

Did You Have an Impact? A Theory-Based Method for Planning and Evaluating Knowledge-Transfer and Exchange Activities in Occupational Health and Safety

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Few evaluation tools are available to assess knowledge-transfer and exchange interventions. The objective of this paper is to develop and demonstrate a theory-based knowledge-transfer and exchange method of evaluation (KEME) that synthesizes 3 theoretical frameworks: the promoting action on research implementation of health services (PARiHS) model, the transtheoretical model of change, and a model of knowledge use. It proposes a new term, keme, to mean a unit of evidence-based transferable knowledge. The usefulness of the evaluation method is demonstrated with 4 occupational health and safety knowledge transfer and exchange (KTE) implementation case studies that are based upon the analysis of over 50 pre-existing interviews. The usefulness of the evaluation model has enabled us to better understand stakeholder feedback, frame our interpretation, and perform a more comprehensive evaluation of the knowledge use outcomes of our KTE efforts.

knowledge transfer and exchange evaluation workplace-based research
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1. INTRODUCTION

Workers continue to be killed, injured, and disabled at work. Not only do workers face a very substantial burden from these injuries, sometimes losing their lives, but the cost is also high for society. Costs of injuries are spread from employers through the compensation system and private insurers all the way to the public healthcare system where workers often go for help and treatment. Urgent, then, is the need in the field of occupational safety and ergonomics to get evidence-based knowledge into the hands of practitioners in the workplace where it can be used in prevention activities [1, 2]. Facilitating the use and incorporation of evidence-based knowledge in practice, policy, and decision-making is known as knowledge transfer and exchange (KTE), or knowledge translation in Canada, and implementation and dissemination science in the USA.

KTE is a growing field composed of multiple practitioners in research institutions worldwide. Currently, the healthcare sector strongly dominates the field with research focusing on the most effective ways to encourage medical practitioners to adopt evidence-based best practices [3, 4, 5]. However, KTE is also evident in multiple sectors: in agriculture, it examines ways to spread new ideas on new crop species and new methods of agriculture [6]; in education, it describes processes to encourage teachers to adopt new curricula [7, 8]; in policy, it provides ways of influencing decision-makers to use research findings [9, 10]; and in occupational health and safety (OHS), it suggests ways to enhance the uptake of research in OHS in workplaces [11, 12]

One integral and often missing component of moving knowledge to practice is evaluating the degree to which knowledge has been successfully transferred. Considering a model for evaluating KTE, especially prior to engaging in a project, will help maximize and document its success. For example, funders and policy-makers need to know whether their investment in research has made a difference; they also need to know that the advice and implementations they advocate are both effective and harmless. Support for the need for evaluating KTE interventions is evident from

the plenary discussion at the recent National Institute of Health (NIH) conference [13]. Also exposing a need for KTE evaluation is a recent systematic review that examined available research on tools to evaluate KTE implementations [14] and found those that were available were lacking. The review concluded with "...we found few well developed instruments to evaluate KTE implementation or its impact in the KTE literature" (p. 81). Our work aims to respond to these needs.

Another identified gap in the field of KTE is a theoretical basis for KTE studies. This has been pointed out by a recent scoping review [15] and by a number of other recent studies [16, 17, 18]. Estabrooks, Thompson, Lovely, et al. identified that there was no overarching theory and there was little consistent use of theory in the field [17]. Colquhoun, Letts, Law, et al., advocated for theory-driven methods in knowledge transfer: "Theories can yield the development of hypotheses that, when supported through theory testing, can be used to describe, explain, and predict phenomena" (p. 277), but concluded with the message that theory was an often neglected dimension of knowledge translation study [15]. Moreover, as Rycroft-Malone outlined, theory gave us the opportunity to develop and test a strategy, to identify appropriate variables, outcomes, and measures, which would help guide the evaluation of the process of knowledge transfer [19]. In her editorial with Bucknall, Rycroft-Malone again emphasized the importance of theory to help explain the "black box" of implementation; to help our understanding of the process that takes place from when the evidence is transferred to its use [20].

The purpose, therefore, of this paper is to present a new theory-based KTE evaluation method. We respond to the need for measurement tools in the field of KTE, the need for theory-based KTE, and the need for a KTE evaluation framework. The method brings together three theoretical models: (a) the promoting action on research implementation of health services (PARiHS) model on research implementation as the context for the implementation; (b) different stages of change of knowledge receptivity based

on the transtheoretical model (TTM); and (c) three kinds of knowledge use (conceptual, instrumental, and strategic) as the outcome variables of any KTE implementation.

A number of theories and frameworks exist for KTE, as noted by Estabrooks et al. [17] and others. The one that continues to be used the most frequently is Rogers's theory of the diffusion of innovation that identifies stages in the adoption process [21, 22].

Rycroft-Malone and Bucknall have highlighted the following models that have been often used to frame, but not necessarily to evaluate, a knowledge-transfer intervention [20]: the Stetler model [23], the Ottawa model of research use [24], PARIHS model [25], the IOWA model of evidence-based practice [26], the advancing research and clinical practice through close collaboration model [27], the Dobbins' dissemination and use of research evidence for policy and practice framework [28], the Joanna Briggs institute model [29], and the knowledge to action framework [30].

However, as noted by Estabrooks et al. [17] and the systematic review that examined available research on tools to evaluate KTE implementations [14], none of these frameworks are consistently used, and few have led to evaluation instruments.

While these models help in understanding the field of KTE, we believe that the evaluation model that we are proposing offers advantages that the others do not.

2. INTEGRATION OF 3 MODELS OF KTE

This paper's proposed evaluation model is based upon the integration of three theoretical frameworks: (a) the PARIHS model, (b) a stages of change model to help understand readiness for organizational change, and (c) a model of knowledge use.

The three frameworks we have chosen have strengths each by themselves. Yet, in combination, the models allow for a deeper understanding of the black box of KTE. We argue that the three constructs in the PARIHS model (context, facilitation, and evidence) are necessary drivers of any

intervention, but note that they are not sufficient for a thorough evaluation, especially in the field of OHS. Our experience with multiple workplace-based interventions shows us that the success of an intervention is very dependent upon the readiness and receptivity of the company. Therefore, we have incorporated the stages of change in our model that helps us understand the process by which change occurs. Thirdly, we have identified different ways of conceptualizing knowledge use as the outcome measure; hence, we have included a model of knowledge use that includes conceptual, instrumental, and strategic use of knowledge.

