Evaluation of knowledge transfer for occupational safety and health in an organisational context: development of an evaluation framework

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Abstract

Introduction

The concepts of Knowledge Transfer (KT) and Knowledge Exchange (KE) are highly relevant to the wider safety and health landscape as there is a need within organisations to transfer safety and health knowledge from the knowledge provider, the safety practitioner or an individual tasked with safety and health, to the employee in many work situations. The concept of KT can be traced back to the 1960s and the work of Rogers (1962) into the diffusion of innovations in society (Rogers 1983). This resulted in the development of conceptual frameworks which aimed to improve the use of research from theory into practice. At this time, there were two main drivers to this process which was a huge amount of scientific knowledge being produced and the increasing expectation that scientific knowledge should be useful to society. In the 1970s, technology transfer was also a term used to describe the transfer of 'things' such as technologies, including production methodologies and capabilities, through different contexts and overseas manufacturing. This was driven by globalisation and post-war technology expansion.

One of the first papers to use the term Knowledge Transfer was published in 1995 by Zander and Kogut in Organization Science. The KT perspective represented a shift in emphasis towards Knowledge Based Views (KBV) of firms, which sees them as "social communities specialising in efficient knowledge creation and transfer" (Reagans & McEvily, 2003) in contrast to Resource Based Views (RBV; e.g. Penrose, 1959), where resources are managed to ensure outcomes cannot be copied by others to sustain competitive advantage. The underlying driver was a switch in emphasis away from technology and the transfer of 'things', to new post-industrial ideas about knowledge and its role in competitive advantage (Argote & Ingram, 2000; Arrow, 1974; Kogut & Zander, 1992).

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". Knowledge based views of organisations are highly relevant to the wider occupational safety and health (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.

Numerous mechanisms exist through which to transfer knowledge. Many, such as procedures, instructions, training etc. will be familiar. 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 which go beyond staple means such as leaflets and guidance documents include those shown in Table 1 below, which is drawn from 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 1 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.

This paper aims to examine theories of KT applicable to OSH and describe the methodology development process undertaken to allow KT to be evaluated for OSH in an organisational setting.

2. Methodology Development

2.1 What is knowledge in an organisational context

Several models of KT have been proposed which have been used in relation to healthcare rather than OSH. However, before describing those, an understanding of what is meant by knowledge in the context of organisations is essential. When we consider what knowledge is, Senapathi (2011) identifies that 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 – creation of new knowledge is effortful
- Knowledge is contextual

In addition to this, consideration must also be made of how knowledge exists. Collins (1993) describes the levels where knowledge resides between a continuum of explicit and tacit forms of knowledge, presented in Table 2. 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 2 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

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.

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). Table 3 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 3 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).

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.

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 4.

