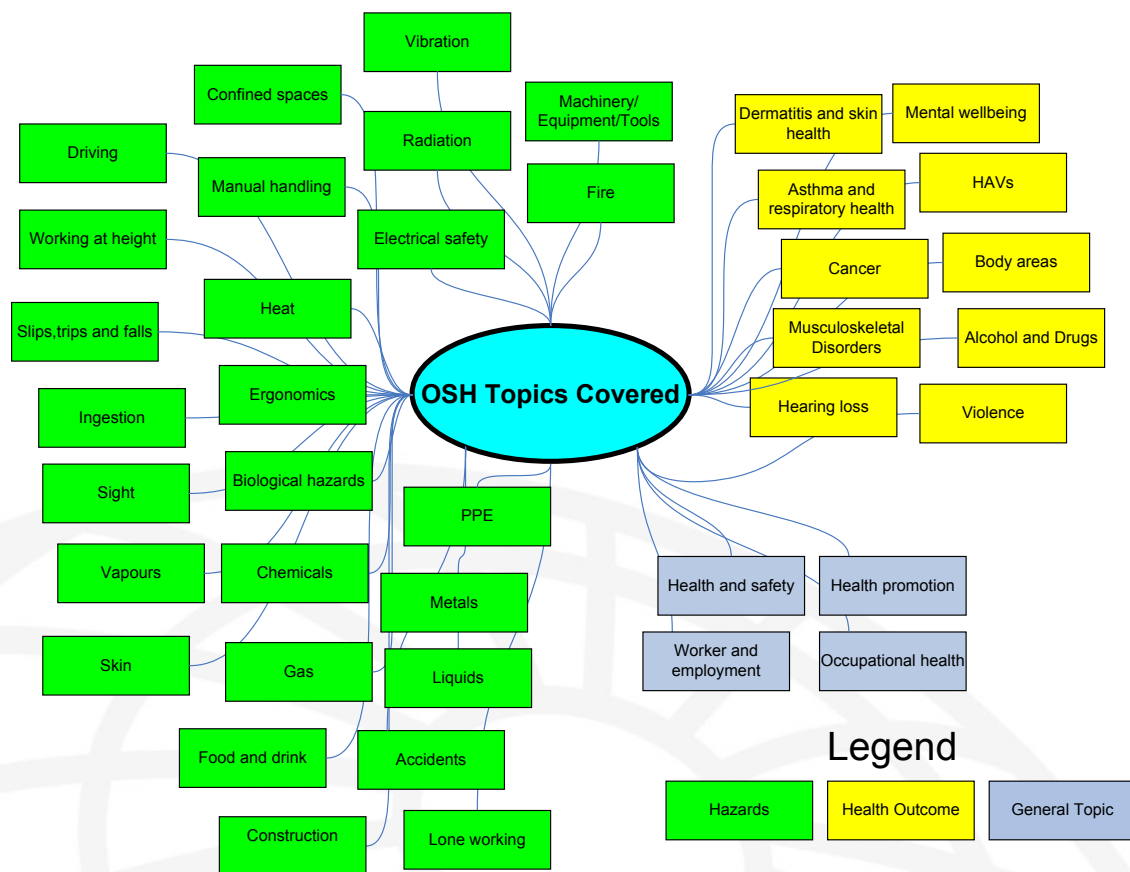


Figure 16 Map of the topics covered by the information providers



A2.14 QUALITY ASSESSMENT

The objective of the quality assessment stage was to contact a sample of the information sources that were identified via the search strategy to find examples of how they evaluated the information they provided on occupational health and safety before making it available in the public domain.

For the purpose of the quality assessment it was assumed that academic journal articles and papers had already been through a peer-review process to assess their level of quality. The sample was taken across the remaining source types; Government, Trade Association, Not-For-Profit/Charitable, Employers Organisation, Voluntary, Trade Unions, Private Company, Professional Association, Trade Journal, Professional Journal, Magazine, University or Research Organisation and Other.

There were five open-ended questions relating to accuracy and quality of information, recording access, identification of information use, accessibility of information and how often information is evaluated. The sample organisations were initially contacted via their information/enquiry email address to try to identify the most appropriate person to respond to the questions. Once contact had been made, an introduction to the project and the questions were sent via email.

From the total of 303 sources identified in the searches, 80 sources were contacted and 16 completed responses from the following source types; Magazine, Not-For-Profit/Charitable, Trade Association, Government, Professional Association and Trade Union were received. The responses have been collated and each question in turn is summarised below;

A2.15 ACCURACY AND QUALITY ASSESSMENT OF INFORMATION PROVIDED

The responses followed a similar theme on how information is monitored. Any information they provide which is written by official sources such as HSE, IOSH, TUC and academic journals is automatically trusted to be accurate and of a high quality.

Other information that sources provide is checked by people such as: member(s) and chair(s) of research committees, people at the organisation who have the knowledge and experience required, peer reviewers, content experts, proxy approvers, technical committees and technical steering committees, consultants, policy groups, reviewers, and reviewers who do double assessment of materials, commercial affairs, product working groups, guidance executives, professional editors and organisation members.

It was reported that, as well as the information being checked for accuracy and quality, it is checked for relevance to the audience, statistics are checked for sensibility and sources and information are checked for validity.



In relation to standards there was also a mention of how information was checked to ensure it met the publication, processes and methods standards which were in place. There was also a mention of information firstly checked at a UK level before being passed on to England, Scotland, Wales or Northern Ireland where further checks are carried out before being published on any of the individual websites. More frequent monthly checks also take place to ensure that links within the information and external websites still exist and show the correct information with any new links being approved by a member of the web team.

One of the organisations provided a flow diagram of the process undertaken for the monitoring of online information and document level monitoring
(Figure 17

Figure 17). In the responses an organisation distinguished between general and specialist information and the difference in how they monitor them. General information is provided by in-house information professionals with a background in the industry who would research current issues and legislation providing information sourced from government or professional organisations. In contrast, specialist information would be contracted out to professional health and safety service providers within the industry.



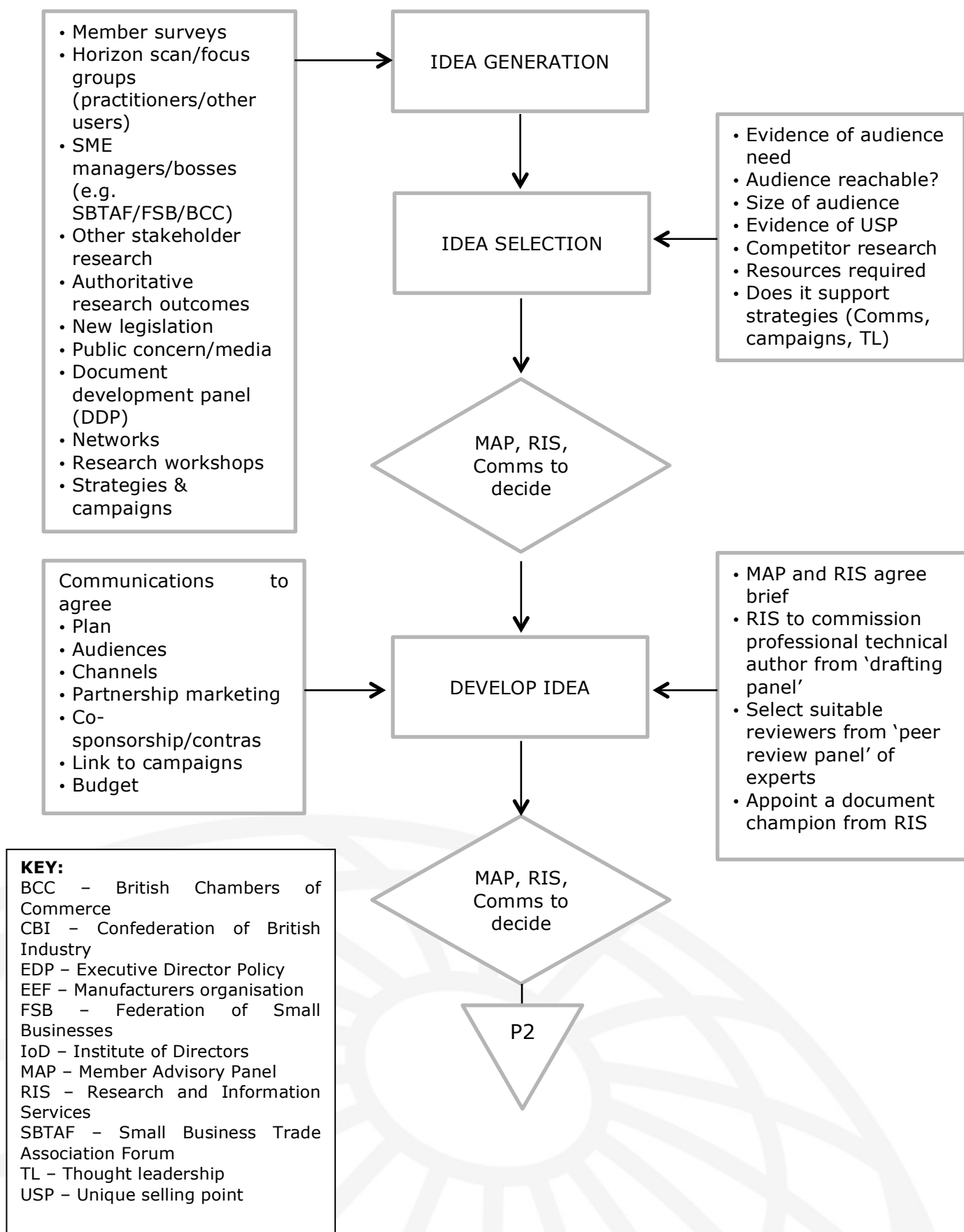


Figure 17 Document Development Process



A2.16 RECORDING

The sources presented different methods of recording who had accessed information, depending on the nature of the information. For freely accessible web based information, the use of website statistics, the statistical package of Google Analytics for page visits and own website analyses of search and access volumes were mentioned. One source specifically stated that they can record the number of people, particular stories they access and how long they spend on the website, with general information about the city and country in which the reader was located. It was mentioned that, for items which are free to download, the access is automatically recorded in a database format. Another source stated that they published the 'themes' from their website which had the highest level figures into their standard monthly report.

One organisation mentioned that they had an area on their website which was free. However it required visitors to register to gain access therefore providing information to the organisation on who is accessing the material within that area.

Sources that provide information which requires payment mentioned that the purchase was recorded in a customer database. Other payment methods mentioned in the responses were subscriptions and memberships. The information from these provides the direct access statistics. However, one of the sources had done a survey and found that, on average, the information which the subscription holder had was also shared within their organisation, increasing the readership to around nine people per copy.

Workshops were also mentioned, as organisations have an attendance list which provides them with the statistics of who the information was distributed to. Similar to this are conferences and exhibitions where printed materials is distributed to delegates.

For enquiries from member companies, it was mentioned that there are methods in place to keep a log, from which monthly and annual statistics are reviewed, as well as receiving statistics from professional health and safety service providers.

A2.17 IDENTIFICATION OF HOW INFORMATION IS USED AFTER DELIVERY

The general theme across the responses was either that there was not a method of identifying how people are using the information once it has been accessed, or it relies on feedback from members. This feedback however usually focuses on suggestions for improvement or usefulness of the information, rather than how it was applied.

A few methods were mentioned, including an example of when information had been distributed with follow-up questionnaires for feedback purposes four days, four weeks and four months after the initial distribution.



When information had been provided via training there were more options mentioned for identifying the use of information, such as follow-up surveys, delivery of more courses, and course feedback. Additionally it was suggested that for companies using consultants and where clients have improved their policies, procedures and risk assessments, their internal customer survey would be able to demonstrate positive changes when successful.

A2.18 ACCESSIBILITY OF INFORMATION

There were mixed responses in relation to the accessibility of information. Some sources mentioned that they aim for general clarity whereas others noted the tailoring of information to their target audience's needs.

The specific audiences mentioned by the organisations include: SMEs in the building industry, business industry, research and academic community, end users, technically qualified users, health and safety representatives, clinicians, occupational health nurses, general practitioners, occupational hygiene professionals, HR professionals, line managers with HR responsibilities, safety practitioners, managers, employees, supervisors, new start-ups, teachers, trainers, young people, organisation members and non-medical practitioners.

The factors stated in relation to accessibility of the information were mainly font type and size, language, content, terminology and communications. Others included it being in English with clarity of information by using 'Plain English', paying attention to paragraph and sentence lengths, avoiding the use of long words, and using a friendly and active tone. One of the responses also included videos with English subtitles for those who view them with hearing difficulties, or for those for whom English is not their first language. Specifically for websites, facilities included a speaking browser to read the content aloud and an option for those who are visually impaired to switch the screen to colour contrasting yellow and blue, as well as adherence to the UK approved web standards and international best practice.

A2.19 HOW OFTEN IS INFORMATION EVALUATED?

Reasons given for not evaluating and updating information included it not being in the remit of the organisation or it not being applicable to the type of information they provide. However for those who do review their information several timescales and methods were described.

In relation to how often information is updated there were various timescales: ad hoc basis, as necessary, not planned, on a rolling basis, on-going, at least once a month, every two months, at least three times a year, every quarter, at least once a year, every year or two, after several years and after a five year period.



Reasons for these differing timescales include the type of information being evaluated or updated, such as legislative changes which require updating as and when there are amendments or significant changes. In contrast, 'codes of practice' would usually be updated every year or two and videos may not be updated for several years.

Also noted as a factor in how often information was updated was the type of evaluating which was being undertaken. More significant reviews of all information were carried out, for example, every three years; whereas evaluation of sectors or specific topics occurs more often, as it is on a smaller scale. However, new links to update information are uploaded approximately every two months or earlier if relevant new legislation comes into force. It was also noted that there is a need for updating information if a section is no longer relevant.

Some of the responses included further information on the frequency of their evaluation, and updating of information, such as their initiation to change information coming from members advising them and requesting that guidance is updated. It was also noted that the occurrence of change depends on the topic being covered and the efficiency of updates depends on the type of information. Further information was also provided on the decision to update guidance as, if it is updated frequently, there can be an effect on the implementation.

A2.20 DISCUSSION OF THE KNOWLEDGE MAPPING EXERCISE

Is there a coherent knowledge base for OSH?

In carrying out the searches for this research project, a large number of hazards and health outcomes were identified from the sources found. However, these are often presented in a variety of ways, depending on the provider of the information. The use of the database to collate this information allowed the research team to organise the information provided by each of the sources in a summary format for this report. More detailed information is available within the Access database built for this work. The variety of formats produced by those providing information ranges from systematic reviews to leaflets. The most comprehensive information was, as expected, provided by the HSE, who covered the majority of safety and health topics at the time of the searches.

From discussions with the Advisory Group in May 2012, the coherence of the knowledge base for OSH appears to be in place for safety topics. However, in relation to health outcomes, it was felt that there is a lack of knowledge – 'know how' rather than 'know what' – in relation to the prevention and intervention of health issues including as an example, stress and mental wellbeing. This is also seen against a backdrop of the issue of accessibility when access to source material is through a paywall. However, as identified in the mapping exercise, although access to primary research is through journal articles where payment is required, access to translated guidance is more often available through sources including government,



professional associations and trade unions, where access is free. It is not clear how many individuals will go back to primary research sources rather than to guidance or codes of practice.

One further consideration within this work is how the identification of particular knowledge sources may be made more difficult depending on the information required and the search skills of the individual. There is a lack of information at the current time in relation to how people search for OSH information. Using standard search engines such as Google, the listings provided will be influenced by previous search terms used. In addition to this, the skills of the individual searching will influence the outcome as will the information sources available to search. For example, there is a large amount of information available on some topics such as manual handling but much less information available on others such as dermatitis and skin exposure. This may reflect the maturity of the knowledge base in these areas but is also likely to have an impact on the ability to find high quality information on those topics.

The question of authoritative sources of knowledge for OSH has been raised throughout this desk study. During collation of the material, initial searches were based on sources that were considered authoritative by the research team and the advisory group. However, it is clear that, when individuals, professionals and non-professionals in OSH are trying to identify authoritative sources to inform their practice or to reduce risks in the workplace, identifying a trusted source of knowledge may not mean the same thing.

A2.21 QUALITY ASSESSMENT OF AVAILABLE MATERIALS

A sample of the providers was asked about the quality assessment of the information and knowledge that they provide. On the whole, the collated responses identified that there is a process in place to evaluate information and knowledge before it is made public. Furthermore, information is also evaluated for relevance to the audience and statistics are checked for validity. For those providing live training courses, quality assurance is carried out to ensure content and delivery is provided in a standardised manner.

The providers sampled were also asked about accessibility to the information. This included structural design such as font size, plain English, the use of sub-titles for those with hearing problems and the ability to adjust text size and colour. However, presented information was also designed for specific audiences in different sectors, or for professionals and non-professionals involved in OSH, rather than a general audience.

There were mixed responses to whether the providers updated their information; some did not see this as within their remit. However, the majority identified that information was evaluated when legislation changed or there was an up-date to the provision. It was also noted that evaluation



and updating of other guidelines such as codes of practice would only happen when there were major changes to practice.

Who accesses the information provided and how is it used?

A number of methods are used to record how many times a website is accessed or how long individuals spend on a particular theme. However, this type of information is generally anonymised and no further information on the end-user is obtained. As noted, some web sites require registration to download or access specific areas. This information has the potential to be collated. At the current time such information is used by the provider to guide them on content and “hot topics” in the field.

Although it is appreciated that there is little control over how knowledge is used once it has been made available in the public domain, the responses to this question did identify that there are a number of ways of following-up. These include feedback after training and workshops, identification of how processes and procedures have changed due to new knowledge provision and other forms of engagement including help lines for further information to be obtained.

This again suggests that consideration is made of the audience, the media used and the potential to follow-up users by the providers of OSH knowledge. It is apparent that tracking information is used to inform the providers about the information that they present rather than identifying who is accessing and how they use the knowledge provided.

A2.22 CONCLUSIONS

The desk study of the OSH landscape and knowledge transfer research has identified the following:

- There is a large amount of information available with regard to OSH but the quality of the information accessed is variable.
- The providers of information cited within this research project are those considered trusted or linked to a source that is considered authoritative.
- Access to primary research is difficult but government sources on the whole provide free access to guidance, codes of practice and primary research that they have funded.
- The main providers of information and knowledge do report evaluating and updating the sources of research.
- The current knowledge transfer literature can be applied to OSH context and is currently being applied by other research teams.
- There is evidence that the factors including message delivery methods and interaction with end users are key in the OSH knowledge transfer process.