These three models are usually found in different intellectual silos (the PARIHS model is usually used in healthcare, the stages of change model is usually found in cognitive psychology and public health, and the knowledge use framework is anchored in KTE), but we argue that combining them gives us the advantage of multidisciplinary breadth. We also argue that the multiple variables in the model (three variables in the PARIHS model, five in the stages of change model, and three kinds of knowledge use) should be the major measures that make up any quantitative or qualitative instrument used to help guide a rigorous evaluation and impact of a KTE implementation. Moreover, these 11 variables can also be used in the planning stage of a KTE intervention to facilitate the evaluation process. We propose that the process of dissecting, considering, and addressing each component of our model during the planning stages of any research, implementation, or project will maximize the uptake of the desired research findings or knowledge.

2.1. The PARIHS Model

The PARIHS model [25, 31] lays the context for any implementation and can be seen as the driver of this proposed evaluation model. Like any good theory, it describes, explains, and should predict the success of a KTE intervention. The model proposes that a successful KTE implementation is a function of the relationship between three elements: (a) the kinds and sources of evidence to be disseminated, (b) the particular characteristics

and quality of the context, and (c) and the facilitation strategies that were used.

Although the PARiHS model was created for the healthcare sector, the model can and has been used with other sectors. Helfrich, Damschroder, Hagedorn, et al. reviewed its use in multiple sectors [32], and this research team has used the PARiHS model as an organizing framework to explore the dissemination of innovations in the construction sector [33]. The model is suitable and applicable to the work of KTE in workplaces because it acknowledges the complexity and inter-relationship of the elements of a KTE implementation. It focuses on the organizational context and the KTE facilitation. We have found that the relevance of the evidence that is being transferred, the receptivity of the companies (context), and the intensity of the facilitation play a part in determining the success or failures of our KTE intervention work.

The model has a number of subelements listed under its three major variables. Under the context element, there are a number of subelements including receptivity, culture, leadership, and evaluation. In many ways, this element is reminiscent of the literature on safety climate that has recently dominated the OHS literature [34, 35] and its priority is reflected in many studies in this field [36, 37]. The evidence element includes the different kinds of evidence pertinent to workplaces including research, clinical experience, worker or patient experience, and information from the local context. The facilitation element is divided into the role of facilitator and the skills and attributes that the facilitator should have to make them effective. One addition that we think is necessary is that facilitation is not just the person standing in the front of the room. It is the whole facilitation process of the implementation of the intervention, which includes multiple decisions on effective and intense communication, both amongst the change group, but also externally to the workplace as a whole and to other stakeholders even outside the workplace.

But despite the large number of studies that have now used the model [32], the subelements have not been shown to be empirically reliable or predictive. We have not tackled this ongoing lim-

itation and rather we have focused on the three main variables.

2.2. Readiness for Organizational Change

The second framework in the proposed model is the TTM, often called the stages of change model [38]. The TTM has until recently been mostly used to help identify the stage of receptivity of individuals to changing their behavior, such as smoking, weight loss, or rehabilitation, and identify appropriate interventions, depending upon which stage the individual is in. There are now over 1500 studies that have been conducted using this model [39].

The stages in the TTM are (a) pre-contemplation—not intending to take action within the next 6 months; (b) contemplation—intending to take action within the next 6 months; (c) preparation—intending to take action in the next 30 days; (d) action—made overt changes under 6 months ago; and (e) maintenance—made overt changes over 6 months ago. A stage-matched facilitation for an individual in the pre-contemplation stage would be increasing awareness with information to move them to the contemplation stage. Likewise, if the person is in the action stage, then resources and reinforcement are necessary to support their change.

Recently, the model's originators adapted the model to apply to organizational change [40]. They argued that a stage-matched facilitation at the organizational level would ensure that pressure was not applied at the wrong time; this usually leading to resistance and resentment. They advocated that being sensitive to where employees were in the cycle of change and recruiting them with communication and persuasion on the importance of the change was integral to gaining their support for the initiative or change. Specifically, they maintained that "[t]his emerging science of change can be applied by leaders to reduce resistance to change, increase participation in change, reduce dropouts from change, increase progress, and greatly enhance implementation of organizational change initiatives" (p. 259).

2.3. Knowledge Use

A classification of knowledge use includes conceptual, instrumental, or strategic use of knowledge. Knowledge use occurs in some form as an outcome of any KTE implementation or intervention; therefore, they are included as the outcome variables. This typology of knowledge use is mostly credited to Huberman and Cox [41] and Huberman and Ben-Peretz [42] but also to Weiss [43] and has been widely adopted in the field of knowledge transfer and research implementation. As summarized by Kramer and Cole, (a) conceptual use (also called enlightenment or indirect) is determined when the research findings are used to gradually change and frame the understanding of an issue; (b) instrumental use (also called structural, problem solving, or direct) is indicated when the research findings are used to design a new policy, program, or procedure; and (c) strategic use (also called political, tactical, or symbolic) is indicated when research is used to justify a course of action already decided upon [11].

Although many researchers in the field of KTE only use conceptual and instrumental use of knowledge in their evaluations, we agree with Beyer and Trice that it is important that the outcome measures of any KTE implementation evaluation should also include potential strategic use of the research findings [44]. It is an important outcome to observe and measure, especially in the context of OHS, where the system is made up of different stakeholders with varying priorities that result in different uses from the same information. For example, workers might use the information as a way to emphasize the role of workplaces in their health and safety. Employers may use the information to emphasize the importance of individual behavior. Unions might use the information to try to influence the system as a whole. Other system partners might use the same information to advocate for regulation or guide the Ministry of Labour's enforcement initiatives. Therefore, embedded within the concept of strategic use of knowledge are the political processes that all the stakeholders use to achieve their goals [45].

Finally, it is worth noting that, although we have presented these three models in a linear fashion, which was necessary to facilitate repre-

sentation and help explain the complex process of KTE; however, we strongly agree with Nutley, Walter, and Davies that knowledge implementation and use is seldom, if ever, linear or unidirectional [46]. There is always an organic flow between the evidence, the context, and the facilitation of the process, between the stages of change, and between conceptual, instrumental, and strategic knowledge use, reflecting the iterative and interactive nature of research use, or as they put it, "the use of research is a subtle and complex process, difficult to trace and resulting in equally subtle and complex outcomes" (p. 33).

2.4. A Proposed Evaluation Tool for KTE Implementations

The purpose of KTE is to facilitate the use of evidence-based knowledge in practice, policy, and decision-making. Building on that idea, it is essential to identify what particular evidence-based innovation (idea, concept, finding, change) is the target of the KTE process. Once the evidence-based knowledge is clearly identified, it should be possible to use the proposed model to evaluate the impact of the KTE intervention or implementation on decision-making.

