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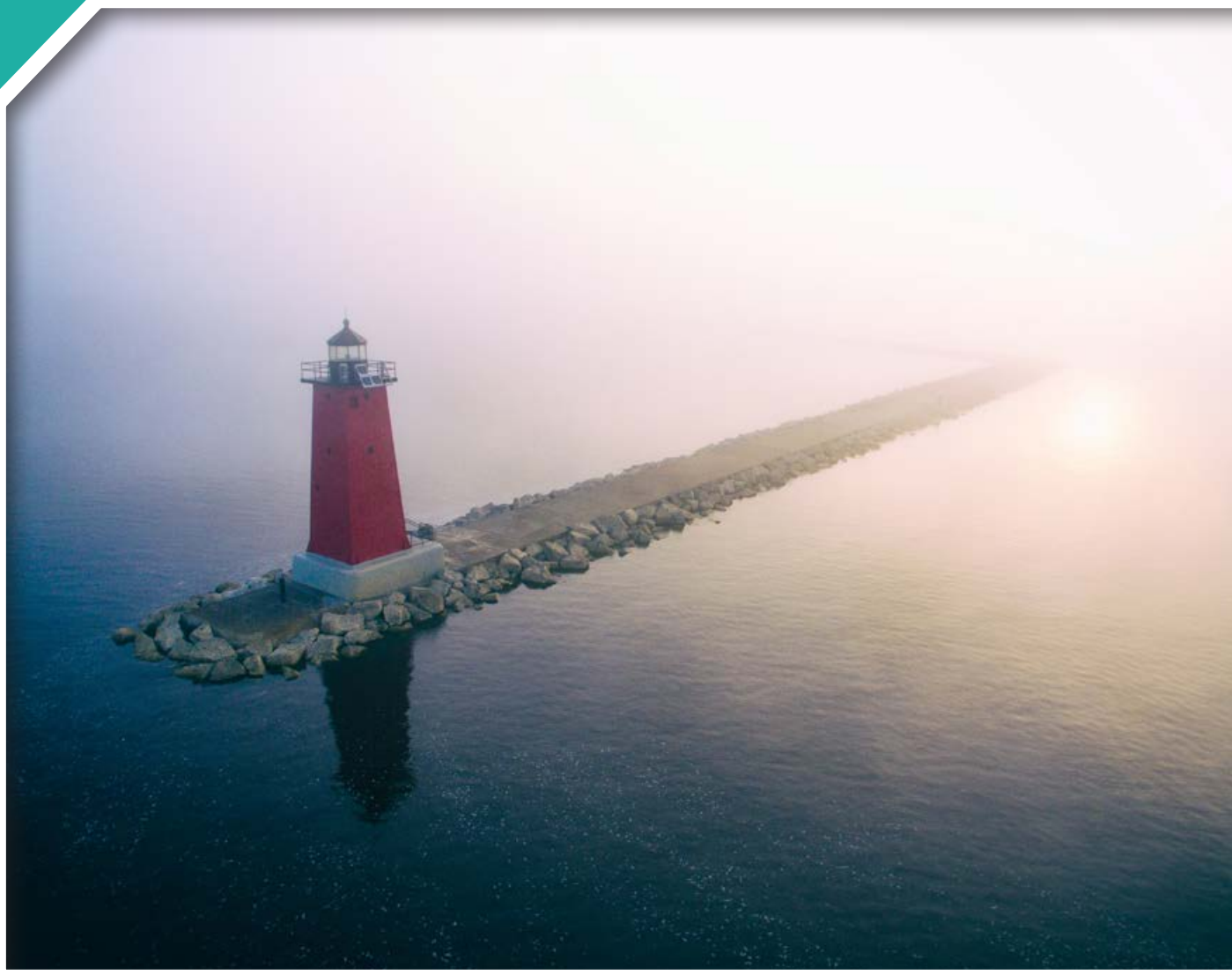
Knowledge Transfer Guidelines and Recommendations for Irish Funding Agencies: How to Embed Knowledge Transfer Principles into Irish Funding Programmes to Help Maximise Measurable Impacts from Public Investments

Authors: M. Keegan Porter, Cliona Ní Cheallacháin, Georgia Bayliss-Brown and David Murphy



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Rialtas na hÉireann
Government of Ireland

ENVIRONMENTAL PROTECTION AGENCY

The Environmental Protection Agency (EPA) is responsible for protecting and improving the environment as a valuable asset for the people of Ireland. We are committed to protecting people and the environment from the harmful effects of radiation and pollution.

The work of the EPA can be divided into three main areas:

Regulation: *We implement effective regulation and environmental compliance systems to deliver good environmental outcomes and target those who don't comply.*

Knowledge: *We provide high quality, targeted and timely environmental data, information and assessment to inform decision making at all levels.*

Advocacy: *We work with others to advocate for a clean, productive and well protected environment and for sustainable environmental behaviour.*

Our Responsibilities

Licensing

We regulate the following activities so that they do not endanger human health or harm the environment:

- waste facilities *(e.g. landfills, incinerators, waste transfer stations)*;
- large scale industrial activities (*e.g. pharmaceutical, cement manufacturing, power plants)*;
- intensive agriculture *(e.g. pigs, poultry)*;
- the contained use and controlled release of Genetically Modified Organisms *(GMOs)*;
- sources of ionising radiation *(e.g. x-ray and radiotherapy equipment, industrial sources)*;
- large petrol storage facilities;
- waste water discharges;
- dumping at sea activities.

National Environmental Enforcement

- Conducting an annual programme of audits and inspections of EPA licensed facilities.
- Overseeing local authorities' environmental protection responsibilities.
- Supervising the supply of drinking water by public water suppliers.
- Working with local authorities and other agencies to tackle environmental crime by co-ordinating a national enforcement network, targeting offenders and overseeing remediation.
- Enforcing Regulations such as Waste Electrical and Electronic Equipment (WEEE), Restriction of Hazardous Substances (RoHS) and substances that deplete the ozone layer.
- Prosecuting those who flout environmental law and damage the environment.