APPENDIX 3. SOURCES OF OSH INFORMATION USED

A3.1 SURVEY AIMS

Building on the earlier findings from the project this section of the report presents findings on the sources currently being used in the UK by individuals that have a responsibility for OSH. This looks at how they inform themselves about OSH and their preferred formats for this information. To explore this, a questionnaire survey was designed and implemented with the following aims:

- To identify sources of OSH information currently used within the UK and explore issues of authority and trust
- To explore how respondents keep up-to-date with information and knowledge
- To explore the methods of communication used for OSH information
- To explore how knowledge transfer is evaluated in the workplace
- To determine if there are barriers in implementing OSH knowledge in the workplace.

A3.2 METHODOLOGY

A3.3 SURVEY RECRUITMENT

The target population for the survey was OSH professionals and non-professionals tasked with OSH within the UK. Potential participants were contacted through IOSH, British Occupational Hygiene Society (BOHS), Institute of Ergonomics & Human Factors (IEHF), Society of Occupational Medicine (SOM), HR Review, Chartered Institute of Personnel and Development (CIPD) and IOM. This was via newsletters, news articles, emails, magazines, websites and LinkedIn groups. Response from this recruitment exercise provided relatively few participants from small organisations. Therefore in addition to these methods a targeted approach was taken to contact SMEs in four areas of the UK through Local Chambers of Commerce, Local Councils, business groups and networks in Cornwall, West Lothian, Cardiff and Birmingham. A number of invitations were also distributed directly to a selection of SMEs using details purchased from the Dun and Bradstreet business directory.

For all participants a web link was provided to the survey questionnaire which was administered using Survey Monkey (<http://www.surveymonkey.com/>) software. The time scale for the survey was October 2013 to January 2013.

A3.4 SURVEY MATERIALS

The research team developed a 60 item measure guided by a desk study and focus group that identified sources, formats and communication of OSH knowledge available in the UK (See Chapter 3). The 60 items were organised into six sections. The first section asked for contextual



information, including two initial questions to determine eligibility for the survey, excluding those without responsibility for OSH or working outside the UK. If eligible, the respondent's role in relation to OSH was identified to differentiate between OSH consultants (providing OSH consultancy services to one or more companies) and OSH employees (a company employee with responsibility for OSH). Subsequently these groups were routed to two separate question sets, the content of these were the same but worded appropriately to suit the different roles of the respondents. These five sections covered:

- Obtaining information on OSH
- General information on OSH
- Keeping up-to-date with information and knowledge
- Communication of OSH
- Respondents experience in OSH

These sections included both free text fields and pick list options including data on industry sectors collected using the Standard Industrial Classification (SIC, 2007).

A3.5 RESULTS

Respondents

There were a total of 498 respondents to the survey, 112 of these were not eligible for the survey (61 non-UK, 37 not OSH) and 14 provided no or incomplete data so were excluded from the results. The remaining 386 respondents comprised 84 consultants and 302 OSH employees. Of the 302 OSH employees, 41 were recruited via the targeted approach to SMEs. For the purposes of the statistical analysis, OSH employees from both recruitment methods were combined into a single group, with appropriate results presented according to company size.



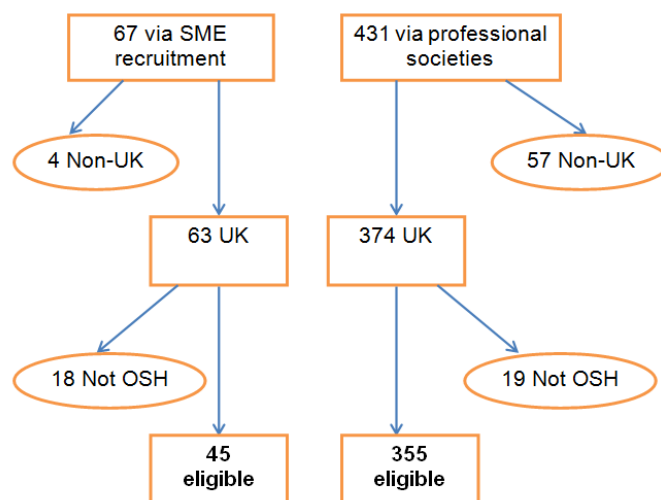


Figure 18 Respondents to the online survey

The distribution of the OSH employees shows that 65% were professional practitioners in their own workplace. Among consultants 80% had 11 or more years' experience in OSH compared to 62% of OSH employees. A quarter of OSH employees and over a third of consultants had more than 20 years' work experience in OSH. The results show that 91% of consultants and 84% of OSH employees that completed the survey have membership to at least one professional organisation. The most frequently reported were IOSH, BOHS and the International Institute of Risk and Safety Management. Most OSH employees and consultants had one or two OSH qualifications, most commonly a National General Certificate (n=145) and/or a Diploma (n=144). Almost half of OSH employees worked in companies with more than 500 employees, and 64% of the OSH employees worked in the private sector and 24% in the public sector. Consultants could provide multiple answers to indicate the kinds of companies to which they provide services; responses indicate 90% worked in the private sector, 55% in the public sector and 40% in the charity and voluntary sector. Both OSH employees and consultants worked for companies from a wide range of industry sectors, most commonly manufacturing and construction.



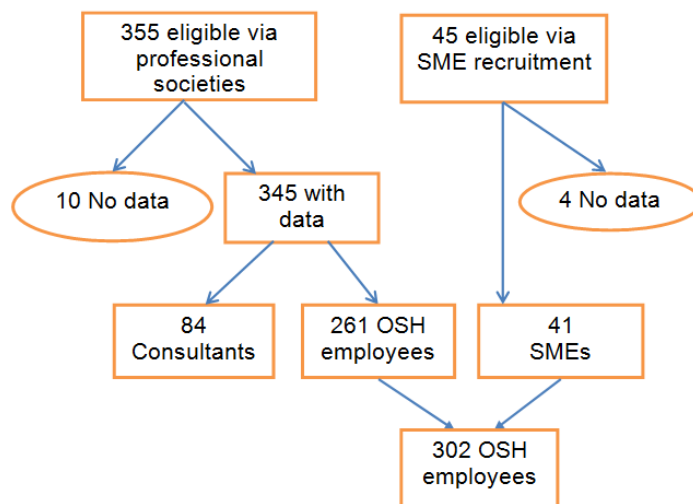


Figure 19 Distribution of eligible survey respondents

A3.6 IDENTIFICATION OF SOURCES OF OSH INFORMATION USED WITHIN THE UK

Information on specific issues

Table 15 shows that around 90% of consultants dealt with physical, safety and chemical issues, whereas OSH employees most frequently dealt with safety issues (93%) followed by around 80% dealing with physical and chemical hazards. Nearly half of the consultants (49%) and OSH employees (40%) dealt with biological hazards. Results subdivided by company size showed that OSH employees in smaller companies were less likely to deal with physical, chemical and biological hazards than those in larger companies.

Table 15 Distribution of issues dealt with by consultants and OSH employees. Each cell contains the number of respondents and *percentage of those responding to the question*

Issue	Consultants		OSH Employees	
Physical hazard	71	90%	241	81%
Chemical hazard	66	86%	231	80%
Biological hazard	38	49%	112	40%
Safety issues	67	87%	259	93%
Occupational health	48	64%	173	64%

Figure 20 shows that OSH employees used Government sources (e.g. NHS, HSE) most often to obtain information on new hazards or safety issues, followed by professional organisations and research material such as journal articles.



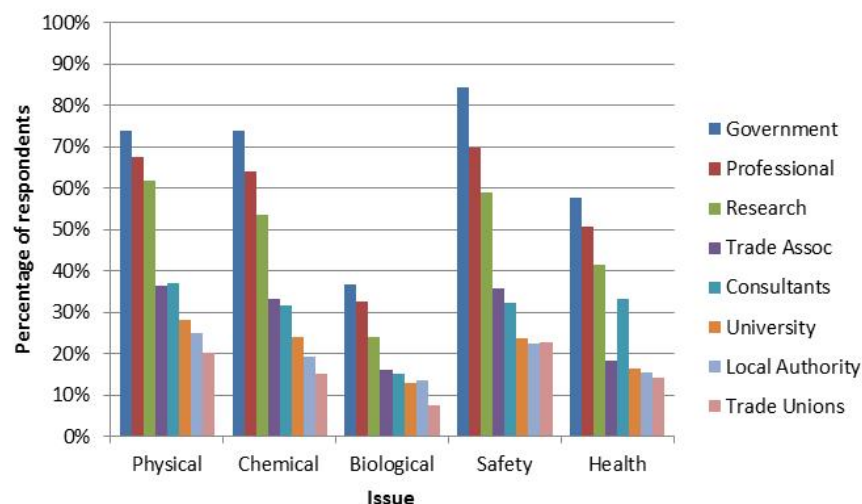


Figure 20 All sources of new information used by OSH employees. Figure shows percentage of respondents reporting use of each source, subdivided by issue.

For consultants the pattern was similar with Government information sources being used most, followed by professional organisations and research. The information being trusted, easy to access, free and easy to understand were the reasons given by both the consultants and the OSH employees for using these sources more frequently (**Table 16**).

Table 16 Reasons for using the most frequently used source. Each cell shows percentage of those responding to each question.

Reason for using source	Hazard Physical		Chemical		Biological		Safety		Health	
	E	C	E	C	E	C	E	C	E	C
Trusted source	68%	77%	68%	77%	35%	44%	78%	81%	52%	59%
Easy to access	68%	81%	65%	77%	32%	36%	78%	75%	48%	48%
Free	63%	73%	57%	68%	30%	39%	67%	68%	41%	47%
Easy to understand	39%	43%	33%	44%	16%	22%	40%	38%	26%	23%
Registered with source	27%	39%	26%	31%	13%	27%	31%	34%	26%	28%
Preferred format	14%	22%	16%	22%	6%	10%	17%	21%	12%	15%
Advised to use it	5%	6%	7%	9%	3%	8%	8%	6%	8%	7%
First site found	1%	4%	2%	1%	1%	1%	1%	5%	3%	7%

E=OSH Employees, C= Consultants

A3.7 GENERAL INFORMATION ON SAFETY OR HEALTH



Figure 21 shows that guidance (information on how to solve a problem) was the format most frequently used by both OSH employees (n=249) and consultants (n=71) when obtaining new information on OSH. This was followed by legislation (n=224, n=67), professional magazines (n=185, n=57) and trade journals (n=136, n=51).

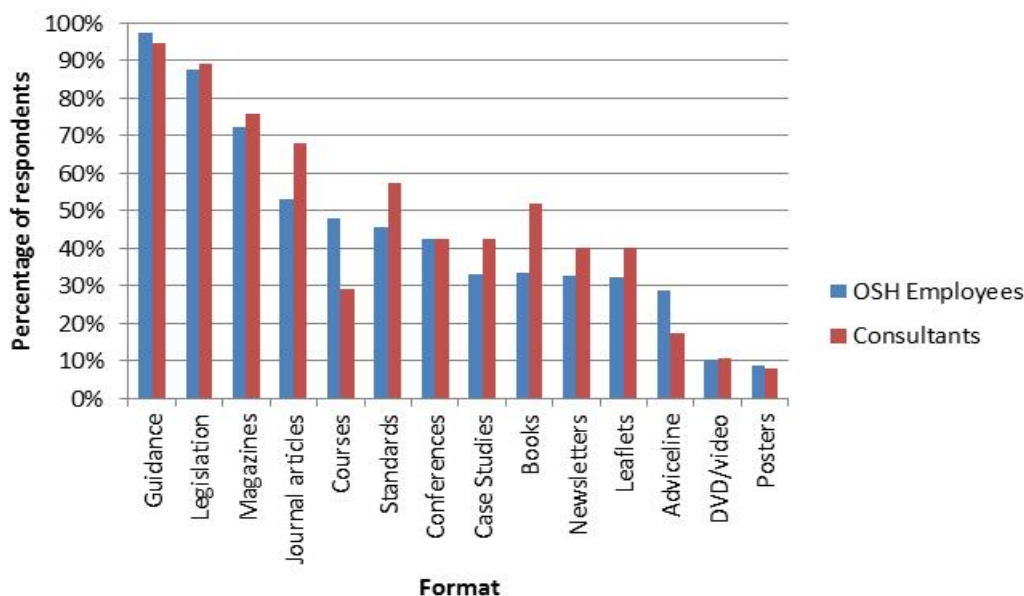


Figure 21 Formats used to find information about a new hazard or health outcome. Figure shows percentage of respondents reporting use of each format.

When subdivided by company size, formats such as trade magazines, journal articles and courses tended to be used more among larger companies. Also OSH employees showed an increase in the use of case studies with company size.

In terms of websites, both OSH employees and consultants indicated they would use the HSE and IOSH sites most often. Of 258 OSH employee responses 128 different websites were identified, with HSE (n=202) and IOSH (n=93) followed by the Environment Agency (n=40) being most popular. From 75 consultant responses 69 different websites were noted with HSE (n=58) and IOSH (n=33) being most frequently used followed by Google searches (n=13). These sources were reported as being used due to them being relevant, informative, up-to-date, trustworthy, authoritative, professional and unbiased with internet searches being quick, relevant, and direct and allowing choice.

In total 281 OSH employee responses reported using 175 different groups and individuals as sources of new information, with the most common being colleagues (n=50), IOSH (n=47), HSE (n=26) and IOSH branch meeting/groups (n=20). There were 64 consultant responses which reported 69 groups or individuals used as sources of information, with the



most common being IOSH (n=13), colleagues in the organisation (n=11), professionals (n=10) and HSE (n=7).

A3.8 KEEPING UP-TO-DATE WITH INFORMATION AND KNOWLEDGE

OSH employees reported that they used guidance (n=224), legislation (n=223), internet searches (n=175) and magazines (n=166) the most to keep up to date with regulations and best practice. Consultants also used guidance (n=67) and legislation (n=65); however they were slightly more likely to use magazines (n=55) rather than internet searches (n=44).

A3.9 METHODS OF COMMUNICATION USED FOR OSH INFORMATION

Communicating Information on Occupational Safety and Health

The methods of communication used by OSH employees and consultants for the physical, chemical, biological, safety and occupational health are shown in **Table 17**. Meetings, email, training courses and toolbox talks were most frequently used by OSH employees for all issues with the exception of occupational health, where there was more use of the internet/intranet and less use of toolbox talks. OSH consultants were slightly more likely to use the internet/intranet and slightly less likely to use toolbox talks than OSH employees.

Table 17 Methods used by OSH employees and consultants to communicate OSH information for different issues. Each cell shows percentage of those responding to each question.

Method	Hazard									
	Physical		Chemical		Biological		Safety		Health	
	E	C	E	C	E	C	E	C	E	C
Meetings	77%	76%	72%	77%	69%	71%	78%	72%	81%	71%
Email	71%	85%	68%	85%	68%	84%	74%	86%	74%	84%
Courses	69%	61%	73%	67%	68%	63%	74%	68%	63%	61%
Toolbox	65%	44%	65%	43%	58%	34%	63%	49%	49%	35%
Internet	54%	50%	57%	50%	59%	47%	58%	54%	59%	53%
Newsletters	36%	35%	38%	35%	40%	42%	42%	39%	40%	39%

E = OSH Employees, C = Consultants

Communication methods for different audience groups are summarised in **Table 18** showing that both OSH employees and consultants were more likely to communicate via meetings and email with senior and middle management, and to communicate via training courses and toolbox talks with employees and new starts.



Table 18 Methods used by OSH employees and consultants to communicate OSH information to different levels of employees. Each cell shows percentage of those responding to each question.

Method	Level of employee							
	Senior Management		Middle Management		Employee		New Start	
	<i>E</i>	<i>C</i>	<i>E</i>	<i>C</i>	<i>E</i>	<i>C</i>	<i>E</i>	<i>C</i>
Meetings	87%	83%	88%	80%	62%	52%	50%	52%
Email	83%	85%	85%	83%	58%	50%	36%	34%
Courses	44%	32%	65%	52%	78%	73%	86%	86%
Internet	43%	37%	51%	37%	50%	32%	37%	36%
Newsletters	27%	24%	34%	22%	42%	33%	31%	30%
Toolbox	14%	7%	27%	15%	66%	52%	50%	45%

E = OSH Employees, *C* = Consultants

In relation to methods of communication that OSH employees found most effective, 76 different methods were identified from 290 responses. The most frequent methods were toolbox talks (n=42), face-to-face communication (n=26) and training courses (n=17). From the 84 consultant responses there were 36 different methods identified, the most frequent responses were meeting employees face-to-face (n=13), toolbox talks (n=9) and email (n=7).

Evaluation of knowledge transfer in the workplace

The method used most often by both OSH employees (n=225) and consultants (n=62) to check that information and knowledge passed on had been effectively implemented into the workplace or working practice was speaking to the employees (**Figure 22**). Other commonly used methods were safety inspections (n=189, n=49) and routine or regular risk assessments (n=166, n=41).



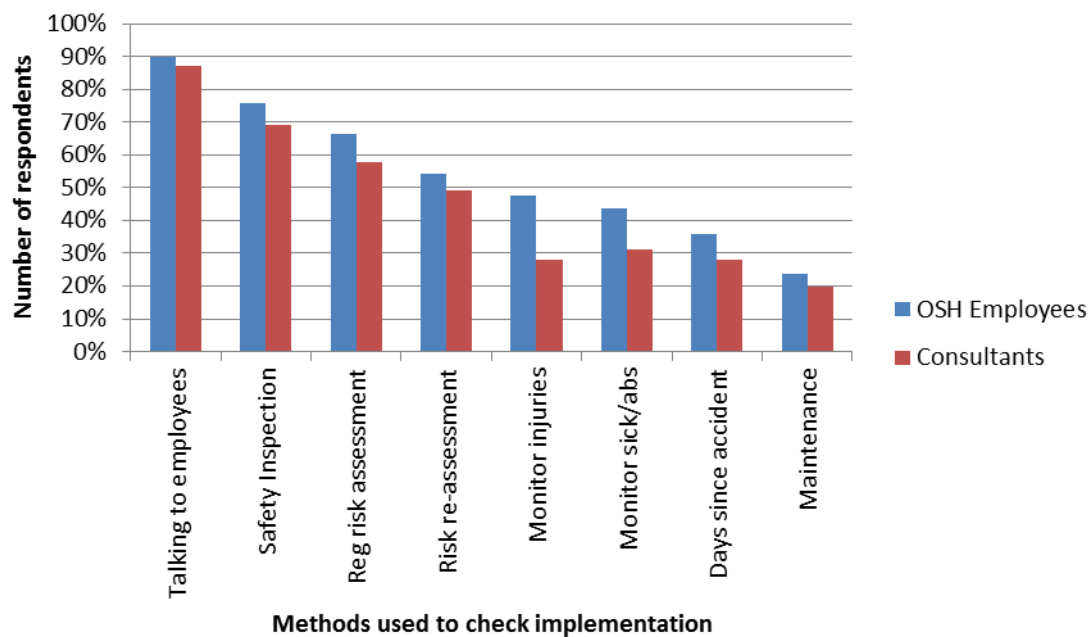


Figure 22 Methods used to check implementation of information. Figure shows percentage of respondents reporting use of each format.