As a heuristic device, we have dubbed this "evidence-based innovation, idea, concept, finding, or change" a **keme**, a unit of evidence-based knowledge. A keme is analogous to a meme, which is Dawkins's concept [47]. Dawkins used the word meme to mean a unit of cultural information that can be transferred between different contexts or cultures. Examples of memes include certain patterns; designs; methods of making tools; or concepts like evolution, patriarchy, and royalty. What makes a keme different from a meme is that it is specifically evidence-based knowledge, which helps inform practice, policy, and decision-making. Examples of kemes in the OHS realm include the value of OHS programs, the effectiveness of participative ergonomics (PE), the evidence that both peak and cumulative load leads to back pain, the link between exposure to asbestos and mesothelioma, and that making changes at the design stage is more effective than trying to eliminate hazards after the production system is functional.

Building on the concept of a keme, this paper presents a new KTE method of evaluation (KEME), which synthesizes the three theoretical models explored so far.

The KEME model firstly uses the PARIHS model as the driver of the change process. Every KTE intervention is different and is driven by the three variables that the PARIHS model highlights. Firstly, there is the relevance, applicability, and the strength of the evidence-based knowledge (the transferrable keme). This is the focus of the KTE application. Secondly, the individuals, groups, and organization and their receptivity to the new evidence-based knowledge (the keme) are the focus of the context. And, thirdly, we measure the intensity and effectiveness of the facilitation process in moving the evidence-based knowledge (keme) to the target audience. These three PARIHS variables set the stage for an effective KTE application; if they are not strong, the adoption of the keme by the stakeholders will likely be ineffective.

Secondly, the KEME model incorporates Prochaska, Prochaska, and Levesque’s TTM known as the stages of change [40]. This model highlights the process of change that the target audience of the KTE implementation goes through, and the inevitable and necessary transformation of the evidence-based knowledge (keme) to match the values and beliefs of the environment [48, 49]. This unit of knowledge will inevitably be different for the different partners in the knowledge and exchange relationship, and will seldom be only one concept or idea. We thought that incorporating the stages of change model was essential to our proposed evaluation approach, since we have found that the receptivity of the audience (in our examples, companies), and their ability to absorb the keme into their lives was a major determinant of the success of KTE implementations. This readiness for organizational change is, therefore, an essential part of our evaluation model.

We integrated the stages of change model to highlight the nature and the intensity of the facili-

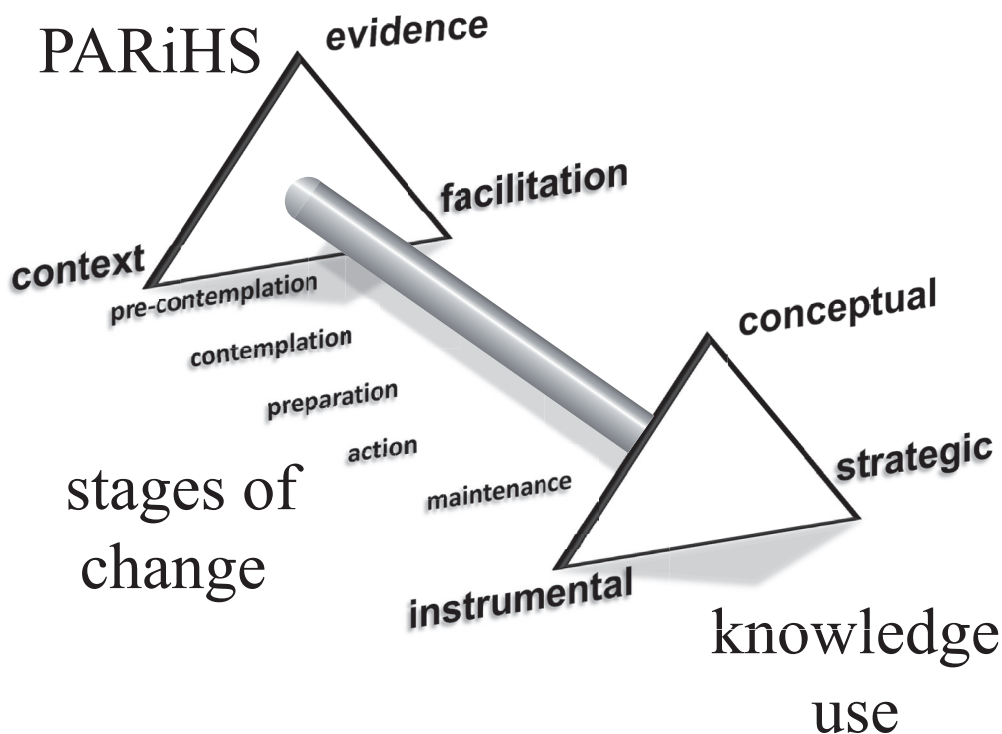


Figure 1. A knowledge transfer and exchange method of evaluation (the KEME system); synthesizing 3 theoretical frameworks. Notes. KEME = knowledge-transfer and exchange method of evaluation; PARIHS = promoting action on research implementation of health services [25].

tation. It emphasizes how important it is to tailor and alter the intervention process depending upon the stage of change that the person is in. This is important when planning and strategizing a KTE implementation; it also makes a nice link to the PARIHS model's facilitation variable. We believe that incorporating the stages of change is essential because it is reflective of our real-world experiences as demonstrated in the four case studies described in the next sections.

Thirdly, we have integrated a knowledge use model as the outcome variable of the KTE process. Conceptual, instrumental, and strategic use of knowledge has strong roots in the KTE literature, and these kinds of knowledge use capture the range of outcomes that may occur when people incorporate new evidence-based knowledge into their lives and work. It is reflective of the reality that there is not a one-to-one correlation between the introduction of evidence-based knowledge and its direct application in the environment; it reflects the inevitable and necessary transformation of the keme by the audience in their context.

Our experience of KTE in workplaces in multiple sectors has led us to the realization that each model, separately, could not fully capture the interaction of people, technology, work organization, and psychosocial factors that we encountered. The three models, when brought together, capture the whole KTE process. Each model brings in different aspects of the process but together they are more capable of reflecting the reality of OHS environments. The KEME model has enabled us to better structure our observations, plan our interactions with the workplaces, frame our interpretation of the process, and perform an evaluation of the knowledge use outcomes of our KTE efforts.

2.5. Case Studies as a Proof of Principle

To demonstrate the usefulness of the model, this paper summarizes four different experiences of KTE of evidence-based knowledge in the field of occupational safety and ergonomics. It evaluates the four case studies with the KEME model. The first two interventions were with companies in manufacturing, and electrical and utilities. The keme in these two examples was that "PE facili-

tated the reduction of exposure to musculoskeletal disorders (MSDs)". The third intervention was in the construction sector. The keme in this example was that "a tool shown to reduce MSDs, if adopted by companies, could reduce workers' exposure to MSDs". The fourth intervention covered six different sectors. The keme in this example was that "if research is conducted collaboratively with users and researchers, it facilitates the uptake of research findings".