Water Management

- Monitoring and reporting on the quality of rivers, lakes, transitional and coastal waters of Ireland and groundwaters; measuring water levels and river flows.
- National coordination and oversight of the Water Framework Directive.
- Monitoring and reporting on Bathing Water Quality.

Monitoring, Analysing and Reporting on the Environment

- Monitoring air quality and implementing the EU Clean Air for Europe (CAFÉ) Directive.
- Independent reporting to inform decision making by national and local government *(e.g. periodic reporting on the State of Ireland's Environment and Indicator Reports)*.

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- Preparing Ireland's greenhouse gas inventories and projections.
- Implementing the Emissions Trading Directive, for over 100 of the largest producers of carbon dioxide in Ireland.

Environmental Research and Development

- Funding environmental research to identify pressures, inform policy and provide solutions in the areas of climate, water and sustainability.

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- Assessing the impact of proposed plans and programmes on the Irish environment *(e.g. major development plans)*.

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- Monitoring radiation levels, assessing exposure of people in Ireland to ionising radiation.
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- Monitoring developments abroad relating to nuclear installations and radiological safety.
- Providing, or overseeing the provision of, specialist radiation protection services.

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- Providing advice and guidance to industry and the public on environmental and radiological protection topics.
- Providing timely and easily accessible environmental information to encourage public participation in environmental decision-making *(e.g. My Local Environment, Radon Maps)*.
- Advising Government on matters relating to radiological safety and emergency response.
- Developing a National Hazardous Waste Management Plan to prevent and manage hazardous waste.

Awareness Raising and Behavioural Change

- Generating greater environmental awareness and influencing positive behavioural change by supporting businesses, communities and householders to become more resource efficient.
- Promoting radon testing in homes and workplaces and encouraging remediation where necessary.

Management and structure of the EPA

The EPA is managed by a full time Board, consisting of a Director General and five Directors. The work is carried out across five Offices:

- Office of Environmental Sustainability
- Office of Environmental Enforcement
- Office of Evidence and Assessment
- Office of Radiation Protection and Environmental Monitoring
- Office of Communications and Corporate Services

The EPA is assisted by an Advisory Committee of twelve members who meet regularly to discuss issues of concern and provide advice to the Board.

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EPA Research Report

Prepared for the Environmental Protection Agency

by

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DISCLAIMER

The EPA Research Programme addresses the need for research in Ireland to inform policymakers and other stakeholders on a range of questions in relation to environmental protection. These reports are intended as contributions to the necessary debate on the protection of the environment.

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Executive Summary

> In line with Irish, European and international policies, Ireland needs to transition towards a resource-efficient, low-carbon and environmentally-friendly economy in which the resources and services provided by our planet are protected and enhanced, and citizens' health and wellbeing are safeguarded. (EPA Research Strategy 2014–2020)

Environmental research provides essential scientific support for environmental policy development, implementation and broader decision making. The Irish Environmental Protection Agency (EPA), as well as other government-supported initiatives, have funded research that has increased national understanding of our environment, the challenges it faces and the responses to these. They have also developed high-quality research capacity and supported innovation that is internationally respected. Yet, despite making efforts to improve the communication of research findings, the translation of research into measurable impact – beyond publications – remains a challenge for the scientific community. The single action of making knowledge publicly available, through general communication or dissemination, does not always result in application, nor subsequent impact. A more proactive approach, proposed in this document as "knowledge transfer", is required in order to demonstrate measurable value creation.

Consisting of three pillars, the EPA research covers "Climate Change", "Sustainability" and "Water". All three disciplines comprise research that can contribute significantly to their respective evidence bases, resulting in substantial economic, environmental and/or societal impact. As securing sufficient research funding for environmental protection is a constant challenge, demonstrating the potential impact of research that is funded, including its impacts on policy, society and the environment, is crucial. Over the past few years, the EPA has been increasing its focus on the communication activities of its funded projects, as well as providing expanded support and guidance to its applicants and grantees, including knowledge transfer guidelines. However, the EPA has also recognised that providing support to researchers on how to carry out knowledge transfer, through the provision of tools such as the EPA Resource Kit developed by AquaTT in 2013, is only one step towards maximising research impact. There is also a critical necessity to review the processes within the Irish funding programmes themselves to facilitate the culture, support system and methodologies necessary for enabling effective knowledge transfer.

The EPA funded the "Research to Policy Impact through Effective Knowledge Transfer" project, carried out from January 2017 to December 2018, to engage with a representative selection of its past funded projects. The objective was to identify key knowledge outputs and determine whether successful knowledge transfer had been or could be carried out to maximise the impact of its research investments. This document is a key output of this pilot exercise, providing guidelines and recommendations for embedding validated knowledge transfer methodologies into future funding programmes to help maximise the likelihood of achieving measurable impacts from public research investments. These recommendations outline how funding programmes could incorporate knowledge transfer at all stages of the research lifecycle (pre funding, during project implementation and post project). The following six recommendations, which are further broken down into proposed actions, are based on the principle that effective implementation of knowledge transfer activities in projects improves the chance of achieving measurable impact.

Recommendations for national funding agencies to embed knowledge transfer systems in current and future funding mechanisms are:

- **Recommendation 1:** Funding call topic descriptions should provide clear expectations of the anticipated impacts of a project, distinguishing between what is expected within the lifetime of a project and what ultimate impacts the project may contribute to over time (post project).
- **Recommendation 2:** Funding agencies should consider providing guidance, support and training, with corresponding application form templates, to help projects design fit-for-purpose communication activities.

- **Recommendation 3:** Funding agencies should provide guidance and training to evaluators so that they can assess the suitability of communication activities. Where needed, adjustments should be made at the pre-funding/contract negotiation stage.
- **Recommendation 4:** Funding agency staff tasked with monitoring project implementation should understand knowledge transfer principles and strategies so that they can effectively monitor and support projects.
- **Recommendation 5:** Templates and instructions for official project reporting should prioritise the identification of the generated knowledge outputs, executed knowledge transfer activities and the impacts of the application of such knowledge.
- **Recommendation 6:** Funding mechanisms for supporting post-project knowledge transfer would help maximise the potential of measurable impacts from research investments.