Barriers in implementing OSH knowledge in the workplace

Forty eight different barriers to transferral of OSH information were identified by the 290 OSH employee responses, in addition to this sixty seven responded that there were no barriers. Of the 48 identified barriers the most common responses were time constraints (n=28), literacy and language barriers (n=18), the culture of the workforce (n=17), lack of management support (n=17), not getting people together at the same time (n=15), lack of interest (n=13) and geographical spread of the workforce (n=11). Similarly 18 of the 68 consultants responded that there were no barriers. There were 29 barriers reported by the OSH consultants of which time constraints (n=10) and language (n=6) were the most common. A further barrier mentioned by consultants was negative perceptions of health and safety (n=4).



A3.10 DISCUSSION

Survey respondents

The majority of the study sample were recruited through professional societies, which is reflected in the high level of professional memberships of the respondents; the most frequent being IOSH and BOHS. Relatively few OSH employees from SMEs responded to the survey, despite the introduction of an additional targeted recruitment process aimed at this group. This lack of participation could be due to a basic lack of interest in OSH or to a lack of time to respond to the survey. The results of the survey are therefore more representative of OSH employees in larger companies and may not reflect the practices in smaller organisations. Hasle and Limborg (2006) identified barriers that SMEs have in accessing OSH that often result in more of an ad hoc approach being taken. The authors also noted that a successful route for OSH in smaller businesses was through information and support from others in the supply chain.

Identification of sources of OSH information used within the UK

A3.11 INFORMATION ON SPECIFIC ISSUES

The results of this survey indicate that OSH employees and consultants use a variety of sources of OSH information within the UK. All respondents dealt mostly with physical and chemical hazards and safety issues, followed by occupational health with fewer dealing with biological hazards. Information on all these issues, for both OSH employees and consultants, was most frequently obtained from government sources. When consideration is made about the reasons respondents use those resources, the most frequent sources were chosen based on trust in those sources as well as being freely available and easy to access. This was reiterated in the comments received with regard to usage of different websites. This perhaps indicates that within the respondents there is an understanding of the importance of obtaining authoritative information so that they can then advise their organisations correctly.

A3.12 GENERAL INFORMATION ON HEALTH AND SAFETY

A variety of different routes to obtain knowledge were identified by respondents. When analysed by company size OSH employees showed an increase in the use of case studies with increasing company size, perhaps reflecting a greater knowledge and experience level which can be drawn upon to develop case studies in larger business sectors. The use of DVDs and videos was more likely to be used in larger businesses, possibly due to their ability to send messages quickly, to a large audience. Less use was made of professional magazines and journal articles and standards by smaller companies, indicating a lack of access perhaps due to cost implications. For the smaller companies who responded, access to usable and free guidance is an important source of information.



The breakdown of information formats used, analysed by membership/non-membership of a professional organisation, indicated that those that have membership are more likely to use legislation, magazines, journal articles and courses than those that did not have membership. This may relate to the need for continuing professional development among the professional groups and a need to maintain and update knowledge and skills. It may also relate to accessibility to available material, where access to a number of formats including articles, standards and case studies may be through pay routes or through industrial or professional groups such as British Standards Institution, Croners or Barbour Index.

Both OSH employees and consultants most frequently reported using the HSE and IOSH web-sites and Google searches while OSH employees also used the Environment Agency web-site. Although there were numerous other web-sites listed, the majority of respondents reported using the HSE web-site, demonstrating its importance to the UK OSH community. This could be problematic in the current economic climate as there is the potential of a reduced resource being made available. A reduction of the quality of information here would clearly have a significant effect.

With IOSH coming in as second most frequently used, this not only suggests that it is an important web-site for this professional group but perhaps reflects that the majority of respondents were IOSH members. It is possible that, had there been more responses from other professional groups, the web-sites of these groups may have been more prevalent in the responses.

The majority of respondents reported that they obtained information from talking to other groups or people. Again similar responses were provided by both OSH employees and consultants who network with IOSH, HSE, use IOSH branch meetings and talk to other professionals. A large variety of other groups and networks were also listed by respondents including trade associations and other professional groups. Although the internet is a vital tool in the modern workplace, there is still a place for networking with others to gain information and knowledge. With the complexity of some OSH information, the transmission of knowledge through interaction with other people is likely to be the most effective way of successful transfer (Crawford et al 2012).

A3.13 KEEPING UP-TO-DATE WITH INFORMATION AND KNOWLEDGE

The most frequent formats that individuals used to keep themselves up-to-date with regulations and best practice were guidance, legislation, internet searches and trade magazines. This shows the variety of routes that people can use to obtain knowledge to inform their own practice.



A3.14 METHODS OF COMMUNICATION USED FOR OSH INFORMATION

Communicating knowledge to others is a key part of the role of OSH employees and consultants, therefore the survey asked about the methods used highlighting different groups and topics. For all topics OSH employees most frequently used meetings, emails, training courses and toolbox talks whereas consultants were slightly more likely to use the internet/intranet and less likely to use toolbox talks. This may reflect the different roles that those employed in the business and those employed by the business have. As toolbox talks may be more useful when delivered by someone known to staff members, rather than an external consultant hired by the company. There is a similar pattern for OSH employees and consultants in the methods used to communicate information to different audiences. For communicating with senior managers this is more likely to be via meetings and email. However, when communicating with employees and new starts, training courses and toolbox talks are used most often by OSH employees and meetings and training courses by consultants. This may relate to the access that the consultants have within the company as training may be more formalised if the company is bringing in an external consultant.

Results on the preferred methods of communicating OSH information to others showed that OSH employees preferred courses followed by meetings and toolbox talks, whereas the consultants preferred meetings, courses and email. This could be explained by the different relationship that a consultant has with a company. The most effective ways of communicating reported by OSH employees included toolbox talks, face-to-face communication, training courses, HSE committees and one-to-one coaching for professionals. Consultants provided a similar list also including email communication as being effective. It can be seen that the majority of the most frequently used and preferred methods of communication involve contact with others either through training situations or face-to-face contact. This perhaps reflects the complexity of the knowledge that is being transferred and that it may be inappropriate to communicate this through routes such as the internet/intranet or email. This shows that OSH employees and consultants understand the need for face-to-face contact to convey some issues in relation to OSH.

A3.15 EVALUATION OF KNOWLEDGE TRANSFER IS EVALUATED IN THE WORKPLACE

The survey asked respondents if they evaluated knowledge transfer and whether the information they provided had been implemented into the workplace. The most frequent response from both OSH employees and consultants included talking to employees and safety inspections. When this was examined in relation to company size, differences in approach were identified with smaller companies spending more time talking to employees, using safety inspections, and risk assessments (and re-assessments) and injury monitoring being used more by larger businesses. This perhaps reflects the processes set up within larger businesses, especially in those



dealing with higher levels of hazards/risks. In these there are likely to be systems in place to monitor and record the different processes including sickness absence reporting, days since last accident and maintenance scheduling. These data suggest that fewer SMEs, specifically those companies with 10 or fewer employees, were using these methods. However, the frequency reported for talking to employees is high across all company sizes possibly showing the importance of this face-to-face contact in both implementing change in OSH and evaluating the impact of change.

A3.16 BARRIERS IN IMPLEMENTING OSH KNOWLEDGE IN THE WORKPLACE

The barriers to effective communication were also explored by the survey. Positively, the most frequent response to this question was "none", showing that many respondents have found effective ways of transferring OSH knowledge. One of the perceived barriers identified by OSH employees and consultants was structural difficulties in access to employees on different shifts or geographic sites. Issues of literacy and language suggest that those delivering knowledge and information need to understand the audience to ensure that materials provided are at a suitable literacy level to ensure effective delivery. This also requires that those delivering knowledge have an understanding of the content, the transformation of knowledge and the target audience. This procedure can be an extra cost to a business however it allows for the format of the knowledge to be tailored to the audience for more effective delivery.

A3.17 SURVEY CONCLUSIONS

The responses to the survey reinforce the research completed by Crawford et al (2012) in relation to the substantial number of sources available and used in OSH in the UK, with 128 different websites being named by OSH employee respondents. The most popular websites used by respondents were HSE and IOSH, these websites provide readers with articulated formats of explicit and embedded information which can easily be shared and transferred to others (Kang, Rhee and Kang 2010). Examples of this are guidance documents that can be shared with others to create value within a company (Kang et al, 2010).

In relation to Collins' 5 levels at which knowledge resides (1993) the survey responses highlighted that smaller companies made little use of tacit knowledge which is high level embrained knowledge such as journal articles and standards. With those with membership being more likely to use legislation, magazines, journal articles and courses than those that don't have membership.

In terms of the survey results, face to face transfer was suggested as being used most frequent and preferred method, this is in line with the results of the review by Hasle and Limborg (2006) that found face to face contact was effective as it develops trust and engagement between the stakeholder and the receiver of the information. The specific face to face methods noted by



respondents included toolbox talks and training sessions which both require the adaptation of knowledge and tailoring material to a target audience, which as suggested by Laroche and Amara (2011) has more of an impact than the use of peer-review articles. It is also in line with the research by Roy et al (2003) that suggested that researchers and practitioners have a different role in OSH in the way that they consider knowledge, therefore ensuring the importance of adaptation of this for the audience.

The survey identified that respondents engage with others and networks to obtain new information, through networking in this way a fluid mix of experience can be drawn in to OSH knowledge to be used within a company to give knowledge its context (Davenport & Prisak, 1998, Yakhelf, 2007). Connecting together these parts and context of information to form knowledge (Senapathi, 2011).

From the survey of OSH employees and consultants, a number of conclusions can be made:

- There was a similar pattern of information sourcing across the different issues by both OSH employees and consultants.
- The most common sources used were Government sources which were seen as being trusted, easy to access and free.
- The formats most frequently used by respondents were guidance, legislation and trade magazines; usage in larger companies was generally higher than in smaller companies.
- The preferred web-sites used by both OSH employees and consultants were HSE, IOSH as well as general internet searches and this was related to being easy to find, definitive and professionally informed.
- The respondents also reported engaging with other people and networks to obtain new information; these networks included IOSH meetings, HSE, trade associations and employers' groups.
- The favoured methods of communicating information to employee groups for senior managers were via email and meetings and for other employees, toolbox talks and training courses.
- The most effective way of communicating to employees was thought to be through direct communication via face-to-face communication including toolbox talks, training courses and committees.
- The barriers to transferring information were perceived to be time constraints, the workplace culture, literacy and language, lack of management support and the inability to get groups together due to shifts or geographical location.



APPENDIX 4. HOW OSH INFORMATION WAS USED IN COMPANIES

This section of work aimed to examine how OSH knowledge was used and transferred within the organisational environment. **Figure 23** shows the process that was used to evaluate knowledge transfer from an information source through to the employee but also taking into consideration the properties of the knowledge as well as measures of effectiveness.

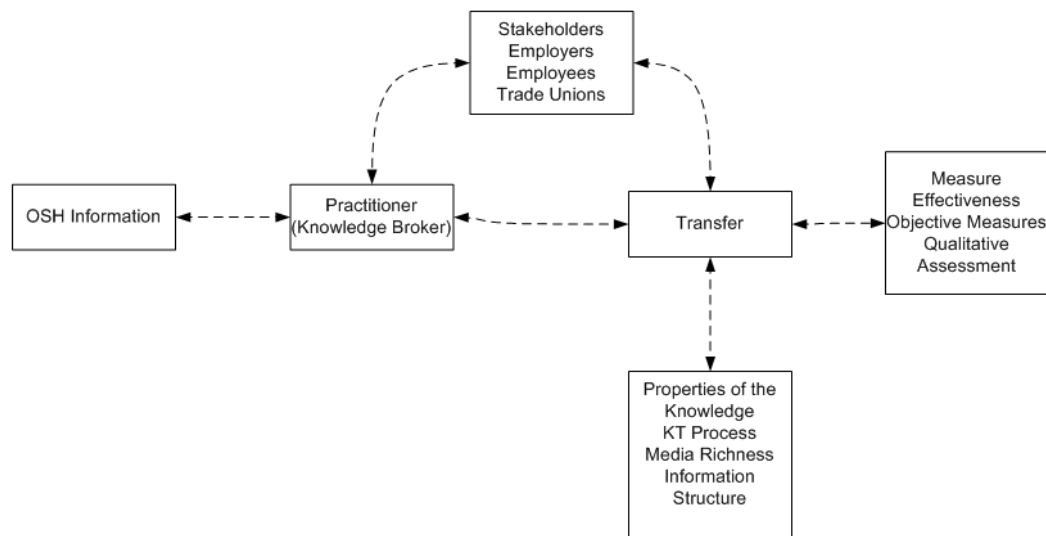


Figure 23 Evaluation of OSH knowledge transfer from provider through to employee

As defined earlier, knowledge transfer is often referred to as knowledge that is transferred from one place to another with the aim of improving performance and/or changing behaviour. However, good knowledge does not necessarily lead to good performance, and good performance does not necessarily always rely on good knowledge. This section identifies methods and practices which have been used within the literature to detect, understand and evaluate different aspects of KT, with particular emphasis on their ability to 'transfer' into the OSH domain.

A4.1 DEVELOPMENT OF CASE STUDY METHODOLOGY

The overall framework used to underpin the development and analysis of the case study tools was The Diffusion of Innovations Theory (Rogers, 1983) presented in **Figure 24**. In this the vertical axis describes the process of transfer through knowledge, persuasion, decision, implementation and confirmation and the horizontal axis presents the stages of the transfer at which knowledge is adopted.



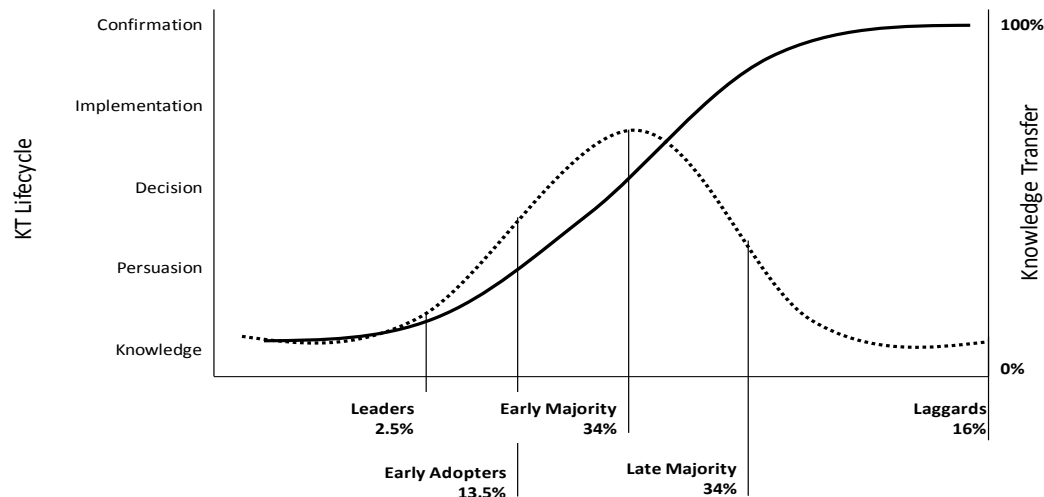


Figure 24 Diffusion of Innovation Approach

As well as the headings from the Diffusion of Innovation Approach providing the outline for the development of the case study tools they also provide an analysis template to guide the exploration of individual interventions in a comparable manner.

This allows us to consider the different factors and each will be described below.

Knowledge

What is the OSH knowledge being transferred?
What are the properties of knowledge used?

Persuasion

The 'physical' means by which the KT is attempted

Decision

Compatibility of contexts
Relative advantage
Ease of implementation
Triable
Observable

Implementation

Absorptive capacity
Changes wrought?
How did it change from info to knowledge?
Info to know how?
Embeddedness

Confirmation

Assessment of objective effect/outputs?
Permanence of change?



A4.2 KNOWLEDGE

To explore the knowledge and allow for the description of this for each of the interventions the question development was based on two knowledge taxonomies. These allowed for the identification of the properties of the OSH knowledge (Zander and Kogut, 1995) and the interaction between the knowledge types and how they were stored and represented in practice at the organisation (Collins, 1993).

The first of these is the taxonomy by Zander and Kogut (1995) shown in **Table 19** dealing with properties of knowledge and what can be done with it. The taxonomy covers the dimensions of codifiability, teachability, complexity, system dependence and observability which are explained in this table. Through using these as a guide, questions were constructed to ask about the knowledge and the person that disseminates the OSH knowledge in the organisation.

Table 19 Zander and Kogut (1995) 'Dimensions of Knowledge Taxonomy'

Dimension	Explanation	Question content from the interview schedule
Codifiability	The extent that the knowledge can be articulated in documents and software	The importance of the formats, dissemination methods, language of information. The importance for employees to have experience in OSH to understand the information
Teachability	The ease at the individual level that it can be taught to new workers	The training of new starters
Complexity	The number of skills or competences embraced by an activity and how important are they in transferring OSH knowledge	The use of OSH information to develop regulations and rules
System Dependence	At the organisational level the extent to which transfer is impaired due to dependency on many different groups of experienced people for its production	The importance of contact between employees and those disseminating knowledge
Observability	Can the capability be acquired from published reports or other methods by other businesses	Could others learn how they transfer OSH knowledge

The second knowledge-based taxonomy used for the development of the questions was Collins (1993) five 'Levels of Knowledge', which investigates the interaction of knowledge type and how it is stored/represented in practice. The taxonomy includes Embrained, Embodied, Encultured, Embedded and Encoded levels of knowledge as described in **Table 20**



below. This allowed the project team to construct questions to ask the organisation about the knowledge processes in place.

Table 20 Collins (1993) Five 'Levels of Knowledge' Taxonomy

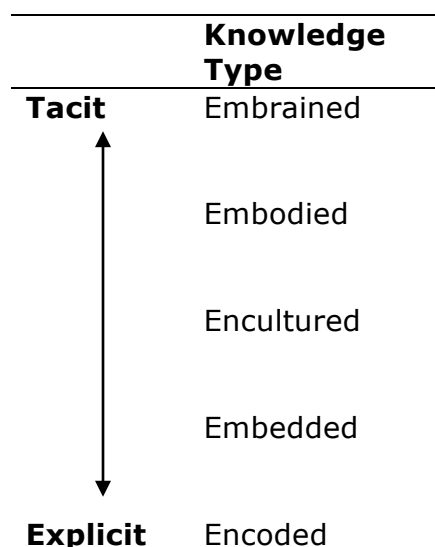
Knowledge Type	Explanation	Question content from the interview schedule
Embrained	Conceptual and cognitive skills high level of OSH knowledge	Training of employees, suppliers and customers Internal KT training
Embodied	Action oriented safe interactions with environment and people	OSH as part of the business strategy and pro-active approaches to OSH How equipped the organisation is to respond to OSH issues
Encultured	Shared understandings and norms – Language and safety culture	Shared ideas about OSH
Embedded	Routines and guidance – Formal OSH / Health and Safety procedures	Formal procedures on OSH
Encoded	Stored knowledge, OSH databases and repositories	Storage of documents on OSH, access to these documents and use

A4.3 PERSUASION

Persuasion is described as the physical means by which KT is attempted in an organisation. The assessment of persuasion was carried out after data collection at the company as it involved collecting information and comparing it against set criteria. The information that is required from the company is the type of knowledge, how it is disseminated and what factors influenced the success or failure of the transfer. Collins (1993) levels at which knowledge resides (**Table 21**) was used in the question development to identify the persuasion as it allows for the identification of tacit and explicit knowledge. Tacit knowledge is knowledge that is embrained, embodied and encultured and explicit knowledge is embedded and encoded meaning that it can be codified, written and stored.