The evaluation of the cases has been, out of necessity, based on a review of interviews that were conducted for other purposes. However, the research team has created a qualitative instrument (Appendix A) and, in Table 1, proposes directions for quantitative questions that can be used to evaluate and measure the impact of future KTE implementations based on the outcome measures of the model. The quantitative questions should include questions on the context and the facilitation process, and questions based upon the stages of change model, and instrumental, conceptual, and strategic use of knowledge. The qualitative interview schedule includes open-ended questions on the themes of facilitation, the stages of change model, and the instrumental, conceptual, and strategic use of knowledge.

Appendix A is a draft generic interview schedule for qualitative work. We are still in the development phase and further testing of these instruments and their measurement properties are planned for future studies. Key to both the quantitative and qualitative instruments is the identification of the keme that is driving the KTE intervention. Both measurement tools use the generic word keme that should be replaced with the particular keme—the particular evidence-based knowledge that is being transferred—that is relevant to the particular proposed project.

3. METHODS

The following sections offer a basic evaluation, using the KEME model, of the KTE of particular evidence-based knowledge (kemes) that occurred within four case studies. The four case studies have been retrospectively built from the re-examination of either the transcripts or the qualitative

TABLE 1. Potential Items to Help Guide a Future Quantitative Survey Based on the KEME System of Evaluation

Element of KEME	Item
Facilitation	The amount and type of facilitation was enough to ensure there was change.
	The facilitator helped incorporate the ideas of the keme.
	The communication process was adequate to allow the workplace to adapt to the ideas of the keme.
	The communication process was adequate to allow the outside stakeholders incorporate the ideas of the keme.
Readiness for organizational change	The time we are spending on the change should be spent on something else.
	I do not anticipate any problems adjusting to the work I will have when the change is adopted.
	My co-workers support this change effort.
	My past experiences make me confident that I will be able to perform successfully after this change is made.
	The supervisor of my work group is committed to making this change a success.
Conceptual knowledge use	I now understand what the keme is all about.
	I now have learned enough to make the keme changes.
	My co-workers are talking about the keme.
	My co-workers now have a more positive attitude of keme.
Instrumental knowledge use	My co-workers now have a better idea of what the keme can achieve.
	There been physical changes made in the workplace based on the keme.
	There are now new ways of doing work in the workplace based on the keme.
	New programs have been adopted based on the keme.
Strategic knowledge use	I now do my work differently now that I know about the keme.
	I think it is possible to use the keme to achieve something I have wanted to do for a while.
	I think it is possible for me to use the keme to raise awareness.
	I have learned something from this project that might help me investigate and resolve other issues.
	I think policies, procedures, and practices based on keme could be used to influence decision-making.
	I think a group in my setting/arena/worksite has used the keme to influence policies, procedures, and practices.

Notes. keme = evidence-based transferrable knowledge.

analysis from over 50 interviews. While retrospective analyses are not ideal in illustrating the usefulness or feasibility of a new evaluation framework, the four cases will assist in demonstrating potential usefulness or proof of principle of the KEME model and provide readers with a sense of the different ways in which it can be used as an evaluation tool. As previously mentioned, the coauthors plan to do a prospective study using the KEME model as the evaluation framework. The authors of this paper were involved or led all four case studies (RW led cases 1 and 4, PB led case 2, and DK led case 3).

3.1. Procedure

3.1.1. Interviews

The four case studies are based in four different sectors: (a) manufacturing, (b) electrical and utilities, (c) construction, and (d) multiple sectors. For this paper, the researchers went back to interviews that had been collected as part of these studies. The researchers re-examined the transcripts and in some cases the pre-existing summaries of and analyses of over 50 interviews. From this pre-existing data, we were looking for evidence of—or the absence of evidence of—the elements that appear in the KEME framework.

In the four case studies, at the end of each of the interventions, data were collected in a series of face-to-face and telephone interviews. In cases 1 and 2, interviewees were workers who had been involved in the ergonomic change teams (ECTs) and management who had been involved in implementing the changes. The interviewers had asked them whether their expectations of the study had been met; what they saw as the role of the ergonomist, the researchers and the health and safety association (HSA); and whether they had achieved both physical changes and more “soft” outcomes, such as linkages and connections to other companies and to the HSA. They were asked what they saw as the advantages of having created a participative ECT, how the findings of the teams’ deliberations were spread throughout the company, and whether they thought the changes were sustainable over time. The interviewers also gained some insight into the barriers that the workplace parties encountered while trying to make changes in their companies. They were asked for their advice on what could have been done to further facilitate company involvement in the change process, and as a final indicator of the success of the projects, whether they would be involved in research again.

In case 3, similar kinds of questions were asked of workers and owners who had expressed interest in adopting innovations. Since the PARIHS model was this study’s theoretical framework, the interview schedule was focused on the PARIHS model. The interviews did not cover either the stages of change or knowledge use parts of the KEME model. These interviews included questions on the organizational context, and the advantages and disadvantages of the innovations, and only marginally on the intensity of the facilitation (those questions will be asked in a forthcoming research study).

The interview schedule for case 4 was based on some of the variables from the KEME model, but again was not ideal since the KEME model has evolved since the interviews were conducted. The interviews were conducted with the members of a collaborative research team which was made up of researchers and union representatives from six unions. In these interviews, the questions focused

on helping to identify any knowledge use (changes in instrumental, conceptual, or political use of knowledge).

3.1.2. Data analysis

The more than 50 interviews that helped inform these four case studies were initially tape recorded at the time of the interviews and, after transcription, were analyzed using qualitative methods. The synthesized, themed, and coded analyses were made available to the coauthors of this paper. The coauthors re-evaluated the interviews that had already gone through at least one level of synthesis, to find evidence of—or lack of evidence for—the variables that have been identified in the KEME model. This is, of course, anything but ideal and is a fundamental weakness of the methodology we have used to arrive at the descriptions of the four case studies. But to re-emphasize, these four case studies are merely offered as examples of how it might be possible to evaluate KTE implementations in workplaces using the KEME model.

The interviews for the first two case studies were conducted in 2004 (manufacturing, and electrical and utilities). The construction case study was conducted in 2008. The collaborative research project occurred in 2011. There are significant gaps in the data that we have used. However, since the coauthors of this paper were (or are) all deeply involved in these studies, their observations and insights have been included to supplement the gaps in knowledge. The evidence of impact or knowledge use within the four case studies has been enhanced by the experience that the researchers have of the cases from their years of involvement in these studies.