1 Introduction

"The European Union is a research powerhouse [and is] still the world's leading producer of scientific knowledge, ahead of the United States. However, Europe too rarely succeeds in turning research into innovation, in getting research results to market" (EC, 2016a). Europe must get better at making the most of its innovation talent, and that's where "open innovation" (EC, 2016b) comes into play. The potential benefits of sharing research information are clearly recognised in the European Commission's (EC) investment plan for Europe, which states that, in order to "boost research and innovation, [European Union] competitiveness would benefit from fewer barriers to knowledge transfer, open access to scientific research and greater mobility of researchers" (EC, 2014). In July 2018, the EC released a strategy (European IPR Helpdesk, 2018) on how communication and dissemination should be implemented in the remaining Horizon 2020 and upcoming Horizon Europe Research Framework Programmes. It describes how better communication, dissemination and knowledge transfer of research will lead to more impact. These concepts also apply at the national level, where creating measurable impact in Ireland from funded research is critically important to both Irish funding bodies and society. Indeed, illustrating the value of funds spent on research and innovation in Ireland both demonstrates the necessity for funders and ensures that solutions to national societal challenges are sought and are in support of innovation for growth.

Ireland's Innovation 2020 strategy (DBEI, 2015) sets out a vision for Ireland to become a global innovation leader, driving a strong sustainable economy and a better society, underpinned by several key messages, including the need for a "coherent joined-up innovation ecosystem, responsive to emerging opportunities, *delivering enhanced impact through the creation and application of knowledge* [italics added for emphasis]". Ireland must therefore ensure that it is making the most of its innovation talent, and fostering a culture of open innovation within research programmes presents a powerful tool for accomplishing this. A critical avenue for inducing this culture shift will require that communication about and from Irish research projects demonstrates the ways in which research and innovation is contributing to the improvement of the knowledge base underpinning environmental protection and sustainable development. It must also account for public spending by providing tangible proof that scientific evidence and collaborative research have societal value. The Environmental Protection Agency's (EPA) state of the environment report 2016 (EPA, 2016) states that "the aims of the research are (1) to develop national capacity in key areas; (2) to generate data and make assessments of priority issues for Ireland; and (3) *to mobilise this knowledge for use in environment and health protection* [italics added for emphasis]". Activities to disseminate information, exploit research and innovation results, and carry out effective knowledge transfer activities should therefore play an integral role in Irish environmental funding programmes.

Many research projects have the potential to have great environmental, social and economic benefits, but in practice only the most well-communicated research tends to influence policy, industry or society. Therefore, the communication of scientific results to users beyond the scientific community is extremely important. Over 20 years ago, Jane Lubchenco (1998) codified the idea of a "new social contract for science". She asserted that society expects two outcomes from its investment of public funds in science: "the production of the best possible science and the production of something useful".

For several years, AquaTT has focused on developing a robust methodology for knowledge transfer to help unlock the potential of research knowledge. Resulting from several distinct knowledge transfer projects, AquaTT has developed a tried and tested innovative methodology to capture and transfer knowledge from research, which was often previously unknown or inaccessible. AquaTT's methodology breaks down project results/publications/products/outputs into

distinct knowledge outputs.[1] Knowledge outputs are not limited to *de novo* or pioneering discoveries, but may also include new methodologies, processes, adaptations, insights, alternative applications of prior know-how and knowledge (AquaTT, 2012). The current iteration of the AquaTT knowledge transfer methodology was developed under the COLUMBUS project (www.columbusproject.eu) and ensures that the transfer of knowledge is strategic, co-ordinated and effective. Designed and managed by AquaTT, the COLUMBUS project represented the EC's largest investment into knowledge transfer related to blue growth (€4m, 2015–2018, 26 partners). Among many activities, COLUMBUS worked with funding agencies and stakeholders to examine the feasibility of implementing knowledge transfer approaches into European and national funding systems to ensure measurable value creation from research.

The EPA has recognised that providing support to researchers on how to carry out knowledge transfer is one step towards maximising research impact, and it has followed up on this recognition through the provision of tools such as the EPA Resource Kit (developed by AquaTT in 2013; O'Neill *et al*., 2016). However, identifying and understanding this need is only the first step; there is also a critical necessity to review the processes within the Irish funding programmes and research system to ensure that the required culture, support and processes exist to enable effective knowledge transfer implementation.

AquaTT carried the insights and experiences gained from past work into the EPA-funded "Research to Policy Impact through Effective Knowledge Transfer" project. Developed to explore how to best maximise the impact potential from selected EPA-funded projects, this project utilised proven AquaTT knowledge transfer methodology, employing it on 20 selected EPA-funded projects. The goal was to identify communication activities carried out, where impact had already been achieved and where further impact could be facilitated using a stepwise methodology. The findings led to the development of a set of recommendations for achieving impact in ongoing and future research projects, which are presented in this report as generic guidelines that can be used by all Irish environmental research funding organisations.

1 A knowledge output is defined as "a unit of knowledge or learning generated by or through research activity. They are not limited to de novo or pioneering discoveries but may also include new methodologies/processes, adaptations, insights or alternative applications of prior know-how/knowledge".

2 Recommendations for Funding Agencies

Over the course of this study, AquaTT interacted with a variety of actors within the research project lifecycle, including researchers, project co-ordinators, representatives of funding bodies and users of knowledge generated through publicly funded research. Based on feedback and past experiences, AquaTT has developed a set of recommendations for Irish funding bodies describing how to embed knowledge transfer principles into each stage of the research lifecycle. It is important to note that not all of these recommendations will be relevant to all of the very different types of public funding programmes covering many scales (e.g. budget, geographic coverage), but it is possible to take on one or several of the recommendations as opposed to them all.

2.1 Pre-funding Stage: Funding Call Description

Call topics can vary widely, from being very open, promoting “bottom-up” ideas from partnerships to solve a specific challenge, to being very closed, with “top-down” prescriptive descriptions of what activities are desired within a given project. When building a robust response to a research question, a key challenge for researchers is to be able to put forward a realistic proposal of what can be achieved within the time frame of a project. It is best practice to define expected impacts and measures to achieve them. By setting out these expectations clearly, applicants are more likely to set themselves realistic, achievable and measurable targets, reducing the likelihood of proposing unrealistic ambitions in applications.