Table 21 Five levels at which knowledge resides (Collins, 1993).



Media richness is defined as “the ability of information to change understanding within a time interval” (Daft and Lengel, 1986). With the importance being the link between the user, the content of information and the medium used to transfer this. In relation to this rich media is personal in nature and low media richness includes rules and procedures. The media richness is described after the case study interviews and surveys and a decision made of whether an appropriate method was used for the specific intervention. Factors that influence this include; the topic, the target audience, the work shifts, geographical location etc. The data collected is then be compared against the statements below:

- **Proposition 1** – “Virtual processes should be used when the knowledge to be transmitted carries high levels of explicitness, is declarative in nature, conceived as an object and accessible through consciousness” (p. 5).
- **Proposition 2** – “Face-to-face processes should be used when the knowledge to be transmitted carries high levels of tacitness, is procedural in nature, socially constructed and accessible through unconsciousness” (p. 6).
- **Proposition 3** – “Virtual processes are relevant when a firm seeks to exploit conveyance knowledge transfer conduits which are low in media richness, rely on cognitive communication cues, and exhibit asynchronous feedback” (p. 6).
- **Proposition 4** – “Face-to-face processes are relevant when a firm seeks to exploit convergence knowledge transfer conduits which are high in media richness, rely on multidimensional communication cues, and exhibit synchronous feedback” (p. 7).
- **Proposition 5** – “When virtual processes are deployed, simpler, fewer and more individual types of knowledge transfer barriers may be encountered” (p. 7).



- **Proposition 6** – “When face-to-face processes are deployed, more complex, multiple and interactional types of KT barriers may be encountered” (p. 8).
- **Proposition 7** – “Virtual processes are particularly suitable for the attainment of knowledge outcomes that are more general, impersonal, acontextual and atemporal” (p. 8).
- **Proposition 8** – “Face-to-face processes are particularly suitable for the attainment of knowledge outcomes that are more specific, personalized, context-dependent and time-related” (p. 8).

We also wanted to be able to describe the structure of the information, for this the framework used was based on Lin et al (2005) (**Figure 25**) taxonomy of the sender receiver framework. For this the sender was the person in the organisation that was disseminating the OSH information and the receiver was the target audience of employees.

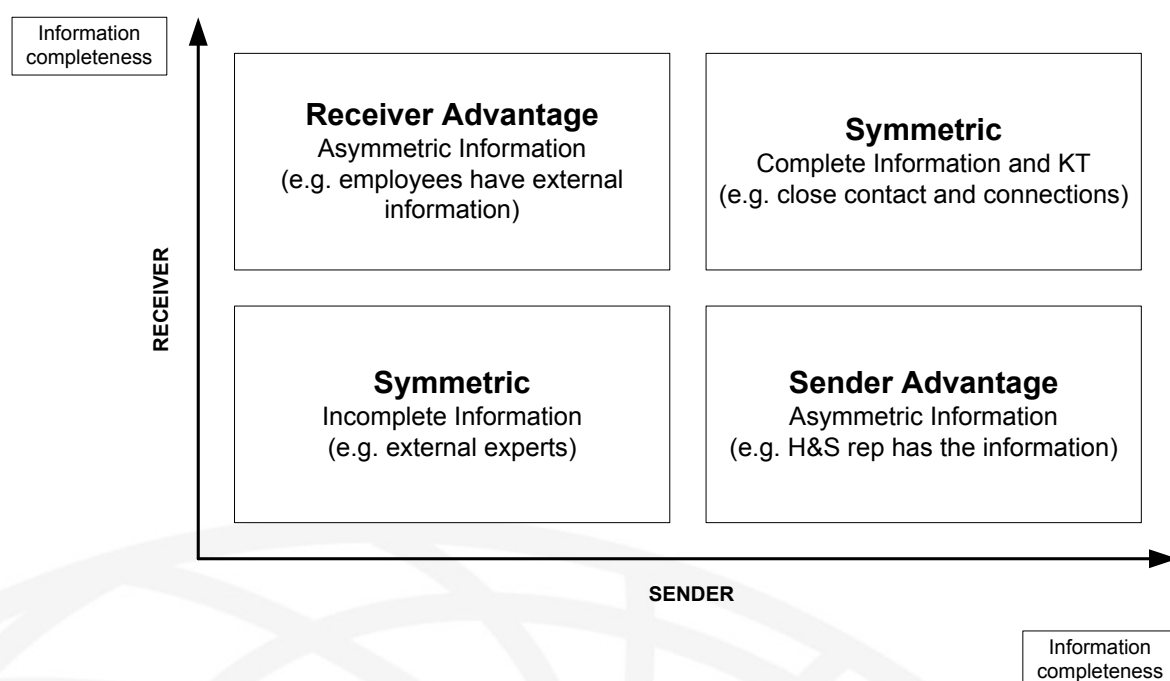


Figure 25 Taxonomy of information structures in KT (Lin et al., 2005, p. 201)

From **Figure 25** above, the terms of the information structures have been explained and example questions provided in **Table 22** below.



Table 22 Taxonomy of information structures in KT

Information structure	Explanation	Question content from the interview schedule
Symmetric Complete Information Position (top-right)	"Much of the [KT] literature implicitly assumes that KT transfers occur under this structure. [...] It may apply to situations where parties have close connections and frequent contact"	Contact with knowledge brokers
Symmetric Incomplete Information Position (bottom-left)	"...this structure is commonly encountered when companies hire experts [...] to fill knowledge gaps, where companies often lack the technical know-how, and technical experts often lack understanding of the business context. [...] One challenge in this structure is for the sender and the receiver to find mechanisms to alleviate information incompleteness for both of them before KT [...] although no party holds information advantage over the other, strategic distortion in communication may still happen"	Those that inform employees
Asymmetric Receiver Advantage (top-left)	"...is the case where the sender's information set is incomplete while the receiver's information set is complete. In this structure, the receiver can identify the sender with the highly valuable knowledge"	Seeking OSH from external sources, talking with others or studying regulations
Asymmetric Sender Advantage (bottom-right)	The situation of 'sender advantage' is likely to occur frequently in OSH settings (i.e. the information advantage falls to bodies that produce OSH knowledge). "The challenges of this structure are how a sender can credibly communicate the correct expected value of his knowledge to the receiver, and how the receiver can determine the value of the sender's knowledge"	Effectiveness of OSH KT in the company

A4.4 DECISION

This section of the interview covers the decisions by the stakeholders involved in the intervention using Spraggon and Bodolica's (2011) taxonomy of knowledge transfer processes to build the questions. In doing this the results can later be mapped on to the model (**Figure 26**). For example, an organisation with low levels of discretion and a narrow range of KT coverage and processes would appear in the upper right-hand quadrant. Once characterised it becomes possible to observe changes in the organisation as a result of KT initiatives.



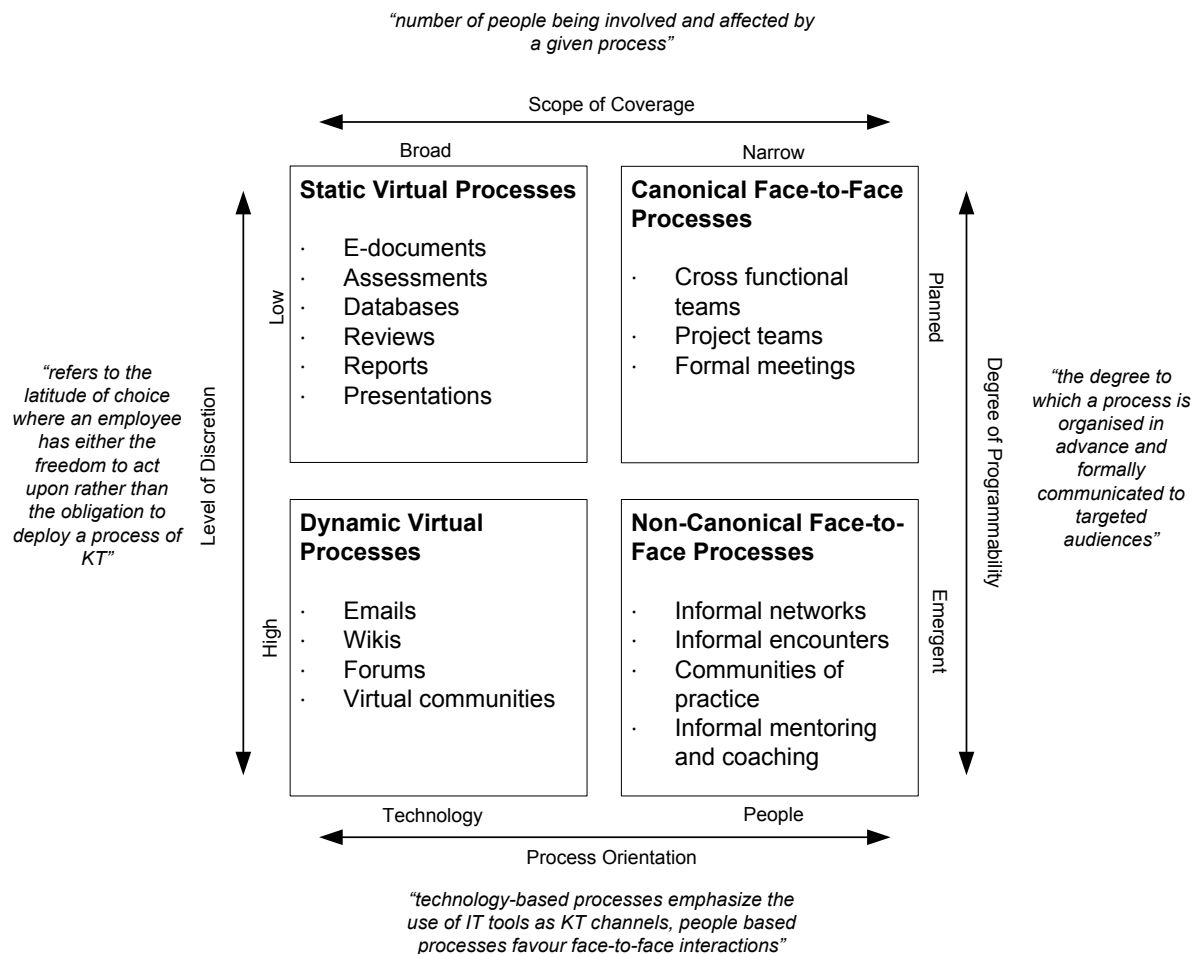


Figure 26 Spraggon and Bodolica (2011) taxonomy of knowledge transfer processes

Question examples from the interview schedule mainly ask about the format used to disseminate information including questions around the preparation of the intervention, the audience and whether or not there was a degree of choice involved. Question examples included topics such as the use of a plan for the transfer of knowledge, identifying a target audience and the choice that the target audience may have had.

From this data there were also comparisons made against the 8 proposition statements mentioned in Section A4.3 (Persuasion) of this report to describe the media richness and whether or not it was an appropriate method to use for the current intervention.

The decision to adopt new knowledge is thought to be impacted upon by the 5 processes of compatibility of contexts, relative advantage, ease of implementation, trialability and observability which are explained in **Table 23**.



Table 23 Processes of the decision to adopt new knowledge

Process	Explanation	Question content from the interview schedule
Compatibility of contexts	How easy it is to assimilate new OSH knowledge into current structures and operations. Knowledge that is easy to use and assimilate is more likely to be transferred.	Previous formal procedures
Relative advantage	What does the transferred knowledge contribute over existing processes e.g., improved performance or compliance?	Improvement in compliance, quality or other measures of organisational performance Possible reduction in risks
Difficulty	What is the effort involved in using new OSH knowledge against the alternative. OSH knowledge seen as easy to use will transfer more quickly and successfully.	Overall result of KT
Trialability	Can the end-users experiment with the knowledge in order to find out what it offers and how it can contribute in practice	Employee participation in the KT process
Observability	Is the new OSH knowledge visible to others in terms of its contribution or effect. The more visible the OSH knowledge, the more it will drive communication in the system	Observability to others in the company

The questions led by these processes will be used to construct a description of the decisions involved in implementing the intervention.

A4.5 IMPLEMENTATION

To investigate the absorptive capacity of an organisation Camison and Fores (2008) constructed a questionnaire of 127 items to provide an assessment of the ability of an organisation to absorb new information. Due to the nature of the case studies a shorter measure was used based on an adaptation of the safety culture questionnaire by Stanton and Glendon (1996). Favourable outcomes from the responses to this suggest an organisation has the capacity for OSH knowledge, whereas less favourable outcomes identify that preliminary work on the capacity of the target audience to absorb new knowledge would be appropriate. There were separate question sets for the interviews and the surveys. For each question the respondent was asked to read a statement and provide an answer on a



scale of: strongly agree, agree, neither agree or disagree, disagree and strongly disagree.

In addition to the use of the safety culture questionnaires the core constructs of absorptive capacity including; the acquisition capacity, assimilation capacity, transformation capacity and application capacity, have been used. These are explained and sample questions are provided in **Table 24** Dimensions of Absorptive Capacity (Camison and Fores, 2008) below.

Table 24 Dimensions of Absorptive Capacity (Camison and Fores, 2008)

Dimensions	Definition	Question content from the interview schedule
Acquisition capacity	Firm's ability to locate, identify, value and acquire external knowledge that is critical to its operations	Sources of information Proactive practices
Assimilation capacity	Firm's capacity to absorb external knowledge. This capacity can also be defined as the processes and routines that allow the new information or knowledge acquired to be analysed, processed, interpreted, understood, internalised and classified.	Keeping up to date on OSH
Transformation capacity	Firm's capacity to develop and refine the internal routines that facilitate the transference and combination of previous knowledge with the newly acquired or assimilated knowledge. Transformation may be achieved by adding or eliminating knowledge or by interpreting and combining existing knowledge in a different innovative way.	After updating knowledge Adapting OSH codes of practice and guidance



Dimensions	Definition	Question content from the interview schedule
Application capacity	Firm's capacity based on routines that enable firms to incorporate acquired, assimilated and transformed knowledge in to their operations and routines not only to refine, perfect, expand and leverage existing routines, processes, competences and knowledge but also to create new operations, competences, routines, goods and organisational forms.	Updating competencies and skills in relation to new OSH knowledge Route to exchange OSH knowledge within the company

A4.6 CONFIRMATION

Assessing confirmation of change will be dependent on the risk or health outcome that is being addressed. All case studies will be asked about confirmation of the knowledge transfer outputs and whether or not there are other factors which may have influenced any changes. The confirmation questions were constructed by the research team for the interview schedule including issues on assessment, negative impacts and other factors that may have impacted on the result of the knowledge transfer. These questions complement the theories mentioned in the above section to confirm that the processes they suggest have successfully changed for the OSH intervention.

A4.7 OTHER QUESTIONS

Where it was felt that more information would be advantageous to the case study, extra questions were added to those already adopted from the literature and tools. These included topics such as those involved in the process, the timescales and what highlighted the need for the intervention. Specifically in relation to the knowledge brokers the research team also asked about where they source information, how often they update this and if employees approach them with issues.

In the surveys employees were also asked about how the company informed them, how the intervention changed their work and in their opinion were there any changes made as a result of the knowledge transfer.

As well as the headings from the Diffusion of Innovation Approach providing the outline for the development of the case study tools they also provide an analysis template to guide the exploration of individual interventions in a comparable manner.



A4.8 CASE STUDY RECRUITMENT

Recruitment to the case studies was carried out via various methods. Firstly, through the survey previously distributed to professionals and non-professionals working in OSH. At the end of the survey the respondents were asked if there had recently been an OSH intervention in their organisation, or if such a change was planned in the near future. Where this was the case, respondents were asked if they were willing to participate further in the research study, and were subsequently contacted by the research team. The second method of recruitment included an email being sent to over 70 of the secretaries of the Safety Groups UK in 11 regions of the UK asking them to email out a participant information sheet to their members about the project. Those interested then contacted the research team directly. Thirdly in March 2014 IOSH posted an item on their website, IOSH Twitter, Linked In and Facebook pages to advertise the recruitment to the case studies.

Through the above mentioned recruitment strategies we identified 8 companies that had implemented interventions in the last 12 months (retrospective interventions) and 4 companies that were due to implement interventions in the next 6 months (prospective interventions). By 'intervention' we mean a change in OSH within the organisation. These interventions were in companies of varying size, type and covering various OSH topics (see **Table 25**).

The case studies in the following sections have been anonymised or not where the companies wished for this.

Table 25 Case Studies Included in the Research

Number	Company type	Type of case study	Intervention	Size of company
1	School within a University	Retrospective	Portable electrical equipment safety intervention	Large
2	Catering Industry Supplier	Retrospective	Introduction of H&S committee	Large
3	Roofing company (Barclay Roofing and KMJ Risk Solutions Ltd)	Retrospective	Refresher face fit training	Small
4	Skip manufacturer	Retrospective	Re-emphasis of hearing protection through information and new types of hearing protection	Small
5	Engineering and construction (NMCNomenca)	Retrospective	Introduction of a new induction process	Large



Number	Company type	Type of case study	Intervention	Size of company
6	Construction, engineering and development (Bowmer & Kirkland)	Prospective	Introduction of a new type of cable locator	Large
7	Facilities Management	Retrospective	Introduction of a Health Surveillance Matrix	Large
8	An aerospace and defence company	Prospective	The impact of change in either/or policies and procedures in relation to working at height	Large
9	Housing Association (Jephson Housing Association Group)	Retrospective	Introduction of an Office Safety Network (OSN)	Large
10	Fire Safety Group (Pyrology Ltd)	Retrospective	Introduction of health and safety policies and risk assessments	Micro
11	International Retail Company	Prospective	Introduction of a new online Health and Safety induction	Large
12	Banking and financial services company (Royal Bank of Scotland)	Prospective	Health and Safety documentation and intranet content re-design as part of the 'Health and Safety Remediation Programme'	Large

On visiting the organisation we interviewed the stakeholders that had been involved in implementing the intervention, such as safety representatives, senior management and/or HR and carried out a survey of a sample of relevant employees that had been impacted on by the intervention.