3.2. Ethics

An external funder (the Workplace Safety and Insurance Board’s Research Advisory Committee) funded the four case studies. For the sake of international readers, it is worth noting that Canadian researchers are paid from their home university or research centre and not from research grants. Hence, there is no inherent conflict of

interest. The representatives from workplaces, HSAs, and unions who were partners on the study, and the workers who were interviewed were all volunteers with their time paid for by their own organizations or firms. Ethical approval for conducting the follow-up interviews with the participants from each case study was individually obtained from the University of Waterloo's Office of Research (for cases 1, 3, and 4) and the University of Toronto's Office of Research (for case 2).

When partners in the research studies were the people interviewed, they were considered fully informed about the research. Since the interviewers were not considered as having any power over those they interviewed, we believed that the participants did not feel coerced to participate. Verbal consent was considered adequate in these circumstances. When workers were interviewed (as in case 1 or 2), signed consent was obtained for the interview from each participant, and any participant could withdraw from the interview at any time. Identification numbers were assigned to participants to assure confidentiality.

4. RESULTS

In the following section, we outline the four case studies (Table 2). With each individual case, we give some basic information on the three concepts in the PARiHS model: the context (including the keme that drove the knowledge transfer application and the objective of the study), the evidence, and the facilitation, and some idea of the companies' readiness for organizational change.

Since the outcomes of knowledge use are more complex, we have included examples of knowledge use that emerged from each study in Table 3. We have used the matrix form of data analysis to help with cross-case comparisons, as explored by Miles and Huberman's causal-approach to qualitative data analysis [50]. We are aware that the information we have provided on the four case studies does not offer enough depth, but we consider these four case studies as pilots that are being used to demonstrate the potential usefulness of the KEME model.

TABLE 2. Features of the KTE Intervention by Case Study

Case Study	Mission/Purpose of KTE Implementation	Follow-Up Interviews	Keme
1	Reducing injuries by increasing the knowledge of ergonomics with a PE process	14	Knowledge of ergonomics and the activities that lead to MSDs; organizational change; process of persuasion to make changes; making changes in programs, policies, and procedures; ways to influence labour-management relations
2	Reducing injuries by increasing the knowledge of ergonomics with a PE process; sharing knowledge (about ergonomics and program implementation) amongst ECTs from other utilities a key aspect	9	Knowledge of ergonomics and the activities that lead to MSDs; organizational change; process of persuasion to make changes; making changes in programs, policies, and procedures; ways to influence labour-management relations
3	Diffusing innovations to reduce exposure to musculoskeletal injuries	15	Learning how a ladder lift can help reduce MSDs and slips and falls; changing the way that workers do their work (instrumental); using the research to get other innovations to reduce physical load (political).
4	Evaluating the collaborative research process to discover whether there was an exchange of knowledge between participants, both researchers and stakeholders, as an indirect effect of collaborating on a research project	12	Union partners: the research process, MSDs and their impact, ways to evaluate risks, potential use of research for activism Researchers: how unions work, how unions interact with workplaces, workplace change

Notes. Case study 1 = PE in 1 manufacturing company, case study 2 = PE in 6 electrical and utilities companies, case study 3 = adopting an ergonomics tool in 13 construction companies, case study 4 = researchers and union representatives collaborate on a study to evaluate a physical-load questionnaire for multiple sectors, KTE = knowledge transfer and exchange, keme = evidence-based transferable knowledge, PE = participative ergonomics, MSDs = musculoskeletal disorders, ECT = ergonomic change team.

4.1. Case Study 1: PE in 1 Manufacturing Company

4.1.1. *The context*

In case study 1, six researchers led a 4-year intervention study in a medium-sized manufacturing company (300 employees). The theme for this study was that “PE was an effective way to make positive ergonomic changes”. The objective of the project was to examine the conditions that facilitated or constrained establishing PE programs and evaluate the health outcomes of PE implementations.

The intervention began when senior management contacted the research team about trying to address the company’s high level of MSDs. After initial informal talks, management, the research team, and union representatives met to discuss the project. A small group of workers and managers (9 members) were brought together and formed an ECT. The ECT’s mandate was to identify hazards, develop solutions to address these hazards, and oversee the implementation of these solutions. This study has been written up in more detail [51].

4.1.2. *The evidence*

A key aspect of the implementations described in the first two cases was that they were designed around a framework for implementing PE in workplaces in Ontario [52, 53]. The framework is a model for PE programs that integrates ergonomics program concepts and processes into a quality management framework. The key piece of transferable knowledge from the framework is that a successful PE program is intensive and sustained, and should be part of an overall management system.

4.1.3. *The facilitation*

In the manufacturing company, the manager and the health and safety manager were the champions and facilitators of the process. The ergonomist-facilitator, who was a member of the research team, worked with the ECT.

4.1.4. *Readiness for organizational change*

The researchers who were involved in this study (RW, SD, PB) observed that the PE program in the manufacturing setting moved, over a period of several months, steadily through the stages of pre-contemplation, contemplation, and preparation. This case study found variations in readiness for organizational change across multiple layers of management. The company’s top managers, who were in direct talks with the research team during the stages of pre-contemplation and contemplation, were fully supportive of the PE program and oversaw it moving forward. In contrast, support from lower levels of management—those on the shop-floor and responsible for ensuring efficient and productive operation of the company—was slow to materialize in the PE program’s first several months. The case also demonstrated that readiness to change changed the course of a PE intervention.

4.2. Case Study 2: PE in 6 Electrical and Utilities Companies

4.2.1. *The context*

In case study 2, a provincial HSA with a mandate to focus on the electrical and utilities sector, six utilities companies, and 12 researchers formed a research partnership. The theme was that “PE facilitates the reduction of exposure to MSDs”. The objective of the research study was to assess the effectiveness of the HSA-led intervention against a variety of outcome measures ranging from organizational change to change in numbers of workers reporting musculoskeletal symptoms and pain.

The six utilities companies formed ECTs. The teams had 8–12 members, including a management representative, an organization/work group representative, and a joint health and safety committee representative. The ECT meetings took place monthly, lasted 1–3 h, and met for a year. With a diverse group of utilities participating, rich information on the facilitators and barriers to success of the implementations was obtained [54].

4.2.2. *The evidence*

This case study was guided by the framework discussed in section 4.1.2 [52].

4.2.3. *The facilitation*

The HSA enrolled the companies and actively provided support, ergonomics training, and expertise to the ECTs throughout the project. The researchers' role in the collaboration was conducting the evaluation. The ergonomist regularly visiting each team to provide advice, assistance, and support was probably the most critical intervention.

Almost everyone directly involved with the research, as well as ECT members at three utilities, said the HSA ergonomist was the true champion of the program to introduce PE in the utilities sector. All those interviewed mentioned the ergonomist by name; she was seen as overcoming barriers to initiate the project. An ECT member noted that the HSA ergonomist played a crucial role in helping them "figure out how we were going to make it work".