2.1.2 Recommendation 1

Funding call topic descriptions should provide clear expectations of the anticipated impacts of a project, distinguishing between what is expected within the lifetime of a project and what ultimate impacts the project may contribute to over time (post project).

Potential actions

- The call text could identify the expected impact of a project using a SMART approach (specific, measurable, achievable, relevant and time limited), as well as identify expected target user(s).
- Any policy timelines that the applicant should be aware of (and that the findings might feed into) could be included in the call text.
- Applicants could be advised to tailor knowledge transfer activities to suit the intended application and stakeholders.
- Applicants could be asked to design a pathway to impact and include expected stakeholder-specific outputs in their proposal.
- The call text might distinguish between the longer term expected impacts of a project and impacts that are achievable within the lifetime of a project.
- Supporting documents could be provided that outline how to embed best-practice knowledge transfer principles into project design.

2.2 Pre-funding Stage: Proposal Submission Criteria and Requirements

There is currently a lot of confusion and misunderstanding surrounding communication terminology in the research community and this frequently hinders applicants’ understanding of expectations. It is therefore important that this issue is addressed in the pre-funding stage so that there is a consensus understanding of funding agencies’ expectations with regard to project communication activities. Appropriate guidance on communication aspects (including definitions of terms) in the context of a specific funding call will provide clarity for researchers at the proposal writing stage. Ensuring that such guidance includes indications of the weighting (in terms of budget designation and expected effort) between communication activities, as well as in the overall project design, will help

applicants design appropriate and realistic activities suited to the call.

Effective knowledge transfer requires complete customisation of the channel, medium and tools used to engage target audiences. It is not always possible to define such approaches at proposal stage as the knowledge expected to be generated by a project does not always match the achievements during implementation. Likewise, specific target users may not yet be known at the proposal stage. Thus, funding agencies (and the evaluators they use) should recognise that it is acceptable and positive to propose a knowledge transfer process that forgoes an exhaustive list of engagement tools in lieu of a suitably embedded project design that allows the necessary flexibility to select the appropriate channel/ medium/tools during the implementation stage, once knowledge is known and target users are identified.

Showing a progressive development from previous funding programmes, the 2018 EPA Funding Programme mandates a project communication plan that includes a stakeholder description, channels, outputs, SMART goals, key messages, a time frame and an evaluation method. Proposals must include descriptions of pressures, policies and solutions. Examples of potential outputs include models, databases, surveys and data. However, the current guidance is dissemination focused (e.g. websites and social media activity are mandatory) and thus this may be interpreted by applicants as the priority in terms of communication. Furthermore, although it is positive to see an increased focus on communication, such as the EPA's mandatory communication budget of 5%, a challenge can be seen in terms of budgeting for impactful activities, as those related to communications seem to often be hidden within project management budgets and deliverables.

If clarity on the expectations is provided, consortia will be in a good position to design and embed appropriate knowledge transfer principles into their project design, including appropriate financial resourcing of activities, inclusion of appropriate expertise into the partnership, and selection of suitable tools, channels, mediums and key performance indicators proportional to the level of expectation defined by the funding body.

2.2.1 Recommendation 2

Funding agencies should consider providing guidance, support and training, with corresponding application form templates, to help projects design fit-for-purpose communication activities.

Potential actions

- Ensure that questions posed within the application form frame the expected communication activities for project applicants.
- Provide guidelines, such as the COLUMBUS Knowledge Transfer handbook,[2] that include definitions for different communication terminology (dissemination, exploitation, knowledge transfer, etc.) and outline a methodology that can be incorporated into project design.
- Consider providing training workshops on how to approach knowledge transfer in project design.
- Require a dedicated work package for communication activities, with its own budget and deliverables, to ensure that activity is completed and expenditure is transparent.
- Applicants could be advised to design a steering committee or external advisory board and include stakeholders who have a mandate or strong interest to take up the project findings.
- Applicants could be allowed or encouraged to engage communication experts to relieve them of the communication role if it is not suitable for the researchers or if it is outside their area of expertise.

2.3 Pre-funding Stage: Proposal Evaluation and Grant Agreement

Evaluation of research project applications generally requires peer review to judge whether the scientific methodology is appropriate. However, when it comes to assessing more generic parts of applications, such as suitable communication, dissemination and exploitation activities, not all evaluators have the required competence or expertise. Appropriately briefing evaluators on the expected impacts (within and post project) and guidance, scoring criteria and weighting for assessment of a project's potential to achieve the expected call impacts, as well as the

2 Available on request from AquaTT.

measures to achieve impact, will aid the assessment process.

Projects that are successful in securing funding are typically those that exceed a minimum threshold per criteria and score highest overall. The Department of Agriculture, Food and the Marine states unequivocally that "proposals that are not seen to have the potential to deliver sufficient sustainable impact or have not successfully articulated how this impact can be delivered, will not be funded through this programme, regardless of scientific excellence" (DAFM, 2019). Recognising that selected projects may be strong in some areas and weaker in others, the "negotiation" period between selection and contracting provides an opportunity to make improvements to project design through negotiation between funding agencies and partnerships. If communication experts are used during evaluation, they will be able to identify weaknesses in communication plans and such feedback could be used as a basis for improvements at the contract negotiation stage. Communication specialists in the funding agencies and/or external experts could take responsibility for such engagement with partnerships.

2.3.1 Recommendation 3

Funding agencies should provide guidance and training to evaluators so that they can assess the suitability of communication activities. Where needed, adjustments should be made at the pre-funding/contract negotiation stage.

Potential actions

- Consider using the negotiation period to optimise the communication/knowledge transfer aspects of selected projects.
- Consider providing external advisory and training support in knowledge transfer to funded projects.
- Ensure that evaluators are familiar with the expected impacts of a call and are differentiating between expectations within the project duration and expectations post project.
- Provide guidance to evaluators on expectations for communication/knowledge transfer aspects that should be included in applications.
- Ensure that the scoring guidance allows for consortia to propose knowledge transfer processes with in-built flexibility so that they can be adapted as required during implementation.
- Ensure that the scoring guidance rewards projects that have ensured that the allocated resource is proportionate and reasonable with regard to achieving a call's expected impacts and project's activities.
- To ensure that projects are impactful, impact could be incorporated into the evaluation process.
- Projects could be evaluated on their plans to transfer knowledge for a specific application and the likelihood that it will achieve its intended impact in the short, middle and long term (as defined by the applicant).
- If proposed communication plans are weak but the rest of the proposal is strong, amendments should be proposed and made before funding is approved.