Table 4 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

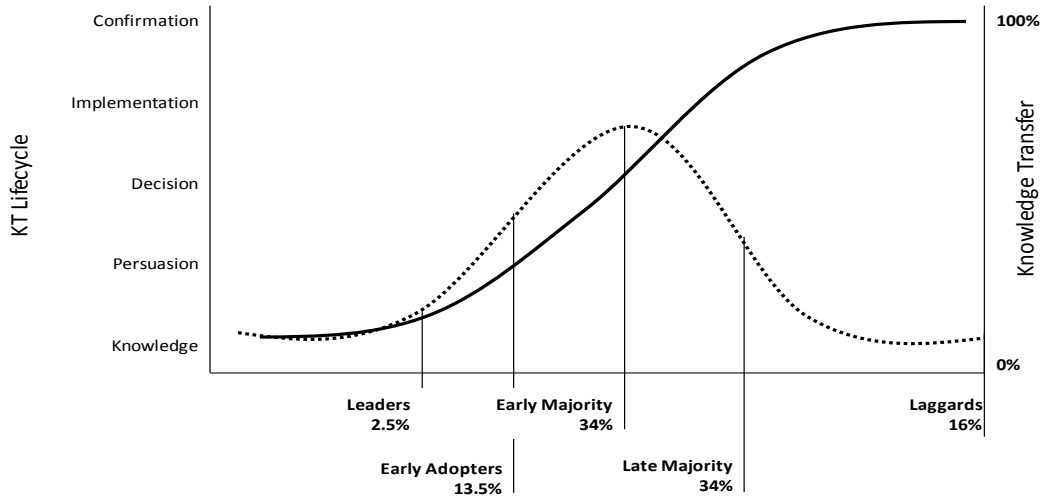

Figure 1 Graphical representation of the Diffusion of Innovations process, showing how different populations of 'adopters', each with differing characteristics, contribute towards an S-curve of knowledge transfer.

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 5.

An adjunct to Diffusion of Innovations Theory is the Research Development Dissemination Utilization Framework, developed by Havelock (1969) and expressed in the oft quoted maxim “who says what to whom by what channel and to what effect”. In the original research a large number of research studies were grouped into seven factors that were put forward as the major conduits/enablers of KT (Estabrooks et al., 2006). The seven factors were: linkage, structure, openness, capacity, reward, proximity and synergy. A more recent development in KT and research utilization is Greenhalgh’s Synthesis. Although this project was conducted as recently as 2004 it relies upon, and extends, Diffusion of Innovations Theory. These examples illustrate that Diffusion of Innovations Theory is, and continues, to operate as a powerful source of analogy within the KT literature.

Table 5 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 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.

Existing methods of evaluating KT

When examining KT evaluation methods which had been developed for other contexts a number of different measures were identified. These included indirect measures such as the knowledge taxonomy of Zander and Kogut (1995) where knowledge is described in relation to codifiability, teachability, complexity, system dependence and observability. The method by Collins (1993) also highlights the five different levels of knowledge (see Table 2). In addition to these the method developed by Spraggon and Bodolica (2011), involved the use of a taxonomy to allow the user to plot where the organisation (or parts of the organisation) was in relation to KT. This method allows the user to compare findings against 8 statements in relation to the type of KT that was being attempted and the best method of completing that such as face-to-face methods, use of media or other means. It was highlighted that pre and post comparison could be carried out to evaluate if the KT had been successful.