4.2.4. *Readiness for organizational change*

Of the four case studies, only this project specifically looked at and collected data for a stages of change model. The study defined readiness for organizational change as the degree to which those involved were individually and collectively primed, motivated, and technically capable of executing the change [55]. A survey that measured readiness just prior to the program found that scores were significantly associated with individuals' participation in ergonomic change activities when the program was running. Thus, there was evidence that the level of readiness for organizational change impacted later program engagement and participation. Interestingly, there were significant differences in readiness for organizational change scores between the office and field staff with mean values for office staff being higher. A possible reason could be that the office staff might work more closely with upper level management and would, thus, feel more confident about management commitment to safety and the importance of the PE program.

4.3. Case Study 3: Adopting an Ergonomics Tool in 13 Construction Companies

4.3.1. *The context*

In case study 3, a collaborative research study that included researchers and consultants from a not-for-profit HSA formed to examine diffusion of innovations in the construction sector. The 7-person research team included 2 ergonomists, an engineer, a biomechanist, an epidemiologist, a sociologist, and an adult educator with a specialization in knowledge transfer. The theme for the study was that tools "that have been shown to reduce the impact of force could reduce construction workers' exposure to MSDs". The objective of the study was to examine the facilitators and barriers to the introduction of tools to the sector.

For the study, 33 managers were asked, at no cost, to try out a hydraulic lift to raise ladders onto the roofs of service vans. The 13 managers who agreed were interviewed about their primary business activity, size of the company, decision-making process, and health and safety climate. Workers who used the hydraulic ladder lifts were surveyed about their health and the value of the tool before they were given the tool and after ~6 months of using the rack. This study has been written up in more detail [33, 56, 57].

4.3.2. *The evidence*

The ergonomist on the team identified the ladder lift as a good example of a valuable innovation. It was evaluated for its potential to reduce shoulder injuries. It could also prevent falls because workers were not required to use a bumper as a step when trying to secure a ladder on the top of the roof of the van.

4.3.3. *The facilitation*

The introduction of new tools took two forms. In the first instance, a fact sheet explaining the benefits of the tool was sent to possible opinion leaders in the construction-service community. This was followed by phone calls explaining the nature of the project and the benefit of the tool. Those who volunteered to try out the tool could determine its relative advantage, compatibility

with their organizational needs, ease of use. They had an opportunity to try and observe the lift in use before committing to adopt the change. People who had chosen to try out the tool gave presentations on their experience to their peers, facilitating the dissemination of knowledge of the benefits of the tool.

4.3.4. Readiness for organizational change

None of the companies that agreed to try the ladder lift were aware of the product before the researchers introduced it to them. Yet, all the companies that chose to adopt the innovation were very interested in improving safety practices, and the decision-makers had sufficient flexibility to try something new. So, we moved the 13 companies to a pre-contemplation stage by introducing something very new to them, to a contemplative stage.

4.4. Case Study 4: Researchers and Union Representatives Collaborate on a Study

4.4.1. The context

In case study 4, a collaborative research study was formed with 5 researchers and representatives from six unions and a labour-sponsored organization: the Ontario Public Service Employees Union, Communications and Energy and Paperworkers of Canada, Ontario Nurses' Association, the United Steelworkers of America, the Canadian Auto Workers, the United Food and Commercial Workers Canada, and the Occupational Clinics for Ontario Workers.

The theme for this case was that "collaboration on research projects can offer researchers and practitioners an opportunity to be mutually involved in the design and process of research, rather than just the findings of research, and this will facilitate KTE". The objective of the study was to test the validity and reliability of a workplace-level physical-load questionnaire in 60 workplaces that were unionized with the different unions collaborating on the study.

4.4.2. The evidence

The concept of integrated KTE is fundamental to the field of KTE. The exchange of knowledge, the increase in awareness, and increased knowl-

edge transfer is the result of being engaged in the process of research [58]; hence, the ongoing emphasis on researchers and practitioners collaborating on research studies [59, 60].

4.4.3. The facilitation

Bringing together the divergent needs and expectations of different stakeholders to this study was not simple; hence, regular face-to-face meetings and exchange of information. These meetings worked to ensure a balance of power, meaningful engagement, trust, and representation of everyone's priorities. Frequent meetings (held every 4–6 weeks during the study) helped create long-term rich relationships that could potentially lead to future collaborative research projects [58].

At least 10–12 participants attended during the year with some unions sending multiple representatives. About 2-h long, the meetings were chaired by one of the two principal investigators (one was a researcher, the other a union representative). The meetings were interactive and engaging. The research co-ordinator took notes of the meeting and of decisions that were made.

4.4.4. Readiness for organizational change

Most union participants in this research had never been actively engaged in either the design or conduct of research or the analysis of data. When initially approached, they agreed to participate with some reservations. The reservations were based on a concern for using their limited resources for a project without a strategic benefit. For the most part, they were not just pre-contemplative but also resistant to change. However, throughout the process they saw a plan develop which would have immediate and long-term benefit for their membership. They also saw that their input was not only accepted but valued. All the participants are now quite willing to participate in future research projects, which can be seen as an indication of a move from reluctant contemplation, to preparedness, to participation.

On the other hand, most researchers on the study had had some previous contact with unions or their membership, but although they had not had union research partners on an equal footing

in previous research grants, they were willing to participate in a collaborative process. Those researchers who had not collaborated directly with unions, changed from focusing on how time consuming and sometimes frustrating the process was, to considering it essentially worthwhile: “It’s messy. The relationships are complex and multi-layered”. But, “the messier the setting, the more collaborative research is necessary”.

The researchers are all prepared to work with union representatives in the future. Some are also willing to try and recruit union membership on upcoming research grants. So, with this group, we also saw movement from pre-contemplation to at least preparation and, in some cases, to the action stage of change.

4.5. Knowledge Use

A matrix with examples from the four case studies of the three kinds of knowledge use (instrumental, conceptual, and strategic use of knowledge) concludes this section.

5. DISCUSSION AND CONCLUSION

In this paper, we have synthesized three conceptual frameworks to create a theory-based KTE method of evaluation, the KEME model. The three frameworks are the PARIHS model that we see as identifying the essential drivers and determinants of success of any KTE intervention (the context, the facilitation and the evidence); the TTM that helps identify a company’s receptivity to change and the importance of matching the facilitation to that stage; and thirdly, the outcome variables of knowledge use (conceptual, instrumental and strategic). We have demonstrated the use of the KEME model to evaluate the knowledge receptivity and knowledge use in four KTE interventions, in multiple sectors, with a range of OHS programs.