2.4 Project Implementation Stage: Project Monitoring

A major aspect of monitoring a project is ensuring that it is adhering to contractual commitments. However, some reporting structures have evolved over time to become administratively burdensome on funding agencies and project partnerships alike. Furthermore, the focus frequently strays from what should be the top priority for all public funding agencies at the evaluation stage: the assessment of the conversion of research investments for scientific discovery into impactful value creation for society at large.

Beyond the administrative component, funding agencies across Europe are now recognising the need to assess the ongoing impact of projects. However, often it is only in the final report of a project where these questions are asked – knowledge transfer activity and impacts are commonly missing from reporting requirements within the project time frame itself. To accommodate a broader monitoring role, staff tasked with monitoring require skills and competence in knowledge transfer processes and assessment.

The situation can be further complicated by researchers being unaware of the value and application(s) of the knowledge that they possess. Even when they are aware, they may not have the time or the know-how to transfer the knowledge effectively so that it can be taken up and applied by others. Nevertheless, partnerships are typically

contractually obliged to communicate their results; for example, the EC's Horizon 2020 Grant Agreement commits partners to actively disseminate their results within and beyond the lifetime of a project.

Reducing rote administrative requirements could free up partnerships to allow them time to reflect and report on the knowledge outputs generated in a project. It would also allow them time to design and implement effective knowledge transfer activities, as well as measure and report on the success of such efforts. Such reporting would enable funding agencies to identify both tangible impacts within a project's duration and potential impacts post project. Such information could be used to communicate the benefits of research to society, as well as identify where future research investments may be required.

2.4.1 Recommendation 4

Funding agency staff tasked with monitoring project implementation should understand knowledge transfer principles and strategies so that they can effectively monitor and support projects.

Potential actions

- Train monitoring staff in knowledge transfer principles to assist them in supporting and assessing project activities and provide them with enough time to carry out such work.
- Include external experts in the monitoring process.
- Provide advisory and mentoring support to projects that are implementing knowledge transfer activities.
- Provide advice on opportunities, events and/or experts that might inform the design of knowledge transfer plans and activities.
- Establish an external expert knowledge transfer team to be available as a help desk (e.g. such as the Intellectual Property Rights helpdesk) to support projects.
- Facilitate analysis meetings to better develop pathways to impact.
- Establish a database of experts who could be called on to support specific projects in carrying out knowledge transfer steps, e.g. expert analysis, the development of pathways to impact and customised knowledge transfer plans.

2.5 Project Implementation Stage: Project Reporting

Projects are typically assessed by the funding body or external assessors at an interim stage or on completion of a project, but the scale of a project can make this task difficult and time-consuming. If a report were to focus on (1) the knowledge outputs produced by a project, (2) how they were transferred and (3) whether or not the project responded to the call text, an impact evaluation would be far more achievable and insightful. This would allow funding agencies to make a more robust examination of how a project has contributed to society. It is important to note that such an approach can also cover the more traditional scientific outputs of a project. For instance, the contents of a scientific paper can be examined to identify multiple knowledge outputs within it, uncovering valuable knowledge such as an innovative methodology or new data set. This may also make the knowledge more accessible to multiple potential target users.

2.5.1 Recommendation 5

Templates and instructions for official project reporting should prioritise the identification of generated knowledge outputs, executed knowledge transfer activities and the impacts of the application of such knowledge.

Potential actions

- Change the focus of reporting from project activities to the knowledge outputs generated, the steps taken to transfer the knowledge and the resulting impact.
- Provide a deliverable reporting template that includes a table at the beginning to clearly identify and describe the knowledge output(s) described within.
- Develop or utilise a free and publicly available repository to allow projects to upload (and update) knowledge outputs, including details of innovations, patents and publications. The EPA DROPLET (Database of Research Outputs: Projects, Literature and Environmental Technologies) web application could be evolved for such a purpose.

- Provide incentives for ongoing reporting of quality knowledge outputs during implementation and penalties for late submissions.
- Consider alternative approaches to reporting requirements; for example, ResearchFish (https://www.researchfish.net/) asks for knowledge outputs to be reported in place of project activity. This ensures that final reports are short and to the point and focused on the outputs and impact. Researchers are incentivised to provide high-quality knowledge outputs as this is quicker than developing a full report.
- Final reports could describe how a project has progressed along its pathway to impact, allowing the funder to understand the remaining steps required to achieve full impact.

2.6 Post-project Stage: Continued Knowledge Transfer

Achieving impact can be a lengthy process, particularly when trying to inform policy or when commercialising a product. If knowledge transfer activities are not sustained beyond the lifetime of a project, knowledge can be lost or left unapplied. Even with the best knowledge transfer strategy in place, rarely will a partnership be able to achieve all of the expected impacts within a project's time frame (typically 3–5 years).

It is unclear in most cases whose role or responsibility it is to transfer knowledge after a project is completed. This problem is exacerbated as many scientists in Europe are on short-term contracts and there is a pressure on them to "publish or perish" and to find and move on to the next research contract or job. In Ireland, although there are examples where a budget is provided for post-project activities, the allowances are limited (e.g. not covering personnel costs).

2.6.1 Recommendation 6

Funding mechanisms for supporting post-project knowledge transfer would help maximise the potential of measurable impacts from research investments.

Potential actions

- Consider adding a section to the final report to include details of the status of knowledge transfer efforts, requesting partnerships to suggest follow-on steps that could be carried out if further financial support was available.
- Provide a follow-on funding mechanism to support post-project knowledge transfer activities.
- Provide the possibility for short-term knowledge transfer extensions for partnerships to continue along the pathway to impact developed within a project.
- Establish an internal team within a funding agency or engage a subcontractor that could transfer high-potential knowledge outputs in co-operation with project partners post project.
- Encourage, recognise and promote efforts to carry out effective knowledge transfer post project.