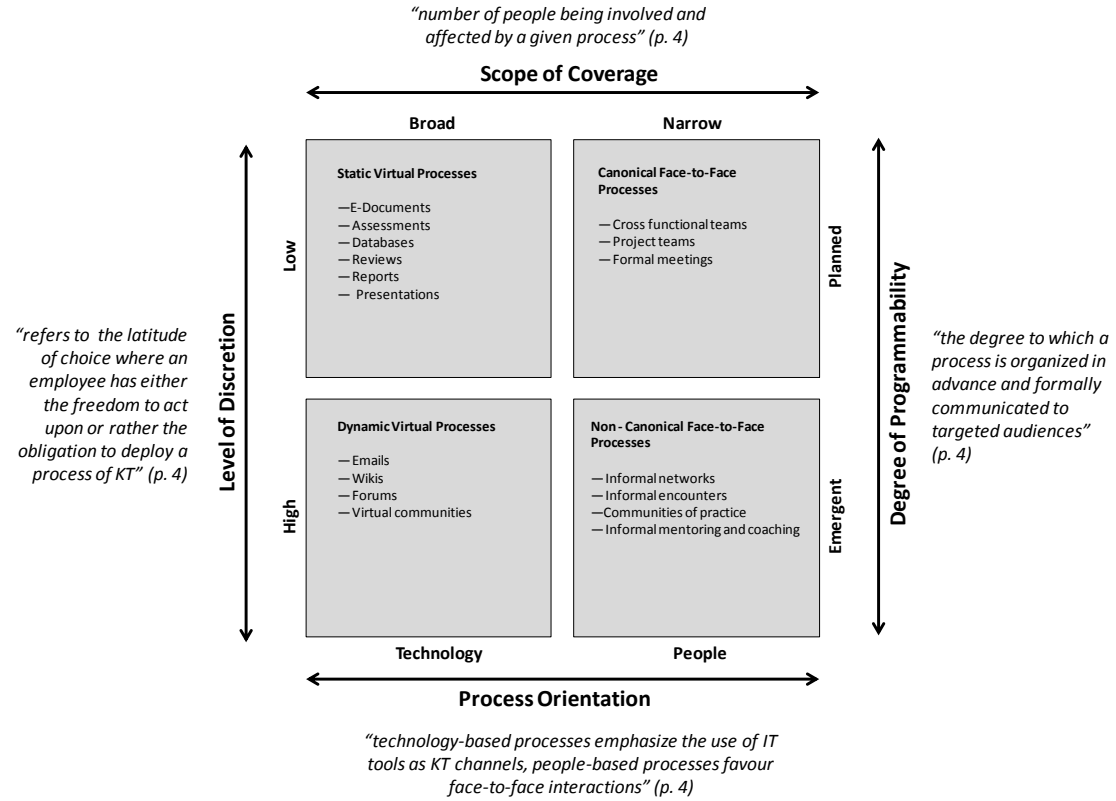

Figure 2 Spraggon and Bodolica (2011) taxonomy of knowledge transfer processes

Table 6 Propositions for comparisons against (Spraggon and Bodolica 2011)

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
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
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
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
Proposition 5	When virtual processes are deployed, simpler, fewer and more individual types of knowledge transfer barriers may be encountered
Proposition 6	When face-to-face processes are deployed, more complex, multiple and interactional types of KT barriers may be encountered
Proposition 7	Virtual processes are particularly suitable for the attainment of knowledge outcomes that are more general, impersonal, acontextual and atemporal
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

Media richness is defined as "the ability of information to change understanding within a time interval" (Daft and Lengel, 1986). Rich media tends to be personal in nature, involve multiple cues and immediate feedback of the sort to be found in face-to-face communications. Low richness media,

or ‘lean media’, may describe much of the extant OSH knowledge base which tends to exist as rules, procedures or other forms of relatively impersonal content. Unequivocal messages are positively associated with speed and adequacy of KT. This is reflected within the domain of OSH communications where knowledge is converted into proceduralised forms before KT is attempted. Media richness theory informs us that this is not always possible or desirable to do this with certain forms of knowledge and users will often try to select the medium most appropriate for the level of media richness when given the choice to do so. Furthermore, it emerges that knowledge type is the main driver behind this decision (Murray & Peyrefitte, 2007). Where messages or knowledge are transferred in a way inappropriate to the situation, they run a higher risk of being ineffective (Carlson & Zmud, 1999). If trying to deliver a complex safety or health message, virtual processes may not be effective. Thus having an understanding of media richness theory can allow evaluation of whether the message was delivered in an effective format dependent on its level of richness.

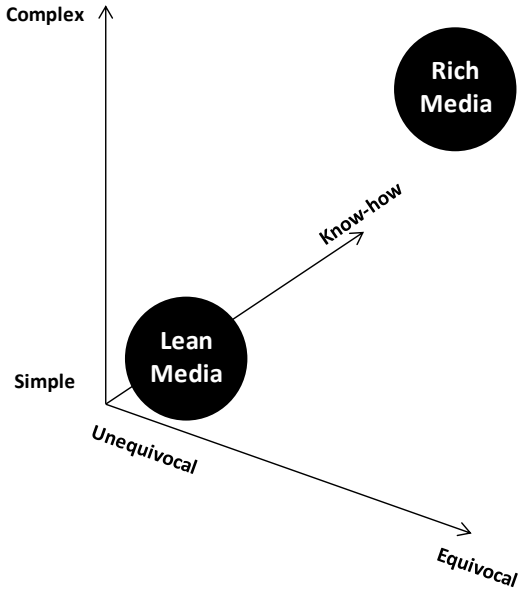

Figure 3 Model of contingency factors and their relationship to lean and rich media