We have also developed a generalizable quantitative survey, and have provided two sample interview schedules that can be used as models for other qualitative studies. We believe this theory-driven KTE-intervention evaluation approach is applicable to both qualitative and qualitative

methods, although that is yet to be empirically demonstrated. We believe that the KEME method of evaluation can be used across multiple contexts, to evaluate the adoption of different kinds of evidence-based innovations and to evaluate different strategies and techniques of KTE.

5.1. KEME as a Planning Tool

We believe that the KEME model could be a useful tool in developing and planning a research initiative. By applying the KEME model when planning a knowledge-transfer intervention, the researchers may be more efficient in the research process and effective in disseminating valuable research. For example, if in case 3, the researchers had spent more time in pre-evaluating the context of the subsector in construction that uses service vans (hence, the ladder lift), they may have chosen another innovation which had more widespread applicability. That could have enhanced their understanding of the acceptance and adoption of the innovation. Conversely, in case 4, the researchers’ awareness of the strategic use of knowledge has provided insight into the role of unions during the research process not simply as receptors for data, but also as creators of knowledge.

A third example of how the KEME model can be important at the planning stage is its ability to create awareness of the importance of the role of the facilitator. As predicted by the PARIHS model, the intensity and quality of the facilitation of the intervention determines the level of knowledge receptivity and knowledge use. For example, a unique aspect of the intervention research in the electrical and utilities sector (case 2) was the hands-off approach that the researchers took to the intervention. They wanted to study the effect of a standard ergonomist-coordinated change process. This is in comparison to a very engaged and intense facilitation that was used in the collaborative research project that involved the unions (case 4). The latter exceeded any expectations for knowledge receptivity and knowledge use outcomes although KTE was not the objective of the study.

TABLE 3. A Cross-Case Comparison of Knowledge Use With the KEME System of Evaluation

Keme	Case Study 1	Case Study 2	Case Study 3	Case Study 4
Conceptual use of knowledge (changes in ideas, awareness, concepts, or language)	Overall, workers and managers on the ECT stated that their training in ergonomics and their experiences gave them a new understanding of ergonomics. Many stated that this went well beyond the idea that there were proper lifting methods which most members noted they already knew. Several members discussed how they now appreciated the hazards involved in job tasks that were typically regarded as light work. Members also noted that they had learned about the new ways of hazard identification and assessment; and, equally important, that there were ways of reducing hazards, some of which were straightforward and inexpensive.	The utilities companies received training in ergonomics and then began to put their knowledge into use. <i>People know what ergonomics is, right now, and they have an understanding as far as what are the risk factors and what can they do should they have a concern. [Okay] That's a huge step for us.</i> An ergonomics champion said <i>I don't think any of the work changes or tool changes that we've made are, you know, of the earth-shattering variety, but I think the bigger win is just that awareness and involvement and, as I say, maybe some thought prior to sustaining injury as opposed to after the fact.</i>	Presentations on ergonomics were given to contractors. This opened up conversations on physical load and the potential impact of MSDs. An employer reported: <i>We are involved with the ladder studies that are going on at CSAO and we get updated on that. We have participated in and actually I have caused a couple of videos to be made that are sort of first aid safety things for the service industry that never existed.</i> Workers learned how to use the ladder lift and spoke about it to co-workers. The project introduced awareness of innovations that could reduce the risks of MSDs to a number of small employers who do not usually go to meetings or have access to the kind of information that larger employers have. The researchers learned a lot about the barriers and facilitators to the adoption of innovations.	The research process can itself be a time of learning. <i>I learned a lot. I moved from just an awareness of MSDs, to what may contribute to MSDs, to the ability to categorize risks in my mind. It has really raised my knowledge level to understanding the various risks and how they play out.</i> The researchers learned a lot about the relationship between the unions and workplaces. The union partners on the team learned about each other's unions and how they work and also increased their knowledge about MSDs.
ECT members also learned a good deal about the processes involved in making change both in how to identify and develop solutions, and go about implementing changes. However, the worker representatives on the team, while very involved in the identification of the hazards and in the solutions that were developed, did not have the knowledge (e.g., what the processes were for, acquiring finances for changes) to be actively engaged in the implementation stage.	Another champion made similar general comments: <i>And I think the ECT helped it to become ... a sustained project. ... [to become] more mainstream and, you know, people accept that term and that function and ... to a large degree now they understand what it means.</i>	The first thing that happens is you get, you become aware that the subject even exists, you know the subject of MSDs.... Well this project was at the level of helping you categorize risk. I mean, I probably would have known that lifting a significant weight out from the body was a risk. But I don't think I'd categorize these risks in my mind and going through the tool again, and again, and again I think has really raised my knowledge level in terms of understanding how different the risk factors are and how they play out.		

Notes. Case study 1 = PE in 1 manufacturing company; case study 2 = PE in 6 electrical and utilities companies; case study 3 = adopting an ergonomics tool in 13 construction companies; case study 4 = researchers and union representatives collaborate on a study to evaluate a physical-load questionnaire for multiple sectors; KEME = knowledge-transfer and exchange method of evaluation; keme = evidence-based transferable knowledge; PE = participative ergonomics; ECT = ergonomic change team; MSDs = musculoskeletal disorders; CSAO = Construction Safety Association of Ontario; I = interviewer, R = respondent.

TABLE 3. (continued)