3 Key Principles of the COLUMBUS Knowledge Transfer Methodology

The core of the AquaTT knowledge transfer methodology is centred on five steps:

1. collect knowledge;
2. assess knowledge;
3. profile target users;
4. develop knowledge transfer plans;
5. transfer and measure impact.

3.1 Key Terms

The definitions below may differ from those used in other sources but are the adopted definitions of AquaTT:

- *Knowledge transfer*. The term for the overall process of moving knowledge between knowledge sources to the potential *targeted* users of knowledge. Knowledge transfer consists of a range of activities that aim to capture, organise and assess knowledge, skills and competence and transmit them from those who generate them to those who will utilise them.
- *Knowledge output*. A unit of knowledge or learning generated by or through research activity. Knowledge outputs are not limited to *de novo* or pioneering discoveries but may also include new methodologies/processes, adaptations, insights and alternative applications of prior know-how/ knowledge.
- *Knowledge output pathway*. This can be one step, or a series of steps, required to carry a knowledge output to its eventual impact. It is also called a pathway to impact. When there is a series of steps, it will include detailed mapping of the steps, the users involved at each step and their predicted role in the pathway to eventual impact.
- *Eventual impact*. The ultimate *end* benefit of the application of the knowledge output.
- *Transfer impact*. The demonstrable evidence that a knowledge output has travelled down a single step on the knowledge output pathway.
- *Target user(s)*. The individual(s) identified in the knowledge output pathway to whom a knowledge fellow will transfer the knowledge output.
- *End-user(s)*. The individual(s) who will apply the knowledge output at the end of the knowledge output pathway.
- *Exploitation partner*. An *external* organisation/ institution/individual who has an interest and/ or expertise that may assist in transferring the knowledge output down the knowledge output pathway to its eventual impact.

3.2 Collection

- Knowledge is collected in units of knowledge (defined as “knowledge outputs” by COLUMBUS) generated by the project, rather than being grouped together in project reports/deliverables.
- Knowledge is collected on an ongoing basis to maximise the time available for transfer within the time frame of the project.
- Descriptions of knowledge outputs are clear so that users understand what the knowledge is and why it is relevant to them.
- Collected knowledge outputs go through a validation process to guarantee accuracy of the descriptions.
- How and where knowledge outputs will be stored and made publicly and freely available is clear from the start of the project (e.g. using publicly accessible knowledge repositories such as the EC Information Sharing Platform or the Marine Knowledge Gate).

3.3 Analysis

- Analysis of knowledge outputs takes place and covers at least the following:
  - potential applications and impact potential (short, medium and long term);
  - market or policy readiness;
  - alternative applications compared with the original expected application (other sectors or markets, etc.);

  - transfer potential within the time frame of a project;
- A knowledge output pathway is designed per knowledge output and defines a route and timeline towards an intended impact. It comprises a single step or a series of steps and includes detailed mapping of timelines, activities and users. The first user in a knowledge output pathway is termed the "target user".
- Target user(s) are profiled per knowledge output. Profiling is needed to ensure that their preferences, motivations and capacities are considered in the design of a customised knowledge transfer plan.

Note: External advisory boards or committees comprising multi-stakeholder groups are extremely useful when carrying out analysis steps.

3.4 Knowledge Transfer

- A customised knowledge transfer plan is developed that significantly improves the chance of successful transfer.
- All knowledge transfer plans have built-in metrics to assess the transfer activity carried out and measure the uptake and application of the knowledge by the target user.
- Knowledge transfer plans also outline metrics for determining if and how far the knowledge output moves down a knowledge output pathway towards an ultimate impact.
- Resourcing of knowledge transfer should be appropriate and proportionate to the expected impacts within the project duration, as defined in the funding call.

Note: Projects may not have the time, resources or remit to ensure that knowledge has an ultimate impact beyond a project's scope. Thus, it is important to identify any potential intermediaries who have an interest in helping, or a mandate to help, knowledge move down a pathway. Transfer and uptake of knowledge is not easy and can be very time-consuming and resource intensive. Acceptance that transfer efforts can and often fail should be expected. Significant learning can still be derived from failed efforts and, if time/resources permit, other attempts could take place within the lifetime of any given project.

3.5 Impact Measurement

SMART impact indicators are in place before the transfer activity occurs and measure:

- the occurrence of transfer activity;
- any uptake of knowledge by target users;
- the application of knowledge by target users;
- the progress of knowledge towards long-term impacts.

An accessible summary of this knowledge transfer methodology, including the principles and key steps, is captured in the COLUMBUS knowledge transfer methodology (https://vimeo.com/203077016). These concepts were also foundational to an EPA-funded Resource Kit that AquaTT (2013) developed in a previous project. This kit included an explanation of the Irish environmental policy system, an introduction to knowledge transfer and a step-by-step guide for researchers on how to carry out knowledge transfer.

4 Conclusions

A strong scientific knowledge base has traditionally been one of Ireland's key assets and has enabled Ireland to achieve world-class status in several research fields. The 2018 European Innovation Scoreboard (EIS) report (DBEI, 2018; EC, 2019) outlines the results of the comparative assessment of the research and innovation performance of European Union (EU) Member States and states that "Ireland's innovation performance has improved with Ireland moving up one place to 9th overall in the EU. However, Ireland does not fare so well on the public investment in research and development and the intellectual assets indicators." The third progress report of Ireland's Innovation 2020 strategy, published by the Department of Business, Enterprise and Innovation in July 2018, outlines the importance of continuing to prioritise investment in research, development and innovation (RDI), in order to reach Ireland's goal of joining the ranks of innovation leaders. A key feature of the EU innovation leaders (particularly among the top four – Sweden, Denmark, Finland and the Netherlands) is the significant level of public and private funding invested into RDI. Therefore, it is becoming increasingly clear that funding agencies need to illustrate impact from their funded projects in order to provide decision makers with the necessary evidence for driving greater future investments.