A4.9 COLLATION OF INFORMATION AFTER COMPANY ASSESSMENT

On completion of each individual case study a report was provided to the company including an analysis of the OSH knowledge transfer for the identified intervention as well as a combined set of anonymised responses from the interviews and surveys. The knowledge transfer section used both sets of responses (interviews and surveys) to provide a description of knowledge used and analysis of the persuasion, decision, implementation and confirmation aspects of the intervention. See **Table 26** for a summary of knowledge transfer results from each case study.

Within this table the knowledge transfer results have been identified as 'yes' where the different stages of KT were identified by the researcher as being successful, and as 'ongoing' where there was evidence of the stage of KT, however it had not yet been successful. For the ongoing cases there were



varying degrees of evidence for these. In the case studies there weren't any instances where a stage of KT was not being acted upon at all.

Table 26 Summary of the case study knowledge transfer results

	Knowledge Description	Persuasion	Decision	Implementation	Confirmation
Case Study	Success	Success	Success	Success	Success
1/a	Yes	Yes	Yes	Yes	Yes
2/b	Yes	Yes	Yes	Ongoing	Yes
3/c	Yes	Yes	Yes	Ongoing	Ongoing
4/d	Yes	Yes	Yes	Ongoing	Yes
5/e	Yes	Yes	Yes	Ongoing	Ongoing
6/f	Yes	Yes	Yes	Ongoing	Yes
7/g	Yes	Ongoing	Ongoing	Ongoing	Yes
8/h	Yes	Ongoing	Yes	Ongoing	Ongoing
9/i	Yes	Yes	Yes	Ongoing	Ongoing
10/j	Yes	Yes	Yes	Yes	Ongoing
11/k	Yes	Yes	Yes	Ongoing	Yes
12/l	Yes	Yes	Yes	Ongoing	Ongoing

A one page summary of each case study has been presented in Tables 27 to Table 38.



Table 27 Case Study 1/a

Company type: School within a University Company size: Large Target population: Staff (academics, lab managers, room managers) and Students (post and under graduates) Level: Individuals Type of work: Non-manual Actors: School Safety Officer, Deputy Head of the School,
Intervention: Portable electrical equipment safety intervention The portable electrical equipment intervention at a school within a University was the result of an incident that was reportable to HSE. After visiting the University the HSE issued an improvement notice which was responded to accordingly. The main knowledge broker for the intervention was the School Safety Officer. The knowledge broker and others developed materials which involved the changing of formats to produce a specific policy to disseminate to all staff (including academics, lab and room managers) and students (including post and under graduates). This knowledge transfer involved a documented plan required by HSE on how implementation was going to occur and capturing information about all equipment coming in to the building. For the majority of those receiving the information it was important for them to understand the background legislation. For the more specialist electrical audience they were expected to have extensive experience for the implementation of this intervention. The physical means by which knowledge transfer was implemented was through a formal letter to all staff, an email sent out by the Deputy Head of the School, all staff meeting, staff assembly including a presentation, corridor conversations and responses to email inquiries. The changes brought about by the intervention are observable from two viewpoints: ISO accreditation for the University and knowledge and information being shared between different schools within the university. The fact that there was consistency in the safety culture questionnaire responses between stakeholders and employees indicates a matching of understanding of OSH in this particular environment.
What was achieved: Since the implementation of the intervention there has been the introduction of a register of electrical equipment and individuals have a new understanding of the importance of registering new equipment. In addition to this there are now more frequent PAT tests of electrical equipment.
Success factors: Translation of the knowledge to the audience concerned Use of formal and informal routes for transfer and checking The development of a plan whether required or not from the regulator Changes in process so all electrical goods are delivered to one point, checked and registered



Table 28 Case study 2/b

Company type: Catering Industry Supplier Company size: Large Target population: All employees Level: Individuals Type of work: Manual Actors: HSE Manager
Intervention: Introduction of H&S committee The knowledge transferred within this case study has been as a result of the knowledge broker (HSE Manager) setting up and managing an OSH committee and their involvement in developing procedures for the workplace. Knowledge has been codified and translated into simpler information in a variety of formats. Thus embrained knowledge has been developed into embodied (through changes in process), embedded (through routines and guidance) and encoded on databases. Knowledge has been transferred through the OSH committee, team briefings, induction training, specialist training and written information provision on noticeboards. There is an understanding of the need to translate knowledge to different audiences and languages and literacy levels. Mixed information obtained in making the decision to adopt new knowledge. Stakeholders suggested that there was participation but this was contradicted by the employee survey. A plan was made and changes identified including quicker responses to issues raised in relation to OSH. Perceptions within the company from both stakeholders and employees included an improvement in compliance in relation to health and safety, incidents and injuries had reduced and there was increased incident and accident reporting. In evaluating the readiness for change, the adapted safety culture questionnaire identified that there were consistent responses from both stakeholders and employees across the survey apart from those questions relating to reporting of problems without reprisal and OSH taking a back seat. These differences perhaps indicate that the KT is still an on-going process with different levels of belief with regard to priorities.
What was achieved: An increase in general awareness of OSH and more discussion of OSH at ground level.
Success factors: Translation of knowledge to the audience concerned Improved reporting and speed of dealing with issues Continuous reiteration to pull everyone to the same level Well qualified and experienced Knowledge Broker to structure and run the intervention



Table 29 Case study 3/c

Company type: Roofing company Company size: Small Target population: All employees that required fresher face fit training Level: Individuals Type of work: Manual Actors: Safety Health and Environment (SHE) Advisor, contract managers, face fit service and training provider
Intervention: Refresher face fit training The roofing company uses a Safety Health and Environment (SHE) Advisor from an external consultancy who works for them one-day per week. They used to use a qualitative method of face fitting however the preferred method was the quantitative method. The purchase of equipment and training involved with quantitative was cost prohibitive so another company was employed to provide face fit service and training. The knowledge transferred within this case study has been as a result of the knowledge broker (SHE Advisor) responding to a need for refresher face fit training. Knowledge has been embrained in to procedural knowledge by both the SHE Advisor and the new face fit service and training provider. Through the knowledge broker and support from contract managers knowledge was transferred through talking to people as it was understood that the target audience didn't want or need documents. The verbal route of transfer in this case study is helped through the good rapport between the SHE Advisor and the employees as they respect and see them as a trusted source of health and safety information. There was no choice in this case on whether to adopt the knowledge or not as depending on the job role of the employee meant they either did or didn't need the training. Changes to work practices were not required by everyone. The training had to occur but an implementation plan was made. In evaluating the readiness for change, the adapted safety culture questionnaire identified that there were consistent responses from both stakeholders and employees across the survey apart from the question about reporting problems without reprisal and health and safety taking a back seat to get jobs done.
What was achieved: Employees that needed refresher face fit training had updated information and training
Success factors: - Face to face routes for transfer of information to enforce the importance of the safety of wearing masks - Good rapport with employees to provide informal routes to transfer - Development of a plan to identify relevant employees for training - Understanding of knowledge by the SHE advisor to ensure they can translate the information in an easily accessible way to employees



Table 30 Case study 4/d

Company type: Skip manufacturing company Company size: small Target population: All employees Level: Individuals Type of work: Manual Actors: Director and Strategic Development and Conformity Manager (SDCM) and Managing Director
Intervention: Re-emphasis of hearing protection through information and new types of hearing protection In 2010 the skip manufacturing company carried out hearing tests and had moulded ear plugs custom made for all employees. Since then it had been highlighted that employees weren't wearing their hearing protection. After directly asking the employees why they weren't wearing them it was identified that it was due to a lack of comfort. Acting on this about 6 months ago the Director and Strategic Development and Conformity Manager (SDCM) decided to supply the employees with a range of hearing protection types to try out for personal comfort. In addition to comfort it also allowed employees to try difference types for different tasks, as for example when wearing a welding helmet the hearing protection choice is more limited. The knowledge transferred within this case study has been as a result of the knowledge brokers (Director and SDCM) responding to the employees not wearing their hearing protection due to comfort issues. Through the knowledge brokers knowledge was transferred through a practical and informal route of discussions and team meetings as there was an understanding of the target audience. The verbal route of transfer in this case study is effective due to the rapport that the knowledge brokers have with their employees. There were choices involved in the hearing protection intervention as employees had the opportunity to try different types of protection and pick which they would like to use. In some cases employees use various types for different tasks. In evaluating the readiness for change, the adapted safety culture questionnaire identified that there were mostly consistent responses from both the knowledge brokers and the employees. There were inconsistencies in the responses regarding telling co-workers when they are not following health and safety guidelines, getting the job done meaning that health and safety sometimes takes a backseat and the respondents seeking health and safety information from outside the company.
What was achieved: The wearing of hearing protection has increased and remained since the intervention was implemented six months ago, as identified visually throughout the company.
Success factors: Management becoming aware of some employees not wearing the previous type of hearing protection Translation of the knowledge to the target audience Use of practical and informal routes for transfer and checking Flexibility and choice of hearing protection types for employees to try Good rapport with employees



Table 31 Case study 5/e

Company type: Engineering and construction company Company size: Large Target population: All employees Level: Individuals Type of work: Manual Actors: Health and Safety Manager (H&S Manager), site managers
Intervention: Introduction of a new induction process In April 2013 the Health and Safety Manager (H&S Manager) of the company identified that a new Site Induction process was needed as the process had included the same document since 1995. There had been additions made to the document however outdated material hadn't been taken out. The H&S Manager wrote the new document and designed it as a template for site managers to add site specific information and photos, making it more practical and applicable for employees. This new Site Induction process was implemented with employees from 2nd January 2014. The knowledge transferred within this case study has been as a result of the knowledge broker (H&S Manager) responding to the need for an updated health and safety induction process at the company. The knowledge was transferred to the site managers through emails, conference call and presentation and from the site managers to site employees through the dissemination of the Site Induction through a presentation and walk rounds. The site employees don't have a choice about the completion of the Site Induction process. The site managers don't have a choice in implementing the Site Induction itself but they do have a choice and a role in the adapting of the template content to suit their worksite. In evaluating the readiness for change, the adapted safety culture questionnaire identified that there were mostly consistent responses from both the knowledge broker and the site managers and site employees. There were inconsistencies in the responses regarding getting the job done meaning that health and safety sometimes takes a back seat and seeking health and safety information from outside of the company.
What was achieved: The introduction of the new Site Induction template has not been in place long enough to assess confirmation, however at the current stage the new template has increased the level of compliance of the dissemination methods and content topics as this is now consistent between sites.
Success factors: H&S Manager becoming aware that the previous Site Induction contained out of date material and wasn't consistently being disseminated on sites. Translation of the knowledge from the H&S Manager to the site managers and from the site managers to the site employees. Use of an adapted Site Induction template to allow for consistency of delivery between worksites with the input of site specific information and photos.



Table 32 Case study 6/f

Company type: Construction, engineering and development Company size: Large Target population: Employees that work on site using cable locator tools Level: Individuals Type of work: Manual work Actors: Director of H&S
Intervention: Introduction of 'SMART Cable Avoidance Tools' for any excavation or operation where there is ground penetration and ground breaking. The knowledge transferred within the case study has been as a result of the 2013 review of service damage incidents where it was identified that new cable locator tools could help to decrease the frequency of service damage. The Director of H&S managed this process from the review in 2013 to the implementation of the three new tools in April 2014. The knowledge broker identified the 'SMART Cable Avoidance Tools' and trialled these at one of the company worksites in April 2013. Following this a plan was put in place involving a pre-let agreement and the development of internal communications on the introduction of the tools. The knowledge was then transferred to employees through company newsletters, e-documents, reviews, reports, intranet, cross functional teams, project teams, formal meetings, and training and information networks. The employees on one worksite had a role in trialling the new tools, and all employees that use the new tools have a choice between which tools to use for specific tasks. In evaluating the safety culture questionnaire there were a few slight inconsistencies between the employees and the stakeholder. The introduction of the cable locator tools has been evaluated through the use of audits. Also the use of the tools is visible to employees, sub-contractors and visitors on the worksites. As well as this it will also be clear where and when they are being used due to the software that the tools link to which catalogue their use.
What was achieved: The introduction of the 'SMART Cable Avoidance Tools' which are being used on the company worksites to reduce the number of incident investigations.
Success factors: Small changes within an existing framework Using the procedures already available Format used – taking a broad approach across different levels Allowing employees to trial the tools Having a comprehensive long term plan in place to guide the intervention implementation Confirming and assessing the intervention with audits



Table 33 Case study 7/g

Company type: Facilities Management Company size: Large Target population: All employees Level: Individuals Type of work: Manual Actors: H&S Manager, Group HR Manager, Insurance company and two Facilities Management health advisors
Intervention: Introduction of a Health Surveillance Matrix In the Construction division of the Group a health surveillance programme was introduced in 2008 and in 2009 there were a few new starts from the Facilities Management division involved in the programme. The new recruits were chosen if they were going in to a job that presented potentially harmful exposures. Following this in 2012 the health surveillance programme was officially started in the Facilities Management division. Those involved in the implementation of this included; H&S Manager, Group HR Manager, Insurance company and two Facilities Management health advisors. The target audience for the intervention included those that have specific roles within the company; excluding those in catering as their main issue is dermatitis which is suggested to be better addressed through using a tool box talk or leaflet. The knowledge transferred within this case study has been as a result of the knowledge brokers responding to a need to introduce a health surveillance programme for the Facilities Management division of the Group. Through the knowledge brokers, knowledge was transferred to employees through presentations, emails, telephone, informal discussions on work sites, letters, site meetings and project meetings. It was reported that a short leaflet of information would be useful to use in future. The employees could exercise a degree of choice to attend the nurses appointments which were part of the health surveillance programme however not attending could impact on the job tasks they could undertake. In evaluating the readiness for change the adapted safety culture questionnaire identified a few inconsistencies from both the knowledge brokers and the employees
What was achieved: The introduction of the health surveillance programme has been assessed with the Insurance company; as a result of this lessons have been learnt on how the process could be improved.
Success factors: Knowledge brokers being aware that the health surveillance programme would be beneficial for the division, learning from the construction division Learning from initial implementation e.g. appointment times can be reduced and the use of an information leaflet for employees could be helpful Using a mixture of both face to face and non-face to face methods where appropriate to ensure effective communication methods Understanding the target audience and how to communicate with them A co-ordinated approach from HR and health and safety Organising a wash-up meeting with the Insurance company to evaluate the process



Table 34 Case study 8/h

Company type: An Aerospace and Defence Company
Company size: Large
Target population: All employees
Level: Individuals
Type of work: Manual
Actors: Health, Safety and Environmental Manager, Health and Safety Coordinator, Production Support Officer, Shop Floor Fitter and Lead Health and Safety Coordinator
Intervention: Introduction of new working at Height policy and procedures At the aerospace and defence company it had been identified that working at height was a major hazard and that current policies and procedures were inadequate to deal with this risk. Thus a new policy and procedure was developed within the organisation via the H&S team and a working group that had been set up to manage working at height. The implementation of the new policy and procedure was due to begin on the 1st of March 2014, however it was launched in April 2014. The intervention was an update of OSH knowledge within the current structures within the company rather than the introduction of a new OSH concept or structure as there had previously been a working at height policy. The H&S team managed the process with input from a working group recruited from shop floor workers and operatives. The H&S team disseminated the updated policy through presentations, cross functional teams, formal meetings, informal mentoring and coaching, e-documents, databases (portal), reports, emails, forums, intranet, information encounters, technical reading logs and union and safety representatives. However from the employee survey it was identified that not all employees were aware of the policy update. The employees were given the opportunity to take part in the intervention implementation through recruitment to the working group. As it was a policy for working at height employees realistically didn't have a choice as to whether or not they adopted the knowledge. In evaluating the safety culture questionnaire there is a good and improving safety culture at the company. However there were also a few inconsistencies both between the H&S team members and between employees and differences between the two recipient groups.
What was achieved: The introduction of the new working at height policy and procedures, this has been informally assessed through visual inspections.
Success factors: Growth of the H&S team in the last 12 months, with individuals who now specialise The level of knowledge and experience in the H&S team Implementing a working group to provide input on the intervention The 'dumb ways to die' presentation being shown in the summer, hitting home the seriousness of falling



Table 35 Case study 9/i

Company type: Housing Association Company size: Large Target population: All employees Level: Individuals Type of work: Manual Actors: Internal Audit Officer, H&S Director, Policy specialists, Director group, staff council, Office Safety Champions
Intervention: Introduction of an Office Safety Network (OSN) In January 2013 the Internal Audit Officer (IAO) who is a member of the H&S Policy Group had learned of an approach at another housing organisation and promoted this to the Director East as an idea that could work at this Housing Association. This idea was to create an Office Safety Network (OSN) which would be made up of an office based staff member at each office and act as the local Office Safety Champion (OSC). The implementation of the OSN included writing the terms of reference which were then ratified by Directors and Boards, followed by the recruitment of members to become the OSCs. The longer term plan was to hold quarterly meetings with all members of the OSN. The OSCs were recruited in June 2013, as part of this role each OSC received training to achieve a H&S qualification. Those that were involved in the implementation of the OSN included; Internal Audit Officer, H&S Director, Policy specialists, Director group, and staff council. The knowledge transferred within the case study has been as a result of the Staff Council feeling they were insufficiently trained to do justice to health and safety and the knowledge broker seeing a similar approach in another company. Through the knowledge brokers, knowledge was transferred to employees through e-documents, reports, presentations, emails, forums, telephone, intranet, cross functional teams (policy group), formal meetings, training (OSCs), informal networks, information encounters (the core brief which occurs quarterly and staff talking), informal mentoring and coaching (ask if need help etc.). The employees could exercise a degree of choice in relation to the OSN, however for those that are OSCs they are required to have a level of consistency. In evaluating the readiness for change, the adapted safety culture questionnaire identified that there were a few inconsistencies between the employee and stakeholder responses.
What was achieved: The introduction of the new OSN has not been formally assessed due to being in its first year; however this is due to take place in the coming months.
Success factors: Knowledge broker becoming aware of the similar approach at another company Knowledge broker drawing on their own knowledge and experience to pull together information for the implementation of the OSN Employee representatives being keen to be OSCs within their offices, providing a key point of contact for staff in the office for health and safety questions Using a variety of communication techniques to ensure the message was transferred, both directly from the knowledge broker and through the OSCs within each of the offices Understanding the target audience ensuring that the content and approach was appropriate Reinforcing the message that health and safety communication between offices on health and safety issues is helpful for everyone