Lin et al. (2005) presented a taxonomy based on a ‘sender receiver framework’, one that characterises the KT relationship in terms of information completeness and symmetry. At a high level it can be deployed to identify whether the receiver has the information advantage, the sender, or neither. In cases of ‘asymmetry’, i.e. when either sender or receiver have an information advantage, the KT process relies more heavily on forms of negotiation and trade-offs than in cases of symmetrical advantage (or disadvantage). Table 7 presents a description of the association with each of these ‘information situations’ are particular classes of KT malfunction or challenge

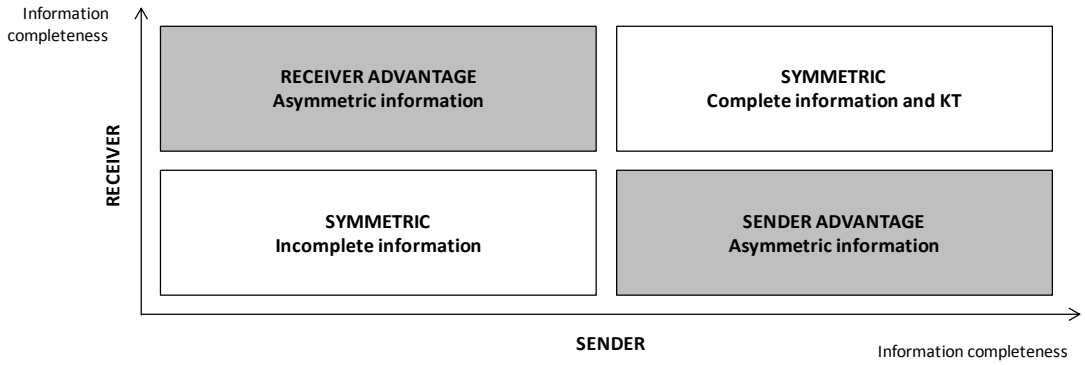

Figure 4 Taxonomy of information structures in KT (Lin et al., 2005, p. 201)

Table 7 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

Direct measures of KT

A number of questionnaires have been developed to evaluate different aspects of KT within organisations. Camison and Fores (2008) 'absorptive capacity questionnaire' would apply to situations that occur before a KT initiative is embarked upon. It aims to provide an assessment of the ability of target organisations to absorb new knowledge. Favourable outcomes would suggest that a KT/OSH initiative can proceed; less favourable outcomes may indicate that preliminary work on the capacity of the target to absorb new knowledge would be appropriate. By these means, the first hurdle at which KT/OSH initiatives 'could' fail can potentially be avoided. The measure includes 127 items that have to be rated on a scale of 1 to 5.

Landaeta's (2008) evaluation questionnaire provides respondents with the ability to rate features of previous 'projects'. It contains both outcome (i.e. was the project successful) and process (did you use specific types of media) measures. In this case the term 'project' can be substituted for 'OSH intervention'. This questionnaire is a 48-item survey where respondents are asked to respond on a scale of 1 to 5 (never to more than 10 times; strongly disagree to strongly agree; over or under budget; very late to very early).

Prevot's (2008) KT questionnaire focuses on the characteristics of the KT process and the disposition of target organisations in terms of styles, approaches and media. If KT/OSH initiatives are contingent on the organisation to which they are intended to apply, then surveys of this type can provide important diagnostics about specific techniques/approaches that may be more successful than others. The questionnaire has 33 items which were scored on a range between 1 to 7 (very high to very low) and 'used' to 'not used'.

Zhao and Anand's (2008) multilevel perspective on KT embodies a questionnaire that overlaps with the previous two. The critical difference is that it provides a perspective not merely on individual level KT, but also at a higher collective level. The questionnaire includes 144 questions which are on a 1 to 7 (very much agree to very much disagree).