Generating new knowledge and ensuring its use in evidence-based policymaking is crucial to maintaining and enhancing Ireland's environmental protection, as well as its sustainable exploitation. Research provides the policymaking community with the latest scientific evidence to inform their decisions. In recent years, there has been growing recognition that, for environmental policy to be most effective, policymakers and regulators need to be well informed by science. However, the disparate professional cultures of environmental scientists and policymakers frequently results in significant communication gaps between them, which presents a major barrier to successful science-to-policy transfer. As such, the effective dissemination of outputs and findings to users (including policymakers, public bodies, non-governmental organisations and other researchers) is a critical aspect for achieving change through research efforts. In *Ireland's Environment 2012 – An Assessment* (EPA, 2012), the EPA stresses the need for environmental considerations "to be placed at the centre of policy and decision-making at national, regional and local levels". The immediate challenge for policymakers and researchers is therefore to address the divide between scientific discovery and science-based policy. Effective communication and knowledge transfer of research outputs is a critical part of embedding research-generated knowledge into the development and implementation of environmental policies.

Reflecting on the overall process, there is a lack of established terminology and processes for knowledge transfer. Currently, there are no clear established rules on utilising knowledge transfer principles in Irish-funded research projects and, as such, the methods and understanding of knowledge transfer vary widely from project to project. There is a need to upskill all actors in the research system to help them better understand the concepts and methodologies for various communication activities and how to measure success. Furthermore, there needs to be more clarity regarding who has the responsibility for performing knowledge transfer activities, particularly post project.

Beyond the previously stated recommendations to manage expectations, set up processes and clarify roles in relation to knowledge transfer, there is also a need to address the culture of research. This is a key dimension: inherent differences exist between the research community, industry, policymakers and other users of knowledge, insofar as each group works with and among different technical levels, priorities, vocabularies, agendas and timescales. These differences all contribute to myriad barriers that can prevent effective knowledge transfer and innovation. A culture change is required in the research community that places less emphasis on peer-reviewed publications, instead incentivising actions supporting the transfer, uptake and application of results. Such a shift is undeniably extremely challenging; however, if successful, it could be transformative for science as it will enable both researchers and research funders to demonstrate an increased value creation and return on investment. Such improvements will be key to maintaining or growing the level of investment in research and will further contribute to Ireland's transition to a knowledge-based economy and society.

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Abbreviations

EC	European Commission
EPA	Environmental Protection Agency
EU	European Union
RDI	Research, development and innovation
SMART	Specific, measurable, achievable, relevant and time limited

AN GHNÍOMHAIREACHT UM CHAOMHNÚ COMHSHAOIL
Tá an Ghníomhaireacht um Chaomhnú Comhshaoil (GCC) freagrach as an gcomhshaol a chaomhnú agus a fheabhsú mar shócmhainn luachmhar do mhuintir na hÉireann. Táimid tiomanta do dhaoine agus don chomhshaol a chosaint ó éifeachtaí díobhálacha na radaíochta agus an truaillithe.

Is féidir obair na Gníomhaireachta a roinnt ina trí phríomhréimse:

Rialú: *Déanaimid córais éifeachtacha rialaithe agus comhlíonta comhshaoil a chur i bhfeidhm chun torthaí maithe comhshaoil a sholáthar agus chun díriú orthu siúd nach gcloíonn leis na córais sin.*

Eolas: *Soláthraímid sonraí, faisnéis agus measúnú comhshaoil atá ar ardchaighdeán, spriocdhírithe agus tráthúil chun bonn eolais a chur faoin gcinnteoireacht ar gach leibhéal.*

Tacaíocht: *Bímid ag saothrú i gcomhar le grúpaí eile chun tacú le comhshaol atá glan, táirgiúil agus cosanta go maith, agus le hiompar a chuirfidh le comhshaol inbhuanaithe.*

Ár bhFreagrachtaí

Ceadúnú
Déanaimid na gníomhaíochtaí seo a leanas a rialú ionas nach ndéanann siad dochar do shláinte an phobail ná don chomhshaol:
- saoráidí dramhaíola *(m.sh. láithreáin líonta talún, loisceoirí, stáisiúin aistrithe dramhaíola)*;
- gníomhaíochtaí tionsclaíocha ar scála mór *(m.sh. déantúsaíocht cógaisíochta, déantúsaíocht stroighne, stáisiúin chumhachta)*;
- an diantalmhaíocht *(m.sh. muca, éanlaith)*;
- úsáid shrianta agus scaoileadh rialaithe Orgánach Géinmhodhnaithe *(OGM)*;
- foinsí radaíochta ianúcháin *(m.sh. trealamh x-gha agus radaiteiripe, foinsí tionsclaíocha)*;
- áiseanna móra stórála peitril;
- scardadh dramhuisce;
- gníomhaíochtaí dumpála ar farraige.

Forfheidhmiú Náisiúnta i leith Cúrsaí Comhshaoil
- Clár náisiúnta iniúchtaí agus cigireachtaí a dhéanamh gach bliain ar shaoráidí a bhfuil ceadúnas ón nGníomhaireacht acu.
- Maoirseacht a dhéanamh ar fhreagrachtaí cosanta comhshaoil na n-údarás áitiúil.
- Caighdeán an uisce óil, arna sholáthar ag soláthraithe uisce phoiblí, a mhaoirsiú.
- Obair le húdaráis áitiúla agus le gníomhaireachtaí eile chun dul i ngleic le coireanna comhshaoil trí chomhordú a dhéanamh ar líonra forfheidhmiúcháin náisiúnta, trí dhíriú ar chiontóirí, agus trí mhaoirsiú a dhéanamh ar leasúchán.
- Cur i bhfeidhm rialachán ar nós na Rialachán um Dhramhthrealamh Leictreach agus Leictreonach (DTLL), um Shrian ar Shubstaintí Guaiseacha agus na Rialachán um rialú ar shubstaintí a ídíonn an ciseal ózóin.
- An dlí a chur orthu siúd a bhriseann dlí an chomhshaoil agus a dhéanann dochar don chomhshaol.