Table 36 Case study 10/j

Company type: Fire safety Group Company size: micro start-up Target population: Project associates Level: Individuals Type of work: Non-manual Actors: Director
Intervention: Introduction of the new health and safety policies and risk assessments In December 2012 a Fire Safety Group was set up as a micro start-up company. It was this start-up of the company that highlighted the need for the health and safety policies and risk assessments. The speed at which these were developed was impacted upon by the need to have them up and running in order to apply for tenders and for the inclusion in contracts. The purpose of these is to ensure that the Fire Safety Group can demonstrate that they work in accordance with health and safety policies and risk assessments. The writing and preparing of these documents was done by the Director (knowledge broker) and took approximately 2 months to develop. Knowledge was transferred through the knowledge broker to project associates through sharing documents, assessments, presentations (if there is something to convey from client to associate), emails, telephone, project teams and information encounters (cafes/motorway service stations). The project associates had a degree of choice in relation to the policies and risk assessments however it is part of their contractual obligation. In evaluating the readiness for change, the adapted safety culture questionnaire identified that there were consistent responses from both the knowledge broker and the project associates.
What was achieved: The process has introduced the policies and risk assessments which have improved the organisational performance as they are a requirement for tenders to allow for access to a wider range of work. Also the policies and risk assessments have increased awareness of hazards, improved compliance with clients risk assessments and have provided templates and formats for future projects. It was reported that there weren't any other factors that may have influenced the introduction of the policies and risk assessments.
Success factors: Knowledge broker being aware that the policies and risk assessments were needed for tender documentation Project associates having a high level of experience and knowledge in relation to being able to feedback information from client site work Having a micro company allows for shorter lines of communication Using templates from the initial policies and risk assessments for future work to allow for consistency Using a mixture of both face to face and non-face to face methods where appropriate



Table 37 Case study 11/k

Company type: International retail company Company size: Large Target population: All store employees Level: Individual Type of work: Manual Actors: H&S Manager, H&S Champions
Intervention: Introduction of a new online health and safety induction within the UK division. The knowledge transferred within the case study was the a result of an internal safety inspection in 2012 identifying the need for an updated induction, issues raised by store H&S champions and store management feedback on the previous paper induction process being that it was too time consuming to complete in busy stores. The UK H&S Manager worked on the development of the content along with HR and the company IT department. The development of the content was planned to take about 1 year which would be followed by a one month trial in 10 stores before being launched in all 120 UK stores. Knowledge was transferred to employees about the new induction through emails, telephone calls, training of store managers, informal encounters and through the 2014 UK division H&S conference. The trialling of the induction took longer than planned due to technical issues with the implementation of the inductions on the store ipads, therefore limiting the use of the induction to the store computers which can only be accessed before the store opens up. In evaluating the safety culture questionnaire there were a few inconsistencies between the employee and stakeholder responses. The introduction of the new online H&S induction has been evaluated by feedback from store managers and supervisors that implement the induction with new starters and feedback from the new starters on how they found the process.
What was achieved: Increased consistency in the implementation of the induction process content and improved record keeping of those that have completed the induction.
Success factors: - Piloting of the new online H&S induction in a sample of stores allowing trialability of material - Updating the induction process rather than the introduction of a new process - Implementing an induction which provides consistency in the implementation of the content and delivery across the organisation - Understanding the restrictions in busy stores for managers to spend time going through a paper based induction - Having H&S champions in store to support the implementation - Holding an H&S conference which was used as the launch for the intervention



Table 38 Case study 12/I

Company type: Banking and financial services company Company size: Large Target population: All employees Level: Individual Type of work: Mixed Actors: HSE Team
Intervention: Health and safety documentation and intranet content re-design as part of the 'Health and safety remediation programme'. The knowledge transferred within the case study has been as a result of an external health and safety review in mid-2012 which identified a disconnection between the health and safety information and job roles. The HSE team managed the process of re-designing the information and the intranet. Knowledge has been translated into simpler information by the HSE team. Thus embrained knowledge has been developed in to embodied knowledge embedded and encoded on the intranet. Through the HSE team, knowledge was simplified and transferred to employees through the intranet, emails, guidance cards, Simplifying branch life huddles, forums, telephone, training, informal networks, information encounters and newsletters. The employees have a choice as to when they use and access the information. They have a role in the feedback on the materials as there are functions on the intranet that allow them to give direct feedback. In evaluating the readiness for change, the adapted safety culture questionnaire identified that there was a very positive safety culture with only a few slight inconsistencies in the results between the HSE team and employee responses. The introduction of the intranet and document re-design has so far been launched through a soft launch and the feedback on this has been positive.
What was achieved: The health and safety documentation and intranet content re-design has been implemented successfully in the company through a soft launch.
Success factors: - The changes and updates being within an existing framework - Using procedures that were already available - The formats used being appropriate for the target audience - Allowing employees to provide feedback - Implementing a soft launch of phased communication over 3-4 months before the final launch to allow for feedback in the interim - Utilising the experience and knowledge of HSE team to de-legalise and make information more accessible



A4.10 MAPPING OF MULTIPLE CASE STUDIES

To allow comparisons to be made against different types of interventions, organisations and sectors in relation to knowledge transfer the case studies the following sections presents the mapping of the case studies alongside each other. During this process we will plot the case studies on to various figures identified in the review during stage 1 to provide a visual analysis of the knowledge transfer for the interventions.

As well as the headings from the Diffusion of Innovation Approach providing the outline for the development of the case study tools they also provide an analysis template to guide the exploration of individual interventions in a comparable manner. In the following sections these headings are complemented by other KT concepts and theories presented in the stage one KT review to further explore the KT for the specific interventions within the organisations.

A4.11 DESCRIPTION OF KNOWLEDGE

To explore the knowledge and allow for the description of this for each of the interventions the question development was based on two knowledge taxonomies. These allow for the identification of the properties of the OSH knowledge (Zander and Kogut, 1995) and the interaction between the knowledge types and how they are stored and represented in practice at the organisation (Collins, 1993).

In all of the case studies the health and safety representatives have embraced high level knowledge due to their levels of expertise. Each of the knowledge brokers in the case studies was an OSH professional, therefore has experience and expertise in the field of health and safety. These professionals and others working on the intervention implementation included; safety officers, health and safety managers, training providers, director of strategic development and conformity manager, site/store managers, HR, Directors, audit officers, policy groups, staff councils, office safety and store safety champions.

As the health and safety professionals were leading the interventions and changes within their company their role was to transfer information, whether this was from experience or from new knowledge for the purpose of the change. The level at which this has been done in the case studies is by translating the knowledge into embodied knowledge to allow it to be integrated into policies and strategies that guide health and safety in the company.

Once knowledge had been embodied in the case studies it was then encultured. However, this can take time as it requires shared understandings through the culture within the organisation involving shared values. When this level is reached it demonstrates a company's level at which they can adopt new health and safety information or adaptations to current procedures.



As well as being embodied through policies, knowledge has also been embedded in the guidance and procedures practiced by employees within a company. Encoded knowledge is the level at which knowledge is stored in the workplace. In the case studies this included being stored on shared portals on computers, policies, procedures, guidance notes, intranet sites and software.

A4.12 PERSUASION

The assessment of persuasion was carried out after data collection at the company as this involved collecting information and comparing it against set criteria. The information required from the company was the type of knowledge, how it was disseminated and what factors influenced the success or failure of the transfer.

Below in **Figure 27** the case study results have been mapped on to Lin et al's (2005) Taxonomy of Information Structures in KT, with the sender of information as the knowledge broker and the receiver as the employees. As can be seen the majority of the responses have been mapped in the 'Sender Advantage, Asymmetric Information' section of the figure. This information structure often occurs in the OSH domain as there is often an OSH practitioner that has that expertise. The location of the case studies varies within this section depending on the influence of other information structures. For example Case study E also overlaps 'Symmetric. Complete Information and KT' as although the OSH practitioner was disseminating knowledge they also had close contact and connections with those working on site. These close connections then impact on the routes and methods used to transfer knowledge. Case study C can be seen to the far left of 'Sender Advantage, Asymmetric Information' as there were also external specialists involved in the transfer of knowledge for refresher face fit testing. For case study J located in 'Receiver Advantage, Asymmetric Information' the receivers of the knowledge were project associates who were external collaborators for certain projects. Therefore due to their levels of expertise they also contributed to the information structure. This case study is located at the bottom right of this section as the expertise of the knowledge broker impacted on the information structure.



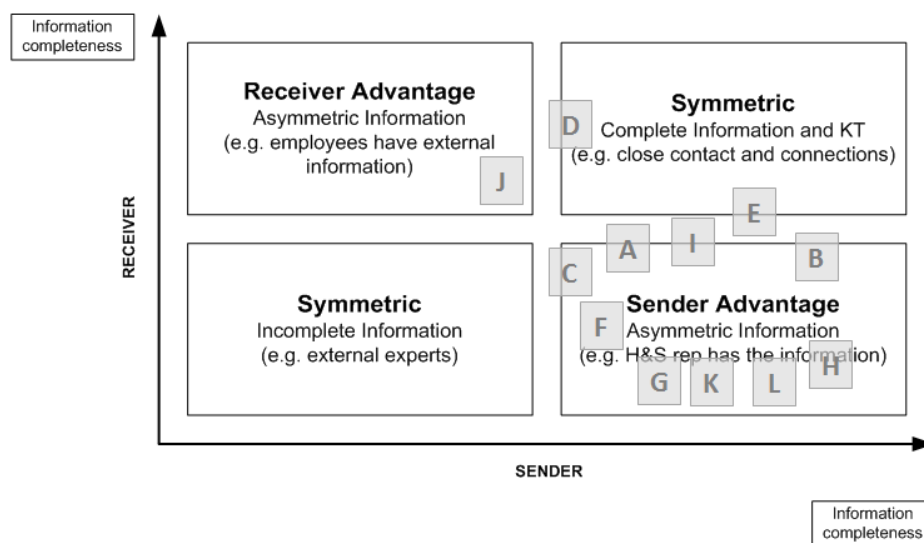


Figure 27 Mapping of Case Study Results on to the Taxonomy of Information Structures

The mapping of these results has highlighted that the largest of the large companies (F, G, H, K, and L) all used similar information structures, whereas companies smaller than these although they used similar structures also had close contact and connections with the receivers of the information. One of the reasons for this could simply be the geographic locations and spread of the larger companies acting as a barrier in the information structures that are practical for them to transfer knowledge.

A4.13 DECISION

The decisions in relation to knowledge transfer by the stakeholders involved in the intervention have been mapped using Spraggon and Bodolica's (2011) taxonomy of knowledge transfer processes.

In **Figure 28** below, the case studies have been mapped on to Spraggon and Bodolica's (2011) taxonomy of knowledge transfer processes. It can be seen that case studies A, F and K are located in the centre of the diagram; due to them using both virtual and face-to-face processes in their transfer of knowledge for the intervention. Case study D can be seen in the 'Non-Canonical Face to Face Processes' section, this is due to them using emergent, people orientated informal processes when transferring knowledge to their employees. The informality of this may be due to the size of it being a micro company, therefore allowing for close and easy contact with employees. The three case studies B, G and L are similar in that all of them used a mix of 'Dynamic Virtual Processes', 'Canonical Face to Face processes' and 'Non-canonical Face to Face Processes' in transferring knowledge on the intervention. Case studies E and I both used a mix of 'Static Virtual Processes' and 'Dynamic Virtual Processes', through mainly using emails and presentations to transfer knowledge, this could be due to the geographic locations as both companies have nationwide smaller



sites. Case Study J used a mixture of both 'Dynamic Virtual Processes' and 'Canonical Face to Face processes' in their approach to knowledge transfer. Case study H used a mixture of 'Dynamic Virtual Processes' and 'Non-canonical Face to Face Processes' as they sent out emails but also had a working group of employees involved in the implementation of the working at height policy. Case study C also used a mixture of 'Dynamic Virtual Processes' and 'Non-canonical Face to Face Processes' in transferring OSH knowledge.

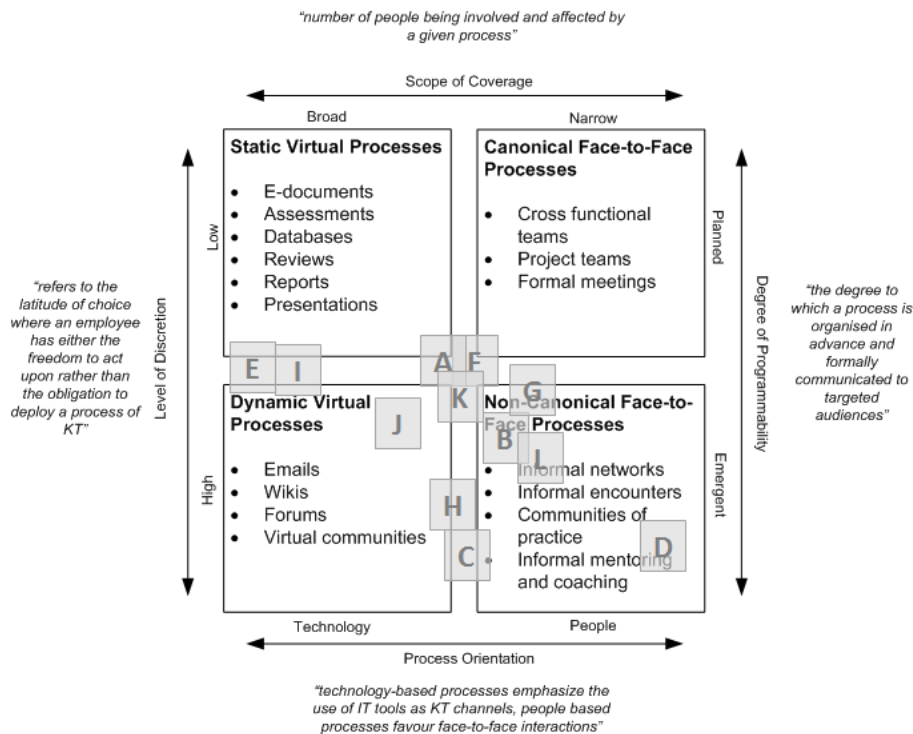


Figure 28 Mapping of Case Studies on to Spraggon and Bodolica (2011) taxonomy of knowledge transfer processes

A4.14 IMPLEMENTATION

To investigate the absorptive capacity of an organisation Camison and Fores (2008) constructed a questionnaire of 127 items to provide an assessment of the ability of an organisation to absorb new information. Due to the nature of the case studies a shorter measure was used based on an adaptation of the safety culture questionnaire by Stanton and Glendon (1996). Favourable outcomes from the responses to this suggest an organisation has the capacity for OSH knowledge, whereas less favourable outcomes identify that preliminary work on the capacity of the target audience to absorb new knowledge would be appropriate. As can be seen in **Table 39** there were varying consistencies in the responses between the stakeholders and employees in each cases study. Consistencies in responses are indicated by a 'Y' and inconsistencies are marked with an 'N'. The degree of inconsistency hasn't been highlighted here, it is important to



note that although results may not be consistent it doesn't mean they were polar opposites. The inconsistency could be caused by a small number of respondents.

Due to the stakeholders within the case studies being health and safety representatives it is hoped that when the employees responses are consistent with these then they would be positive in relation to health and safety. Therefore assuming that where there are consistencies marked with a 'Y' in the table it therefore represents a positive safety culture. For example for the safety culture question 'Investigations of accidents are used to give solutions rather than laying blame' there is consistency for majority of the case studies between the stakeholders and employees therefore in relation to the previous section this would mean that respondents agreed with this statement, meaning there is a positive safety culture present.

The two questions where there isn't consistency between the stakeholders and employees are on health and safety taking a backseat and seeking health and safety information from outside of the company.

For the question on health and safety taking a backseat, only case studies 7 and 10 had consistency in results from stakeholders and employees. The inconsistency in the other case studies could be due to numerous reasons such as time pressures in the workplace causing them to put health and safety to one side. Also it could be due to the level of risk present not being high at the time.

In relation to seeking health and safety information from outside of the company the inconsistencies can be linked to the job roles of the employees completing the surveys due to the varying levels of employees for whom getting external information may not be expected.



Table 39 Summary of Safety Culture Mapping

Safety Culture Questions	Case Study 1	Case Study 2	Case Study 3	Case Study 4	Case Study 5	Case Study 6	Case Study 7	Case Study 8	Case Study 9	Case Study 10	Case Study 11	Case Study 12
The people I work with have a good understanding of the safety and health rules and procedures here	N	N	Y	Y	Y	Y	Y	Y	Y	Y	N	N
Management acts quickly to resolve health and safety hazards in the workplace with results of investigations immediately implemented	Y	N	Y	Y	Y	Y	N	N	N	Y	N	N
Investigations of accidents are used to give solutions rather than laying blame	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	N
Employees inform management of problems with health and safety without worry of reprisal	N	N	N	Y	Y	N	Y	N	Y	Y	Y	N
I tell my co-workers when they are not following health and safety guidelines	Y	Y	Y	N	Y	Y	N	Y	N	Y	Y	N
We have the resources including staff, technology and training to work safely	Y	Y	Y	Y	Y	Y	N	N	N	Y	Y	N
Management lead by example on health and safety	N	N	Y	Y	Y	Y	N	N	N	Y	Y	N



Safety Culture Questions	Case Study 1	Case Study 2	Case Study 3	Case Study 4	Case Study 5	Case Study 6	Case Study 7	Case Study 8	Case Study 9	Case Study 10	Case Study 11	Case Study 12
Getting the job done sometimes means that health and safety takes a backseat	N	N	N	N	N	N	Y	N	N	Y	N	N
The organisation keeps me well informed about the potential effects on health and safety from the materials and equipment I work with	N	N	Y	Y	Y	Y	N	N	Y	Y	Y	N
I seek health and safety information from outside the company				N	N	N	N	N	N	Y	N	N
When I have a safety or health query at work I know who I should speak to				Y	Y	Y	Y	Y	N	Y	Y	N



In addition to the use of the safety culture questionnaires the core constructs of absorptive capacity including; the acquisition capacity, assimilation capacity, transformation capacity and application capacity, have been used.

A4.15 CONFIRMATION

Assessing confirmation of change is dependent on the risk or health outcome that is being addressed. All case studies were asked about confirmation of the knowledge transfer outputs and whether or not there are other factors which may have influenced any changes.

The confirmation methods used in the case studies are presented in **Figure 29**. It can be seen that case study K and L both used employee feedback, these case studies are prospective and have not yet carried out their more formal confirmation methods and have currently only implemented soft launches and trialling of the interventions. Case studies D, C and H were all in relation to an intervention about employees wearing PPE or using equipment (face fit masks, hearing protection, working at height equipment), therefore their confirmation methods can be seen to be similar through the target audience being trained on wearing masks and seeing hearing protection and working at height equipment being worn within the workplace. Both case study A and B were confirmed by staff being aware of new policies in relation to electrical equipment and being aware of the new health and safety committee. By being aware it also confirms that employees were aware of a change in proceedings in relation to health and safety. For case study J which was a start-up company the confirmation method was that due to the new health and safety policies and risk assessments for project tenders they successfully won new work contracts. Case study F and G both put in place direct measures of confirmation through audits of new cable avoidance tools (F) and meetings to evaluate the process of introducing a health surveillance matrix (G).