Organisational culture is a well-studied topic in Human Factors research and overlaps with issues of context in the KT literature. Stanton and Glendon's (1994) safety culture questionnaire (SCQ) provides access to the relevant set of contextual issues in KT, using a set of items that lend themselves well to OSH settings. Organisations that score very differently on this measure would indicate contextual incompatibility: the effect of a KT/OSH intervention would be to reduce this, and questionnaires of this form provide a way to monitor progress towards such an objective. The questionnaire has 58 items that that are scored on a 1-9 scale from never, to sometimes then always.

All the questionnaires identified evaluate different aspects of KT and as part of this research project were evaluated for usefulness and usability as a means of evaluating OSH knowledge transfer in different organisations.

Methodology Development

The review of KT identified a number of different frameworks and evaluation tools that had the potential to be used to evaluate OSH interventions within an organisational context. However, evaluation of the questionnaires cited, identified that they were not all relevant for the safety and health context and two questionnaires had a large number of questions and it was perceived that respondents would not be willing to complete such lists. Thus a decision was made to develop an interview schedule that could be used with stakeholders involved in an OSH intervention to evaluate KT from identification of the need for intervention through to the impact on the employees. However, it was essential to use a framework around which to build the interview schedule to enable the knowledge flow to be tracked.

The review of KT methodologies identified that the Diffusion of Innovations would be an appropriate framework around which to develop an evaluation methodology. This was based on the assessment of the different factors involved in the KT lifecycle; knowledge, persuasion, decision, implementation and confirmation which are relevant in the OSH context. Each of those is described below and what needed to be considered in relation to transfer. At this stage it was recognised that there was a need to collect information from the stakeholders involved in KT but also to summarise this information before evaluating the responses against other constructs, for example, in relation to persuasion, identifying the physical means by which KT was attempted and comparing it against the propositions of Lin et al (2005). Thus a two-stage approach was taken to enable data collection and collation with stakeholders and comparison of collated findings to evaluate media richness, appropriateness of transfer method used and absorptive capacity.

Knowledge

In relation to the knowledge to be transferred, a number of different facets had to be identified including what was the knowledge to be transferred, at what level and complexity, what was the source of the knowledge and whether the knowledge had to be changed before it was transferred. Changes to knowledge included factors such as changing the language level (reading age), changing the format from documentation to face-to-face communication or developing presentations or toolbox talks.

A method was also needed to be able to describe the properties of the knowledge and questions were developed based on the constructs within Zander and Kogut's (1995) taxonomy. The constructs included codifiability (the extent that the knowledge can be articulated in documents and software); teachability (the ease with which it can be taught to new workers); complexity (the number of skills or competencies embraced by an activity and how important they are in transferring OSH knowledge); system dependence (at the organisational level the extent to which transfer is impaired due to dependency on different groups for its production) and observability (can the knowledge be acquired by those external to the organisation, can it be seen).

A set of questions were developed to identify these factors but also to obtain more knowledge about the context of the intervention and the reasons for its occurrence. These are presented in Table 8.

Table 8 Stakeholder questions to allow description of the knowledge transferred

Who was involved in the intervention?
How long ago did you identify there needed to be a change in OSH at your organisation?
How long did it take to implement the intervention
What highlighted the initial need for the change, Accident, injury or ill-health, legislation change, Safety inspection, Issue raised by employee(s) or Other
Did you have formal OSH procedures in place in relation to this before
When you identified a need for change did you put in place a plan before transferring the OSH knowledge?
Who was the target audience for the planned change, Individual, Department, Whole company, Other
Were the target audience all at the same level of experience with the topic of the OSH intervention?
Where do you store OSH change documents; shared area on the computer, intranet, database, company procedures or other
Do employees have access to the OSH information storage?
Do employees use their access to this information?
Is OSH part of the business strategy?
Does the organisation take a pro-active approach to OSH by taking a best practice approach?
Is management proactive in discovering new OSH opportunities and reacting rather than waiting to see what happens?
Is the organisation equipped to respond quickly to necessary changes as a result of identified risks
Do you use OSH information to develop regulations and rules within your company solely for company use?
Are their shared ideas between employees about OSH knowledge within your company?
Do employees seek their own OSH information from other sources?