Bainistíocht Uisce
- Monatóireacht agus tuairisciú a dhéanamh ar cháilíocht aibhneacha, lochanna, uiscí idirchriosacha agus cósta na hÉireann, agus screamhuiscí; leibhéil uisce agus sruthanna aibhneacha a thomhas.
- Comhordú náisiúnta agus maoirsiú a dhéanamh ar an gCreat-Treoir Uisce.
- Monatóireacht agus tuairisciú a dhéanamh ar Cháilíocht an Uisce Snámha.

Monatóireacht, Anailís agus Tuairisciú ar an gComhshaol
- Monatóireacht a dhéanamh ar cháilíocht an aeir agus Treoir an AE maidir le hAer Glan don Eoraip (CAFÉ) a chur chun feidhme.
- Tuairisciú neamhspleách le cabhrú le cinnteoireacht an rialtais náisiúnta agus na n-údarás áitiúil *(m.sh. tuairisciú tréimhsiúil ar staid Chomhshaol na hÉireann agus Tuarascálacha ar Tháscairí)*.

Rialú Astaíochtaí na nGás Ceaptha Teasa in Éirinn
- Fardail agus réamh-mheastacháin na hÉireann maidir le gáis cheaptha teasa a ullmhú.
- An Treoir maidir le Trádáil Astaíochtaí a chur chun feidhme i gcomhair breis agus 100 de na táirgeoirí dé-ocsaíde carbóin is mó in Éirinn.

Taighde agus Forbairt Comhshaoil
- Taighde comhshaoil a chistiú chun brúnna a shainaithint, bonn eolais a chur faoi bheartais, agus réitigh a sholáthar i réimsí na haeráide, an uisce agus na hinbhuanaitheachta.

Measúnacht Straitéiseach Timpeallachta
- Measúnacht a dhéanamh ar thionchar pleananna agus clár beartaithe ar an gcomhshaol in Éirinn *(m.sh. mórphleananna forbartha)*.

Cosaint Raideolaíoch
- Monatóireacht a dhéanamh ar leibhéil radaíochta, measúnacht a dhéanamh ar nochtadh mhuintir na hÉireann don radaíocht ianúcháin.
- Cabhrú le pleananna náisiúnta a fhorbairt le haghaidh éigeandálaí ag eascairt as taismí núicléacha.
- Monatóireacht a dhéanamh ar fhorbairtí thar lear a bhaineann le saoráidí núicléacha agus leis an tsábháilteacht raideolaíochta.
- Sainseirbhísí cosanta ar an radaíocht a sholáthar, nó maoirsiú a dhéanamh ar sholáthar na seirbhísí sin.

Treoir, Faisnéis Inrochtana agus Oideachas
- Comhairle agus treoir a chur ar fáil d'earnáil na tionsclaíochta agus don phobal maidir le hábhair a bhaineann le caomhnú an chomhshaoil agus leis an gcosaint raideolaíoch.
- Faisnéis thráthúil ar an gcomhshaol ar a bhfuil fáil éasca a chur ar fáil chun rannpháirtíocht an phobail a spreagadh sa chinnteoireacht i ndáil leis an gcomhshaol *(m.sh. Timpeall an Tí, léarscáileanna radóin)*.
- Comhairle a chur ar fáil don Rialtas maidir le hábhair a bhaineann leis an tsábháilteacht raideolaíoch agus le cúrsaí práinnfhreagartha.
- Plean Náisiúnta Bainistíochta Dramhaíola Guaisí a fhorbairt chun dramhaíl ghuaiseach a chosc agus a bhainistiú.

Múscailt Feasachta agus Athrú Iompraíochta
- Feasacht chomhshaoil níos fearr a ghiniúint agus dul i bhfeidhm ar athrú iompraíochta dearfach trí thacú le gnóthais, le pobail agus le teaghlaigh a bheith níos éifeachtúla ar acmhainní.
- Tástáil le haghaidh radóin a chur chun cinn i dtithe agus in ionaid oibre, agus gníomhartha leasúcháin a spreagadh nuair is gá.

Bainistíocht agus struchtúr na Gníomhaireachta um Chaomhnú Comhshaoil
Tá an ghníomhaíocht á bainistiú ag Bord lánaimseartha, ar a bhfuil Ard-Stiúrthóir agus cúigear Stiúrthóirí. Déantar an obair ar fud cúig cinn d'Oifigí:
- An Oifig um Inmharthanacht Comhshaoil
- An Oifig Forfheidhmithe i leith cúrsaí Comhshaoil
- An Oifig um Fianaise is Measúnú
- Oifig um Chosaint Radaíochta agus Monatóireachta Comhshaoil
- An Oifig Cumarsáide agus Seirbhísí Corparáideacha

Tá Coiste Comhairleach ag an nGníomhaireacht le cabhrú léi. Tá dáréag comhaltaí air agus tagann siad le chéile go rialta le plé a dhéanamh ar ábhair imní agus le comhairle a chur ar an mBord.

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Knowledge Transfer Guidelines and Recommendations for Irish Funding Agencies: How to Embed Knowledge Transfer Principles into Irish Funding Programmes to Help Maximise Measurable Impacts from Public Investments

Authors: M. Keegan Porter, Cliona Ní Cheallacháin, Georgia Bayliss-Brown and David Murphy

Knowledge Transfer

The goal of scientific research is to discover new knowledge that has an impact on society, usually through the advancement of science, industry or policy. Despite the efforts of funding agencies to support impact creation and to support researchers to improve the communication and dissemination of their findings, communication beyond academic publications remains a challenge. The single action of making knowledge publicly available, through dissemination alone, does not always result in uptake and application by potential users, which would then result in measurable impacts. This report advocates a more proactive systematic approach, known as "*knowledge transfer*".

Knowledge transfer is a two-way process through which a "knowledge output" moves from a knowledge source to a targeted potential user, who then applies that knowledge. A *knowledge output* is a unit of knowledge or learning generated by or through research activity. The reason that knowledge transfer is described as a two-way process is because its core philosophy is to frame transfer activities around target users' needs. Effective knowledge transfer requires that a specific target user is profiled and bespoke materials are developed in a medium that is framed for, and specific to, that user's motivations, role, needs and interests in order to maximise the likelihood of uptake and application.

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