At the time of the case study interviews case study E and I hadn't yet put in place any formal confirmation methods for their interventions.

It can be seen that the confirmation methods used highly depend on the type of intervention content, company size, and whether or not there was intended to be a direct change in behaviour or changes in health and safety policies for staff to be aware of. For example case study B was about the introduction of a new health and safety committee for which it wanted employees to be aware of but case study D specifically looked at directly changing employee behaviour by wearing hearing protection. Therefore how these were confirmed was varied due to the nature of what the interventions were aiming to achieve.



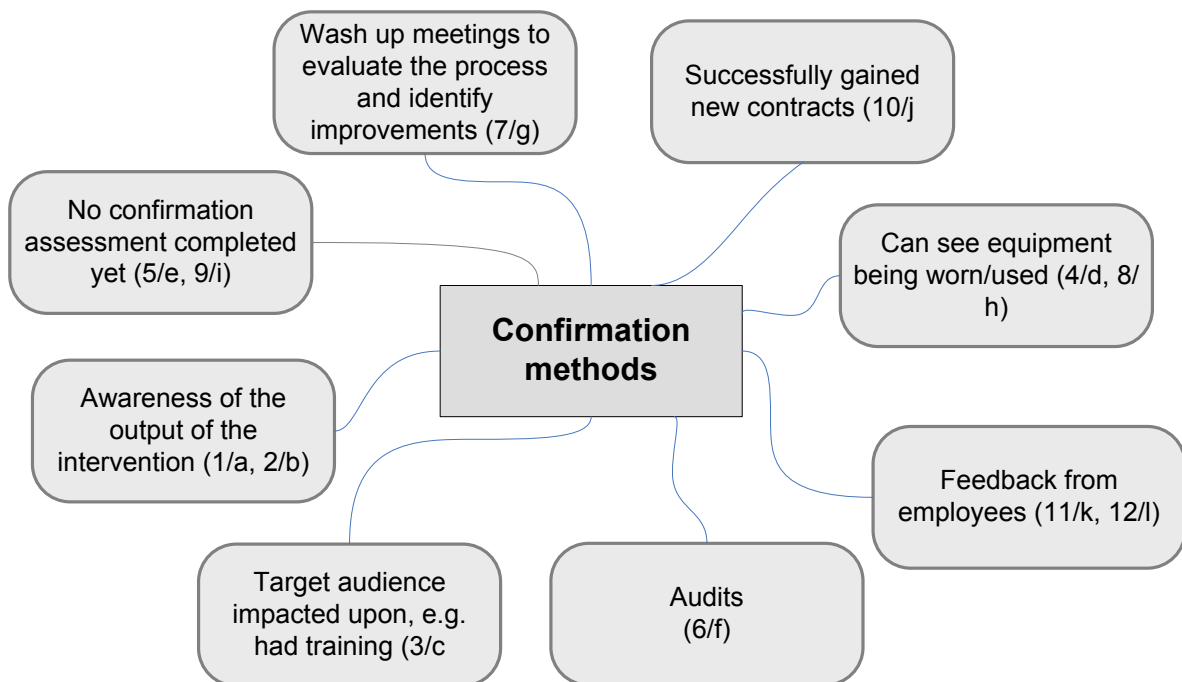


Figure 29 Mapping confirmation methods

A4.16 DISCUSSION

The mapping of the case studies has allowed for comparisons to be made between types of interventions, content, communication methods and how these were confirmed.

Ultimately these factors are all impacted on by the knowledge broker and how they implemented the intervention, this is likely to be different in different companies that have different ways of implementing and communicating information. In addition to this the level of risk in the company is likely to impact on this in relation to the level of risk of the work environment.

Due to the nature of OSH interventions the level of knowledge is high as it often comes from policies and legislation, the transfer of this to a level which is applicable to the workplace is the aim of these case studies. Whether it was to transfer legislation of face fit testing into practice or training or whether it was transferring company policy on having a health and safety committee. In these instances it is how this information can credibly be transferred to an accessible level. In all the case studies for this project the knowledge broker has had an embrained and tacit level of knowledge on the topics required which have ultimately in the process been transferred in to encoded and explicit knowledge which is stored in the company.



In relation to the persuasion of the knowledge transfer this involved where information was from and who was receiving it. It could be seen in the mapping section that for most of the case studies they were mapped in the 'Sender Advantage, Asymmetric Information' section of the figure. This can be expected in OSH due to the sender of the OSH information usually being an OSH professional that has the expertise and information that they are then aiming to transfer to those not as expert in the OSH field.

How the case studies communicated information varied greatly and in all case studies it was identified that numerous methods were used. In some cases this was due to geographical issues, such as having numerous work sites located throughout the company so therefore where site visits weren't applicable teleconferences and emails were used. Also the methods used differed depending on the target audience with emails being more likely to be used for managers who would then pass on this information to employees through toolbox talks or put up posters on notice/information boards. The communication method chosen was mentioned as being important in all the case studies as ultimately it need to be suited to the audience but also the company and follow their usual communicated formats and procedures.

The implementation of the case study interventions was impacted upon by the safety culture at the company at the time of implementation. As in practice if there is a positive safety culture present then there is already an understanding of safety and what this means in relation to work and other employees.

The confirmation methods used varied depending on issues such as the topic of the intervention, the intended outcome of the intervention and the timescales for the confirmation. For those case studies that required a physical change in equipment or task procedure these were confirmed through visible checking where as other intervention were focused more on a change in policy or procedure that it was important for employees to be aware of but didn't necessarily require a change to the way that they physically did their job, therefore not presenting a visual confirmation method. Therefore in these instances confirmation was done by more of a checking of awareness or implementation.

A4.17 CONCLUSIONS

The mapping of the case studies has highlighted the following:

- The interventions occurred due to identifying a need for the introduction or adaptation of procedures, therefore highlighting the importance of health and safety in the companies recruited for the study
- The knowledge brokers were OSH professionals that either had the tacit knowledge required for the case study or had the experience to know where or who to speak to



- For all case studies a plan was put in place for the implementation of the intervention
- The communication methods were tailored to the target audiences as there was an understanding of what is required in relation to formats, dissemination methods and language
- For smaller companies there was close contact between the employees and the knowledge broker. In larger companies employees often had close contact with a manager that the knowledge broker had sent information to for them to disseminate, such as posters or a toolbox talk.
- The majority of case studies were using confirmation methods to assess the change and therefore the success of the knowledge transfer.



APPENDIX 5. THE OSH LANDSCAPE AND KNOWLEDGE TRANSFER

In carrying out this research project, a number of different areas have been examined in relation to knowledge transfer, the OSH landscape in the UK, knowledge provision and knowledge use and how knowledge is transferred from knowledge brokers to employees in the context of OSH.

This section aims to bring this work together to create an overview of the current landscape and what this means in the context of knowledge transfer and OSH. The objectives stated at the start of the project aimed to examine the OSH Landscape in the UK. From this starting point, the project developed into Appendix 3 which was a questionnaire survey of sources used and barriers and facilitators to translating knowledge within the workplace. The final case study component of the project (Appendix 4) aimed to examine how knowledge was transferred in relation to OSH in the organisational context against the diffusion of innovations framework. The following sections aim to bring together our findings to aid in the development of our understanding of knowledge transfer and the skills and expertise that are required for successful transfer of OSH knowledge.

A5.1 THE OSH LANDSCAPE IN THE UK AND WHO PROVIDES INFORMATION AND KNOWLEDGE

Although it is clear that OSH knowledge in the UK is influenced by EU and wider international sources, to enable the project to be carried out within the timeframe, limits were placed on describing the OSH landscape within the UK. Before carrying out the work a number of questions had to be addressed including who provides authoritative information, how this is provided, who is using this knowledge and what hazards and health outcomes occur in relation to work.

The database developed to collate this information identified a large number of sources available. However, not all sources are freely accessible and the quality of all sources cannot be guaranteed. In particular, access to original research is often restricted if individuals want to find particular journal papers. Conversely, within the UK context, government information is generally freely available and this does include research reports, codes of practice, guidance documents and legislation.

The major providers of OSH knowledge, in this case HSE and IOSH, do provide free information and are considered authoritative sources. HSE in particular translate research knowledge into guidance and codes of practice. The study also identified that these providers do not have the facility to track who is using their information or where it goes from them, do have a quality control procedure in place to update and maintain information on their websites.



In mapping the OSH landscape the project identified broad coverage of both occupational health and safety topics. However, the usability of material was questioned and in relation to coherence of topic coverage, it was perceived that it did exist for safety but not for health. It was suggested that this was a matter of understanding “knowing how” to do something in the safety arena versus the “know what” in health. For example, understanding that a particular chemical may be hazardous to health is “know what” but how to remove that hazard is “know how”. This may also reflect the different disciplines involved in safety and health where safety can often still be prescriptive rather than risk management but part of that prescription is knowing how to remove a hazard or reduce risks. Within the health arena, prevention methodologies are still maturing and the use of evidence based practice in relation to health issues has a broadening knowledge base but in some cases, still to be put into practice.

In addition to the sources available, there is also a need to understand how people search for information and make decisions in relation to the authority of the information found. Much of this project involved the use of health and safety professionals who as part of their training need to learn where and how to obtain information. It is unclear how professionals are taught how to find relevant information and knowledge but the fact they do so, suggests that this is learned at some point. For those not involved in a professional capacity, the need to give guidance to those trying to find information is key. HSE for example, provide a small business section on their website which leads to further information.

A5.2 SOURCES OF KNOWLEDGE USED IN THE UK

To identify the sources used by UK participants in the research a questionnaire survey was used. The participants in the study were mostly safety practitioners although it was aimed to involve other professional groups in the OSH field. The use of the survey confirmed that the sources most frequently used were government (HSE and NHS) and the most frequently reported websites used were HSE and IOSH. The sources were used as they were seen as being trusted, easy to access and free. The respondents also noted that engaging with other people and networks was also a method to gain new knowledge. Examples included IOSH meetings, trade associations and employers groups. Networks are also an important source of knowledge for those respondents. The formats identified as being most used were guidance, legislation, trade magazines and those employed in large companies reported a higher usage rate.

The questionnaire also asked respondents about how they communicate with different groups of people and it suggested that respondents understood that face-to-face communication with employees was a better media when trying to transfer knowledge rather than sending emails or other methods that could not be tracked. The same was found for evaluating impact in that speaking to employees or carrying out safety inspections was seen as a positive approach. What is not clear is where this



understanding of the need to use different methods for different groups comes from but is certainly supported by the knowledge transfer literature.

The barriers and facilitators to successful knowledge transfer in the workplace ranged from lack of commitment by management, workplace culture and literacy and language difficulties. The perception is that for those working within the safety environment, the understanding of the need to translate OSH information to a local level, be that educational level or different languages, is clearly understood.

A5.3 WHAT HELPS MAKE EFFECTIVE KNOWLEDGE TRANSFER

The twelve organisational based case studies carried out aided in our understanding of the process that are undergone when trying to translate OSH knowledge in the workplace. The methodology developed for case study data collection was a series of interview questions based around the Diffusion of Innovations framework. As part of the framework the elements of knowledge, persuasion, decision, implementation and confirmation were mapped across the case studies.

A5.4 KNOWLEDGE

Much of the knowledge shown in the case studies was tacit but the expertise of the practitioners to translate that knowledge was evident. A clear understanding of the need to translate to a particular group or groups as well as understanding that in relation to complexity, face-to-face approaches were more often taken within the studies. The need to do this was clearly understood within the case studies but what was not known is whether this had been learned as part of OSH training or had been learned as part of other training as many of our practitioners had trained in other fields before become OSH practitioners. This is an essential part of knowledge transfer and as such all individuals involved in such processes need to have that understanding.

A5.5 PERSUASION

The persuasion methods used across the case studies identified that this varied in relation to the size of the company and the audience for the intervention. It was observed that for the largest companies, similar information structures were used (intranet and other electronic media) to transfer information to staff. This is perhaps understandable in relation to the size and spread of the business groups in these organisations and the distance between the knowledge brokers and the employees. What was also evident was the smaller large businesses that used similar method, there were closer connections to their employees. The use of electronic media to transfer knowledge is an important tool in modern business but the concern may be that there is a need to evaluate how that knowledge has been transferred and whether it has been taken up and being used by employees. The closer connections in the smaller large businesses allow this to happen. In our largest companies, there is a need to ensure that



other means are used to evaluate whether transfer has been successful or not.

A5.6 DECISION

The methods used to transfer knowledge in the companies was both face-to-face processes and virtual processes. This varied by company size with smaller companies using less formal methods because of closer contact between the sender and the receiver. However, at least one company used both face-to-face and virtual processes but that perhaps was due to both the sender and the receiver having some expertise in OSH.

Again this shows an understanding of the context of the knowledge transfer in that it is difficult in large companies to always use face-to-face processes. However, in at least two of the case studies there were workplace champions in place who supported electronic media and were able to discuss changes within the employees.

Thus having networks of expertise when making OSH interventions is essential in larger companies. Thus the knowledge broker can implement change but takes the change out into a network who then broker at a more local level thus having closer connections to employees.

A5.7 IMPLEMENTATION

The purpose in using an adapted safety culture questionnaire was to identify if stakeholders and employees were at a similar level of absorption (readiness) in relation to the implementation of OSH changes. This is an important part of knowledge transfer as, if there is a lack of agreement between stakeholders and employees the employees may not be ready for change.

Any differences identified within the survey may have been due to the small number of respondents. However, one question in particular in relation to OSH taking a backseat due to the need to get the job done may reflect the different experiences of the knowledge broker as a safety practitioner and those employed on the shop floor. Employees may be under different pressures to complete work and the safety messages have to get through to them. This is beyond the remit of this project but does highlight the importance of buy-in for OSH in relation to everyone working to the same practice.

A5.8 CONFIRMATION

The assessment of confirmation within the case studies highlights the importance of having a means to assess any changes in relation to an intervention made. Whether that is by informal means such as face-to-face interaction or other more formal structures such as audits, all the case studies were carrying out some assessment process. These again varied by company size but also by intervention type. For example the setting up of



new OSH structures within an organisation was assessed by awareness levels. However, where behaviour change was required, this was assessed by identifying if the behaviour had changed. Again this shows an understanding of what is required by the practitioner.

A5.9 THE SKILLS OF THE KNOWLEDGE BROKER – HOW DO OSH PROFESSIONALS KNOW HOW?

When carrying out this research project a number of different skills for OSH professionals were identified. As mentioned previously, it is not clear whether these skills have been picked up in other disciplines or within OSH training as many practitioners come into OSH after careers in other areas.

A5.10 KNOWING WHERE TO FIND AUTHORITATIVE KNOWLEDGE AND TO ASSESS KNOWLEDGE QUALITY

This is a key skill for all professionals involved in the safety and health arena. In certain respects, such skills are taught within the health arena to ensure that health professionals are able to evaluate evidence before taking it into practice. However, it is perceived that such skills are still developing within other OSH professions (Safety, Ergonomics and Occupational Hygiene). An important part of future training is to enable all our practitioners to be able to find and evaluate authoritative knowledge sources be that systematic reviews or other high quality research outputs; including those translated into guidance and codes of practice.

A5.11 PLANNING INTERVENTIONS

All interventions were planned from the case study research. This included understanding of the need for careful timing of interventions, working with senior management in this process and then an implementation plan. These highlight the management skills of the OSH practitioners involved in the research and also may reflect the change from prescriptive OSH management to risk management. Again, these skills, which may be described as soft skills, are key for the practitioner.

A5.12 KNOWLEDGE TRANSLATION SKILLS AND UNDERSTANDING THE AUDIENCE

One of the clear areas identified within the case study research was the understanding that the OSH practitioners had about the need to translate knowledge into local language, context and reading skill level. Again, it is not known where such skills are obtained but it is apparent that this type of skill is required for OSH professionals.

A5.13 COMMUNICATION TYPES TO DIFFERENT AUDIENCES

Both the survey and the case studies identified that the OSH professionals involved understood that different communication methods were more acceptable for different audiences. For example, for induction training and



other more complex training, face-to-face contact was important. Yet when trying to get information across to more senior people in the business, meetings and electronic media were seen as acceptable. However, it was observed that for large companies, electronic media may be the most efficient method of transferring knowledge but in several case studies example, this was backed up by having local champions to help support the transfer process.

A5.14 THE USE OF DIFFERENT MEDIA TYPES AND THEIR RELEVANCE TO PRACTICE (COMPLEXITY)

It was also apparent from the research that there was a tacit understanding of the need to use different methods of transfer for different interventions. Although this appeared to be based on company size, the use of champions within the company reiterated the understanding that face-to-face contact was important either through the knowledge broker or others in the organisation. This appeared to be a tacit understanding that face-to-face interaction was better in interacting with the workplace. When we consider the use of media richness against choice of media type this appears to be a natural choice within the case studies.

A5.15 CONFIRMATION METHODS

The choice of confirmation methods within the study (both survey and case studies) were both visual confirmation (where relevant), walkthroughs and discussions with members of staff. There are a number of readily usable tools available for the OSH practitioner including risk assessments and audit that can be used to confirm change. Again the method used to confirm changes was dependent on the intervention, the company size and whether there was intended to be a change in behaviour. This suggests that the OSH practitioners in this case were making decisions that fitted the interventions as to how best audit.

Table 40 presents the skills required by the OSH practitioner to aid them in successful knowledge transfer in relation to safety and health.

Table 40 Collation of skills required by the OSH Practitioner

Topic	Skills Required by the OSH Practitioner
Identification of knowledge	Search skills, ability to assess quality of knowledge
Persuasion	Understanding of the context of the intervention, face-to-face communication often better for new starts and training situations. Virtual contact may be required depending on the size and geography of the organisation;



	consideration of how to evaluate this is vital
Decision	Understanding that face-to-face interaction often better. For larger organisations having a network of expertise across the organisation to support decision making can help
Implementation	Ensuring that the employees are at the same level of readiness as those involved in implementing change – evaluation of safety culture can help with this process
Confirmation	Vital to be able to evaluate whether the change has had an impact either through walkthroughs, risk assessments, observation or other means of data collection including accident or incident rates.

A5.16 RESEARCH TO PRACTICE

One of the major questions in relation to knowledge transfer is how quickly we can move research into practice. This can often take several years as identified earlier in the project, research questions often address only one aspect of a particular problem and not the workplace context in which the solution has to be implemented. In considering this issue, the examples from Canada where a knowledge broker works between the researchers and the health and safety professionals to negotiate a better understanding of the problem and how that problem can be solved. Thus researchers need to be able to understand the context of the research problem and often in workplace situations where scientific control is difficult. However, this project has highlighted that both to gain access to the organisations and to interventional research, the OSH practitioners have been the knowledge broker and worked with the research team to allow the work to happen.