Kernel	Case Study 1	Case Study 2	Case Study 3	Case Study 4
Instrumental use of knowledge (changes in policy, procedures, and practices)	The ECT members were able to apply their ergonomics knowledge in many instances to identify and address hazards. Although the ECT initially struggled with solution development and implementation, over the course of the initiative, the ECT developed and implemented 40 solutions.	Of the 194 changes/activities identified by the 6 utilities companies, 38% were tool and equipment related, 20% communication/ awareness related, and 5% involved work organization or work process changes. Despite the number of changes that were made, it is possible that the PE programs had little impact on the physical demands of tasks or jobs, at least at the level of usefulness (some individuals may have reported declines in perceived effort but the overall scores at the usefulness level were not significantly different). Based on all the completed process indicators, the milestones with the lowest scores included changes in corporate ergonomics policy. None were noted.	Small and some medium-sized employers who were part of the study said they would buy ladder lifts for new trucks. A contractor who was not part of the study, who saw the lift, decided to buy it for his company in the future. As the participant explained: <i>I have a good friend in another company, it's a one-man company and I usually meet him once a week for lunch. He'd just bought a new rack for his van. He saw the ladder lift and asked, "Is that the one with the hydraulics?" and I said, "Yeah". He asked, "What do you think of it?" We stood there yapping and I showed him how [the hydraulic lift] worked and he said, "WOW!"</i>	The collaborative group created and evaluated an assessment tool, the union presidents sent out letters supporting the study; the study gained access to nearly 60 workplaces who filled in the questionnaire. Companies have received an ergonomist's evaluation; and some of the companies have started conversations about risks for MSDs.
Strategic use of knowledge	The ECT learned that implementing changes is complex and time consuming and involves getting assistance from the right personnel, consulting with vendors from outside the company, negotiating with senior managers to approve the necessary alterations in the company, acquiring the necessary finances if the change was costly, and gathering and presenting evidence to persuade workplace parties that changes were necessary. <i>I think we've learned some things the hard way. You do need to talk to the employees more than you think you need to talk to the employees. ... Just because you think it's a good idea doesn't mean that everyone else is going to. ... I think ergonomic change comes when you spend a LOT of time working relationships with people.</i>	Contractors saw the advantage of participating in research projects and said they would be willing to engage in future research.	The unions see the questionnaire as a way to raise the profile of ergonomics and a way for workplace joint health and safety committees to engage management on the issue of physical load and their potential damage to health. <i>I also thought that the big, you know the long-term goal of this [would be relevant to future] regulations, or at least as it is, to be able to support the arguments for regulations. Stronger arguments.</i> I: So you see this piece of research as a stepping stone to a regulation? R: Yes. I: Not immediate, but in the long term? R: Yes. You know it would never hurt to gather the information that we had, to be able to use it, and I don't know when or how it would be used but I thought if it was there, it could be valuable in our arguments down the road.	

Notes. Case study 1 = PE in 1 manufacturing company; case study 2 = PE in 6 electrical and utilities companies; case study 3 = adopting an ergonomics tool in 13 construction companies; case study 4 = researchers and union representatives collaborate on a study to evaluate a physical-load questionnaire for multiple sectors; KEME = knowledge-transfer and exchange method of evaluation; keme = evidence-based transferable knowledge; PE = participative ergonomics; ECT = ergonomic change team; MSDs = musculoskeletal disorders; CSAO = Construction Safety Association of Ontario; I = interviewer; R = respondent.

5.2. KEME as an Evaluation Tool

At the initiation of a KTE intervention, the KEME model should be used to determine the **kemes** that will be the focus of the intervention, whether that is the transfer of a best practice, a training program, a new innovation or knowledge of ergonomics. Setting up the project with the final evaluation in mind is useful, and will help determine if you have been successful. The estimation of the success of the adoption of the specified keme during the intervention will ensure a more rigorous evaluation of the effectiveness of the KTE process. As mentioned, the research team is proposing to extend the research in case 4 to evaluate the impact the use of the physical-load tool has had in workplaces. This proposed study has outlined its expectation for the keme (that the use of the workplace-level evaluation tool for physical loads will help companies identify high-risk jobs and make changes in the workplace). The KEME method will be used to evaluate the companies' stages of change, and conceptual, instrumental or strategic use of the keme.

5.3. Exchange of Knowledge

As highlighted in the model, KTE is not just a one-way transfer of knowledge; it is a two-way, complex exchange of knowledge. This is especially relevant when it comes to collaborative research studies when the objective is the interchange of knowledge between stakeholders and researchers to ensure the relevance of the research. We found that the researchers on the projects felt as though they had learned as much, or even more from the workplace parties than they had imparted. The KEME model's focus on different kinds of knowledge receptivity and knowledge use could enhance this awareness and could result in a more inclusive research process and more efficient KTE.

5.4. Case Comparison

Using the KEME model with four case studies was a learning experience for the researchers. Since we have had the advantage of being able to compare the usefulness of the KEME model with the four case studies, we have observed that it was easiest to use it with case 4 where the KEME

model helped determine the structure of our interview schedule for our evaluation. Having the theoretical evaluation model guide the interview schedule ensured that we were able to elicit instrumental, conceptual and strategic uses of knowledge. With cases 1–3, when we were doing a post-analysis on pre-existing interviews, we had to infer our findings. This is not ideal and has left some major gaps in what we learned.

The analysis of these four case studies is retrospective. The conceptual rather than empirical evaluation of the KEME model is unfortunate and is a strong shortcoming of this paper, but this is a limitation of all emerging conceptualization. The research team that includes the authors of this paper intends to use the KEME model when planning, executing and evaluating future KTE workplace interventions.

Nevertheless, in this study, the KEME model acted as a mechanism to enable us to evaluate the KTE process including identifying where we were successful in finding an impact of the KTE intervention and where those findings were inadequate. It may not be necessary to have a finding for every variable of the KEME but in those areas where findings are absent or inadequate, we need to determine if the lack of findings identifies a major barrier to the KTE implementation or simply a bump along the way.

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APPENDIX A

Sample qualitative interview schedule for the Knowledge transfer and Exchange Method of Evaluation (KEME)

(The term “keme” should be replaced with a relevant context-specific unit of evidence-based knowledge).

Thank you for agreeing to participate in this research study. Your time and effort are greatly appreciated.

NOTE:

- ✓ **This interview is totally voluntary.**
- ✓ **I will NOT require your name, or any personal information.**
- ✓ **All the results are completely CONFIDENTIAL.**
- ✓ **You are in no way obliged to answer any particular question or any part of this interview. However, your participation is greatly appreciated. Your response, and others like yours will help provide a healthy workplace for all.**

We would like to clarify the information that we have for you.

1. What is your current position?
2. How long have you held your current position?
3. How long have you been in this *arena*?

We would like to ask you some question about the keme project that has been conducted in your workplace:

1. FACILITATION

- a. Were you aware that there was outside help to make the change?
- b. What did you think about the help you received in making the keme?
- c. What were the strengths and weaknesses of the person who facilitated the keme?

2. READINESS FOR KEME

- a. Next we would like to ask you about your feelings **towards the introduction of the keme** in your firm?

3. CONCEPTUAL USE OF KNOWLEDGE

- i. What has been the most important thing you have learned from being involved in this keme process?
- ii. Do you now know how the keme is being spoken about or considered?
- iii. Have you learned more about how the workplace parties interact when it comes to the keme?

4. INSTRUMENTAL USE OF KNOWLEDGE

- a. Through this keme process, did you make any changes in the way you do your work?
- b. Through this keme process, did you make any changes in the physical structure of your workplace?
- c. Through this keme process, did you make any changes, or are you aware of any changes to policies to do with the keme?
- d. Through this keme process, did you make any changes, or are you aware of any changes to procedures to do with the keme?

5. STRATEGIC USE OF KNOWLEDGE

- a. Were you made aware that people involved in the keme process could use research to further their own agenda? In what way?
- b. Can you see yourself using this research in the future? In what way?

THANK YOU VERY MUCH!