Persuasion

Persuasion is defined as the means by which KT is attempted in an organisation. It was acknowledged that assessment of persuasion and the effectiveness of transfer would need to be carried out after both interview and the collation of responses in relation to the type of knowledge, how it was disseminated and what factors influenced the success or failure of KT. Thus questions were developed to identify what the type of knowledge transferred was (in relation to tacit or explicit knowledge), how it was disseminated and what factors influenced the success or failure of the transfer. Table 9., shows the questions developed in relation to the sender and receiver of information to identify where on the taxonomy the intervention occurred.

Table 9 Questions Developed to Evaluate Persuasion

Were the following important for successfully transferring OSH knowledge for the intervention; changing the format, choice of dissemination method, changing the language.
Who made any changes identified above
Was it important for everybody in your company to know everything about OSH knowledge and relevant hazards?
Was it important the employees had extensive experience in OSH?
What formats were used to communicate the current intervention (examples given of e-documents to team meetings and training sessions
Who informed the employees of an OSH change; health and safety representative, external specialist, internal specialist, human resources, supervisors or line managers or other?
Was it important that employees were in constant contact with those that disseminate OSH knowledge for effective transfer?

Where did you for information or advice on the planned change, internal specialist, hiring an external specialist, internet, or other?
How often do you keep yourself up-to-date on OSH?
Did you put a plan in place before transferring OSH knowledge?
What OSH resources do you use most?
Do people approach you for information about OSH?
Who else in the company would know about OSH topics?

Media richness was also evaluated as part of persuasion and the methods undertaken to identify how KT was attempted (face-to-face or virtually) and what the content of the knowledge was. This was compared against the eight propositions of Spraggon and Bodolica (2011) to evaluate fit.

Decision

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 10.

Table 10 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

For the interview schedule a series of questions were developed to enable the research team to find out where respondents were in relation to the decision to take on the OSH change; these are presented in Table 11.

Table 11 Questions developed to evaluate the decision process

Did you have formal OSH procedures in place in relation to this intervention before?
How often do you keep yourself up-to-date on OSH?
After updating your knowledge would you then update any relevant documents or training materials?
Did employees participate in implementing OSH knowledge and dealing with any workplace changes?
Did the employees have a degree of choice as to whether they adopt the knowledge or not?
Did the OSH knowledge transfer improve performance, reduce risk or improve compliance?
Are changes visible to other areas within the company or other companies?

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 12 below.

Table 12 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

Dimensions	Definition	Question content from the interview schedule
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
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

Questions developed for the interview schedule are presented in Table 13.

Table 13 Assessment of implementation and absorptive capacity question

Is there a route to exchange OSH knowledge within the company?
How often do you keep yourself up-to-date on OSH
What OSH resources do you use the most
After updating your knowledge, would you then update any relevant documents or training materials or notify the workforce?
Who else in your company would know about OSH topics?
Are you or the company able to update competencies and skills in relation to new OSH knowledge
Are you able to adapt OSH codes of practice and guidance?
Do you or OSH professionals attend scientific congresses, workshops or other knowledge exchange processes?
Do you and others attend training courses or meetings for OSH?
What OSH resources do employees use the most?
Do employees in your company seek their own OSH information from other sources?
How much internal training do you carry out in relation to OSH topics and competencies and do you train suppliers or customers?
What percentages of your employees receive KT training?

In addition to these questions, stakeholders and employees were asked to complete an adapted safety culture questionnaire which asked the questions shown in Table 14. Respondents were asked whether they strongly agreed, agreed, neither agreed nor disagreed, disagreed or strongly disagreed with the statements.