The use of organisational based case studies has also allowed the identification of how organisations actually transfer knowledge and what works in different contexts. Case Studies are an important route for knowledge transfer to allow individuals to see what can be done. Often there are comments that it wouldn't work in my industrial sector; however the skills required by the knowledge broker to help translation within different contexts have been identified as part of this work.



APPENDIX 6. BRAINSTORMING CATEGORIES

Database Development

Providers of Authoritative Information

HSE/HSL
Local Authorities
DOH/NHS
DWP
RoSPA
Trade Unions
SEPA/EA
HPA/HPS
HWL/English Equivalent
BSI/ISO
CBI
FSB
Trade Associations
Private OH companies (BUPA, AXA, Capita)
CIPD
Supply Chain
Insurers
Professional Associations (BOHS, IEHF, FOM IOSH)
CIH/REHIS
Consultants
Publishers
NIOSH
EU-OSHA
OSHA
DoL (NZ)
Worksafe Australia
Campaigns
Press
Fire Service
Police

Media

Academic Journals
Magazines
Internet
TV
Radio
Newspapers
Inspections
Social Media
Pamphlets
Events (Roadshows)
Apps



Gadgets
Advice Lines

Consumers

Individual
Sole Traders
Micro-organisation
SME
Large
Multi-nationals
Public
Private
Voluntary
Trade Association
Trades Unions

Hazards

Physical

Noise
Vibration
Heat
Radiation

Chemical

Skin
Lung
Other

Biological

Safety

Slips, trips and falls
Work at height
Lone Working/ Violence
Confined spaces
Manual handling
Machinery
Driving

Health Endpoints

MSDs
Asthma
COPD
Hearing
Headache/Sight
HAVS
Dermatitis
Cancer
Mental Wellbeing



Mortality
Behind a Paywall
Barbour
Croners
BSI
Research Journals

Websites or information inclusion criteria

English language
Considered authoritative – defined by research team and advisory group



APPENDIX 7. ADVISORY GROUP MEMBERS

Dr Robert Atkinson	Scottish Centre for Healthy Working Lives
Dr Steve Bailey	Independent Consultant
Mr Andrew Kennedy	Scottish Power
Sue King	HSE
Dr Paul Litchfield	BT
Sheila Pantry	Independent Consultant
Helen Pearson	Viridis Safety Ltd
Marion Richards	University of Sussex
Mr Hugh Robertson	TUC
Dr Kevin Tesh	Ethicon
Ms Dianah Worman	CIPD



APPENDIX 8. QUESTIONS FOR OSH LANDSCAPE ADVISORY GROUP

1. How does research in occupational safety and health feed into the knowledge base?
 - a. How does research feed into the knowledge base?
 - b. Who is providing the research knowledge?
 - c. How is it brought into the knowledge base?
 - d. How does research knowledge in OSH get translated into practice?
2. Who provides authoritative knowledge for occupational safety and health practice?
 - a. Who is authoritative and how do we know?
 - b. Which media?
 - c. Where do professional practitioners get their information
 - d. Where do non-professionals access information
3. What do people (professionals and non-professionals) access in terms of information?
 - a. Particular providers
 - b. Formats
4. What are the health and safety issues that people want information on?
 - a. Health issues
 - b. Safety issues
5. How is occupational safety and health knowledge translated within your organisation?
 - a. What experience do you have of knowledge transfer
 - b. What is the best way to transfer OSH knowledge within organisations?
 - c. Is this impacted by size of organisation?
 - d. Is this affected by type of industry or type of hazard?
 - e. What types of ways would you use to transfer knowledge about a particular hazard or risk?
 - f. Thoughts on SMEs,



APPENDIX 9. SEARCH STRATEGY

Providers of Authoritative Information

Health and Safety Executive/Health and Safety Laboratory
Local Authorities
Department of Health
National Health Service
Department of Work and Pensions
Royal Society for the Prevention of Accidents
Trade Unions
Environment Agency
Scottish Environmental Protection Agency
Health Protection Authority
Scottish Centre for Healthy Working Lives
British Standards Institute
Confederation of British Industry
Federation of Small Businesses
Trade Associations
Chartered Institute for Personnel Development
Insurers
Professional Associations (BOHS, IEHF, FOM IOSH)
CIH/REHIS
Consultants
Publishers
EU-OSHA
Press
Fire Service
Police
Barbour
Croners
BSI
Academic Journals
Universities
Research Institutes

Media

Academic Journals
Magazines
Internet
TV
Radio
Newspapers
Inspections
Social Media
Pamphlets
Events (Roadshows)
Apps
Gadgets
Advice Lines



Hazards

Physical

Noise
Vibration
Heat
Radiation

Chemical

Skin
Lung
Other

Biological

Safety

Slips, trips and falls
Work at height
Lone Working/ Violence
Confined spaces
Manual handling
Machinery
Driving

Health Endpoints

MSDs
Asthma
COPD
Hearing
Headache/Sight
HAVS
Dermatitis
Cancer
Mental Wellbeing
Mortality

Information inclusion criteria

- English language
- Relevant to the UK context
- Occupational safety
- Occupational health
- In the public domain

Information exclusion criteria

- Domestic health and safety
- Environmental Regulation
- Unrelated to the UK context



APPENDIX 10. SOURCES OF KNOWLEDGE IN THE UK LANDSCAPE

Table 41 Peer-reviewed journals

Journal	Accessibility
Accident Analysis & Prevention	Behind Paywall
American Journal of Industrial Medicine	Behind Paywall
Annals of Occupational Hygiene	Behind Paywall
Applied Ergonomics	Behind Paywall
Archives of Environmental & Occupational Health	Behind Paywall
Chemical Studies in Toxicology	Behind Paywall
Clinical Biomechanics	Behind Paywall
Contact Dermatitis	Behind Paywall
Environmental Health	Yes
Ergonomics	Behind Paywall
Ergonomics Abstracts	Behind Paywall
Health	Behind Paywall
Human Factors	Behind Paywall
Injury Prevention	Behind Paywall
International Archives of Occupational and Environmental Health	Behind Paywall
International Association of Traffic and Safety Sciences	Behind Paywall
International Journal Industrial Ergonomics	Behind Paywall
International Journal of Industrial Ergonomics	Behind Paywall
International Journal of Occupational and Environmental Health	Behind Paywall
International Journal of Occupational Medicine and Environmental Health	Behind Paywall
International Journal of Occupational Safety and Ergonomics	No
Journal of Agromedicine: practice, policy and research	Behind Paywall
Journal of Hazardous Materials	Behind Paywall
Journal of Occupational and Environmental Hygiene	Behind Paywall
Journal of Occupational and Environmental Medicine	Behind Paywall
Journal of Occupational and Organizational Psychology	Behind Paywall
Journal of Occupational Health and Safety - Australia and New Zealand	Behind Paywall
Journal of Occupational Health Psychology	Behind Paywall
Journal of Occupational Medicine and Toxicology	Yes



Journal	Accessibility
Journal of the ICRU	Behind Paywall
Journal of toxicology and environmental health	Behind Paywall
Occupational and Environmental Medicine	Behind Paywall
Occupational Health and Industrial Medicine	Behind Paywall
Occupational Medicine	Behind Paywall
Prevention today	Yes
Risk Analysis	Behind Paywall
Safety Science	Behind Paywall
Scandinavian Journal of Work, Environment & Health	Behind Paywall
South east Europe review (SEER) for labour and social affairs	Yes
Work & Stress	Behind Paywall
Accident Prevention	Behind Paywall
Noise Control Engineering Journal	Behind Paywall
Nuclear Energy Agency News	Yes
The Law Society - Lawyers for your Business	Yes

Table 42 Trade Associations linked to HSE

Trade Association	Accessibility of Information
Aluminium Federation	Some information is free
Asbestos Control and Abatement Division	Some information is free
Asbestos Removal Contractors Association	Some information is free
Association for Consultancy and Engineering	Some information is free
Association for Project Safety	Some information is free
Association of British Fire Trades	Some information is free
Association of Fire Protection Specialists	Some information is free
Association of Plumbing and Heating Contractors	Behind Paywall
Association of Technical Lightning and Access Specialists	Some information is free
British Abrasives Federation	Some information is free
British Aerosol Manufacturers Association	Some information is free
British Beer and Pub Association	Behind Paywall
British Ceramic Federation	Some information is free



Trade Association	Accessibility of Information
British Chemical Engineering Contractors Association	Some information is free
British Coatings Federation	Some information is free
British Compressed Gases Association	Some information is free
British Constructional Steelwork Association Ltd	Free
British Industrial Truck Association	Behind Paywall
British Pest Control Association	Behind Paywall
British Plastics Federation	Free
British Precast Concrete Federation	Some information is free
British Rig Owners Association	Free
British Rubber and Polyurethane Products Association	Some information is free
British Safety Industry Federation	Free
British Signs and Graphics Association	Behind Paywall
British Soft Drinks Association	Some information is free
British Sprinkler Automatic Fire Sprinkler Association	Some information is free
British Woodworking Federation	Behind Paywall
Chartered Institute of Building	Some information is free
Chemical Business Association	Some information is free
Chemical Industries Association	Some information is free
Concrete Repair Association	Some information is free
Confederation of Construction Specialists	Behind Paywall
Contract Flooring Association	Some information is free
Coventry and Warwickshire Occupational Safety and Health Group	Free
Crop Protection Association	Some information is free
Electrical Contractors Association	Some information is free
Emergency Response and Rescue Vessel Association Ltd	Some information is free
Engineering Construction Industry	Some information is free
Federation of Master Builders	Some information is free
Federation of Plasterers and Dry Wall Contractors	Behind Paywall
Fire Industry Association	Some information is free



Trade Association	Accessibility of Information
Fire Protection Association	Behind Paywall
Food Storage and Distribution Federation	Behind Paywall
Fork Lift Truck Association	Some information is free
Furniture Industry Research Association	Some information is free
GAMBICA	Free
Guild of Master Chimney Sweeps	Behind Paywall
Gypsum Products Development Association	Free
Heating and Ventilation Contractors Association	Some information is free
Industrial Rope Access Trade Association	Some information is free
Institution of Mechanical Engineers	Behind Paywall
International Marine Contractors Association	Some information is free
Lift and Escalator Industry Association	Some information is free
Lifting Equipment Engineers Association	Some information is free
Liquid Petroleum Gas Association	Some information is free
National Access and Scaffolding Confederation	Some information is free
National Association of Agricultural Contractors	Free
National Association of Professional Inspectors and Testers	Behind Paywall
National Federation of Demolition Contractors Ltd	Some information is free
National Federation of Roofing Contractors	Behind Paywall
National Pest Technicians Associations	Some information is free
National Specialist Contractors Council	Some information is free
Paint Research Association	Some information is free
Painting and Decorating Association	Behind Paywall
Port Skills and Safety	Some information is free
Rail Industry Fire Association	Behind Paywall
Resin Flooring Association	Some information is free
Retread Manufacturers Association	Some information is free
Mineral Products Association	Some information is free
Safety Assessment Federation	Some information is free



Trade Association	Accessibility of Information
Scottish Electrical Trade Association SELECT	Some information is free
Single Ply Roofing Association	Behind Paywall
Society of Operations Engineers	Behind Paywall
Solvents Industry Association	Free
Specialist Access Engineering and Maintenance Association	Behind Paywall
Sprayed Concrete Association	Some information is free
Stone Federation of Great Britain	Behind Paywall
Storage Equipment Manufacturers Association	Behind Paywall
The Federation of Piling Specialists	Some information is free
Thermal Insulation Contractors Association	Some information is free
UK Contractors Group	Some information is free
UK Offshore Operators Association (Oil and Gas UK)	Some information is free
UK Petroleum Industry Association Ltd	Some information is free
UK Spring Manufacturers Association	Behind Paywall
United Kingdom Warehousing Association	Some information is free
Water Jetting Association	Some information is free
Working at Height Safety Association	Free

Table 43 Professional Associations

Professional Association	Accessibility
Association of Occupational Health Nurses	Some information is free
Association of University Radiation Protection Officers	Behind Paywall
British Occupational Hygiene Society	Free
British Self-Defence Governing Body	Free
British Standards Institution	Behind Paywall
British Toxicological Society	Behind Paywall
Chartered Institute of Architectural Technologists	Some information is free
Chartered Institute of Environmental Health	Some information is free
Chartered Institute of Logistics and Transport	Some



Professional Association	Accessibility
	information is free
Chartered Institute of Personnel Development	Some information is free
Chartered Institute of Wastes Management	Some information is free
Chartered Institution of Building Services Engineers	Some information is free
Energy Institute	Some information is free
Faculty of Occupational Medicine	Some information is free
Independent Safety Consultants Association	Behind Paywall
Institute of Acoustics	Some information is free
Institute of Ergonomics and Human Factors	Free
Institute of Marine Engineering, Science and Technology	Some information is free
Institute of Safety in Technology and Research	Behind Paywall
Institution of Fire Engineers	Some information is free
Institution of Gas Engineers and Managers	Some information is free
Institution of Lighting Engineers	Some information is free
Institution of Occupational Safety and Health	Free
Institution of Structural Engineers	Some information is free
International Institute of Risk and Safety Management	Some information is free
National Association for Safety and Health in Care Services	Behind Paywall
National Inspection Council for Electrical Installation Contracting	Behind Paywall
The Royal Environmental Health Institute of Scotland	Some information is free
Royal Society of Chemistry	Some information is free



Professional Association	Accessibility
Society of Occupational Medicine	Behind Paywall
South Wales Construction Safety Group	Behind Paywall
The Council for Registered Gas Installers (CORGI)	Behind Paywall
Trading Standards Institute	Free

Table 44 Trade Unions

Union	Accessibility
British Dental Association	Behind Paywall
British Medical Association	Free
GMB	Some information is free
Royal College of Nursing	Some information is free
Trade Unions Congress	Free
UNISON	Free
UNITE	Free

Table 45 Employers Organisations

Organisation	Accessibility
Confederation of British Industry	Some information is free
Construction Employers Federation	Some information is free
Engineering Employers Federation EEF	Some information is free
Institute of Directors	Free
Joint Industry Board	Free

Table 46 Charitable and Not for Profit Organisations

Organisation	Accessibility
Advisory Conciliation and Arbitration Service	Free
Asthma UK	Free
Back care : the national organisation for healthy backs	Free
Birmingham Health Safety and Environment Association	Some information is free



Organisation	Accessibility
Brake the road safety charity	Some information is free
British Occupational Health Research Foundation	Free
British Printing Industry	Some information is free
British Safety Council	Some information is free
Building Research Establishment (BRE)	Some information is free
Cochrane Collaboration for Occupational Safety and Health	Free
Construction Health and Safety Group	Behind Paywall
Construction industry research and information association	Some information is free
Electrical Safety Council	Some information is free
Engineering Equipment and Materials Users Association	Behind Paywall
Federation of Small Businesses	Behind Paywall
Forum of Private Businesses	Some information is free
Greater Manchester Asbestos Victims Support Group	Free
Hazards Forum	Free
Institute of Materials Minerals and Mining	Some information is free
Institution of Engineering and Technology	Some information is free
London Hazards Centre	Free
Merseyside Asbestos Victim Support Group	Free
National Eczema Society	Some information is free
National House Building Council (NHBC)	Some information is free
National Safety Council	Some information is free
Royal Society for the Prevention of Accidents	Free
Safety Groups UK	Free
Sheffield Occupational Health Advisory Service	Free
Stress Management Society	Some information is free
Suzy Lamplugh Trust	Some information is free
The Royal Society for Public Health	Some information is free
Wiltshire Occupational Safety and Health Association	Free



Table 47 Voluntary Organisations

Organisation	Accessibility
Cambridge Occupational Safety Group	Behind Paywall
Central Scotland Safety Forum	Behind Paywall
Employers in Voluntary Housing	Behind Paywall
Leicestershire Occupational Safety and Health Association	Behind Paywall
Local Government Employers	Free
Manchester Occupational Health and Safety Group	Some information is free
Merseyside and Cheshire Construction Safety Group	Free
Merseyside Occupational Health and Safety Group	Behind Paywall
Mid-Anglia Environment Safety & Health Group	Behind Paywall
North Lincolnshire Health and Safety Group	Behind Paywall
Solent Occupational Safety Association	Behind Paywall
South Cumbria Occupational Health and Safety Group	Behind Paywall
St John Ambulance	Free

Table 48 Private companies providing OSH information

Company	Accessibility
AXA	Free
Barbour Index	Behind Paywall
British Insurers Brokers Association	Behind Paywall
BUPA	Free
Croners	Behind Paywall
Fire Prevention	Free
Lloyds Register	Some information is free
National Chemical Emergency Centre	Some information is free
Occupational Health and Safety Advisory Services	Behind Paywall
SGS Yarsley	Some information is free
Small Business Advice	Free



Table 49 Magazine Sources

Title	Accessibility
Chemical Hazards in Industry	Behind Paywall
EHS Today	Behind Paywall
Global Occupational Health Network	Free
Hazards	Free
Health and Safety at Work	Behind Paywall
Health and Safety Monitor	Some information is free
Health and Safety Newsletter	Free
Health and Safety Review	Behind Paywall
Institute of Risk Management	Some information is free
National Fire Protection Association Journal	Behind Paywall
National safety	Behind Paywall
Occupational Health	Behind Paywall
Occupational Health Review	Some information is free
Occupational Safety and Health	Behind Paywall
Plant Engineer	Behind Paywall
Safety and Health Practitioner	Some information is free

Table 50 Other Sources

Title	Accessibility
Advisory Committee for Roof Safety	Free
Advisory Committee on Working at Height	Behind Paywall
Bradford Area Occupational Health and Safety Forum	Free
BUSK	Free
Chemical Hazards Association	Some information is free
Construction Industry Training Board	Some information is free
Constructiononline	Behind Paywall
Contractors Health and Safety Assessment Scheme	Some information is free
Doncaster and Rotherham Group Training Association	Behind Paywall
Equality and Human Rights Commission	Free
International Labour Organisation	Free
Investors in People	Some information is free
UK Fire and Rescue Services	Free
National Examination Board in Occupational Safety and Health NEBOSH	Behind Paywall



Title	Accessibility
Newcastle Construction Safety Group	Free
Occupational Road Safety Alliance	Free
Precast Flooring Association	Some information is free
SAFEContractor	Free
Safety Group Fife	Free
Sandwell Training Association	Behind Paywall
Sector Skills Councils	Some information is free
Sheffield Occupational Health and Safety Association	Some information is free
Small Firms Enterprise Development Initiative	Free
Standing Committee on Structural Safety	Free



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