Table 14 Adapted Safety Culture Questions

The people I work with have a good understanding of the safety and health rules and procedures here
Management acts quickly to resolve health and safety hazards in the workplace with results of investigations immediately implemented
Investigations of accidents are used to give solutions rather than laying blame
Employees inform management of problems with health and safety without worry of reprisal
I tell my co-workers when they are not following health and safety guidelines
We have the resources including staff, technology and training to work safely
Management lead by example on health and safety
Getting the job done sometimes means that health and safety takes a backseat
The organisation keeps me well informed about the potential effects on health and safety from the materials and equipment I work with
I seek health and safety information from outside the company
When I have a safety or health query at work I know who I should speak to

Confirmation

To assess confirmation that a change had occurred in relation to the OSH intervention, a question set was developed to find out how the organisation was going to evaluate the impact of the OSH intervention. The confirmation questions were constructed by the research team and included identification of how the success (or failure) of the intervention was to be assessed and identification of other factors that may have influenced this process, for example, restructuring or other training programmes. The question set is presented in Table 15.

Table 15 Questions developed to evaluate confirmation

How was the change assessed?
Did the OSH knowledge transfer improve quality or other measures of organisational performance? If yes, how was performance assessed?
Do you think the OSH change made things worse? If yes in what way?
Did the OSH knowledge transfer reduce risks? If yes how was the reduction in risks assessed?
Did the OSH knowledge transfer improve compliance? If yes how was compliance improved?
How long ago did you implement the change?
Have the changes remained since they were implemented?
What was the result of change in OSH knowledge; for example an increase in awareness of other hazards or other safety issues?
Were there other factors that might have influenced the OSH knowledge change?

Additional 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.

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.

Employee Survey

The question set developed was long and as employees were going to be involved in data collection too, a separate short questionnaire was developed. This was after discussion with the project Advisory Group as it was identified that access to employees for a 1.5 hour interview was not likely to be encouraged within organisations at the time of data collection. Thus a short questionnaire survey was developed for completion by a sample of employees at the time of data collection.

Employees were invited to complete the adapted safety culture questionnaire as the first step in the survey. Additional questions are presented in Table 16.

Table 16 Employee Questions

Any other comments on the general health and safety in your company?
The company has recently implemented …… Intervention as a result of ……. Were you aware of this? Yes or No
If yes, please describe the changes you have noticed since this intervention?
How did the company inform you about the changes? The method, for example a presentation Did you understand the information? (Opportunity was given for several different responses to this question.
In what ways did the …….. intervention change the way you work; e.g., learn a new method, adapt a current method?
If yes, please describe how you changed the way you work since the …… intervention?
If you didn't change the way you work was this as a result of the following? The intervention didn't require me to change the way I work. Personal choice I wasn't provided with the correct equipment I lacked the skills to Other (please describe)
Are other people in your organisation not involved in the …… intervention aware that it has occurred in your workplace? Yes, no, don't know.
In your opinion has the …….. intervention made a difference, e.g., in your ability to do your job, or made the workplace safer or changes in procedures to do the job? Please describe.
Please add any additional thoughts or comments below in relation to the impact of the …… intervention.
Thank you for your participation in this survey. If you have any other thoughts or comments on the …… intervention or how it was communicated please write these in the box below.

Conclusions

This paper has evaluated KT literature in relation to OSH to identify if there were existing methods that could be applied to OSH to evaluate the impact of safety or health interventions. The review identified that the Diffusions of Innovations approach would allow knowledge movement across an organisation to be tracked as well as identify the different factors or processes used (knowledge, persuasion, decision, implementation and confirmation). Furthermore, the collation of data collected to allow comparison of the type and level of knowledge, the type of media and the sender-receiver framework allows for the likelihood of success or failure of an OSH intervention to be judged.

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