

**AN INTRODUCTION TO KNOWLEDGE MANAGEMENT  
FOR THE MARIFISH ERA-NET**

*This report aims to help the reader understand, in an immediately practical but theoretically rigorous way, the field of knowledge management. It seeks to answer the questions that anyone new to the field might want to ask.*

*By the time you have finished reading this report, you should:*

- ~ feel confident that you are ready to start managing knowledge better now*
- ~ understand the key theoretical ideas without having had to undertake a PhD*
- ~ and have some clear ideas about what practically to do next.*

Dr Alister Scott  
The Knowledge Bridge Ltd  
Sussex, Autumn 2008  
[alister@theknowledgebridge.com](mailto:alister@theknowledgebridge.com)  
07904 500097

Draft for comment: Please do not cite without contacting the author as a better version may be available!

## INTRODUCTION AND EXECUTIVE SUMMARY

Knowledge Management can make significant contributions to both the efficiency and effectiveness of most contemporary organisations. The need to manage knowledge better grows all the time, as the amount of knowledge in the world continues to increase and the need for that knowledge to inform related decisions becomes ever clearer.

Europe commissions a large amount of fisheries research each year, both by value and volume. The research is varied and also geographically scattered. Experts from a range of disciplines are involved in the research, often approaching questions with different theories and methods. At the same time, policy decisions that need to be informed by research-based evidence come at regular intervals, sometimes with significant social and economic consequences and controversy attached.

All these factors pose classic knowledge-management challenges to the communities involved. How can we best learn from past research? How can researchers across Europe be connected better? How can knowledge be provided in a timely way for those involved in policy-making?

This document is intended to provide a brief, practically oriented introduction to, and overview of, the field of Knowledge Management. It covers both the theoretical and practical backgrounds of the practice, and the ways in which KM is applied and used today. Whilst it is not exhaustive - Knowledge Management is a vast and expanding field - it provides a review of relevant literature and a context in which to situate Knowledge Management practices for fisheries science and policy.

The review is structured around a set of questions. It starts by asking what is knowledge management: it is as simple as learning to do things better. KM involves learning before, learning during, and learning after. It involves a continuum of activities that encompass both knowledge *capture* - writing down and making available things that people have learned, and *connectivity* - linking the people who know things with the people who need to know them. A thorough-going KM strategy therefore requires a combination of People, Processes and Technology, supporting activities along the whole capture-connectivity spectrum.

The report then asks what is knowledge, since it is necessary to understand what we are seeking to manage. Knowledge can be both codified, or explicit - knowledge that can be written down - and tacit, or implicit - knowledge that is inside people's heads and hard to convey except through joint activity. This has significant implications for KM since many organisations, particularly in expert communities, often privilege written knowledge above other forms of knowledge. If, as a result, KM initiatives purely focus on the codified, written end of the spectrum, they are likely to ignore a whole raft of activities that generate value by connecting people better.

Along the way, these sections touch on the theory of knowledge - or epistemology - an ancient branch of philosophy in which debates still rage. Objectivist, positivist views of knowledge are contrasted with practice-based views. The report also explores the distinctions that can be made between data, information and knowledge, distinctions that again help to illuminate the types of activities that are likely to be effective in KM. When those involved want *outcomes* and not just

*outputs*, people become central. A reliance on written knowledge or IT-driven database systems will be unlikely to help achieve useful outcomes.

The review then asks what are the challenges for KM in expert communities. It highlights the dominance of an objectivist philosophy among scientists as a danger for KM practices, since it privileges written knowledge at the expense of tacit knowledge. This can lead to an unbalanced approach in which 'capture' activities focused on written knowledge are emphasised at the expense of 'connectivity' activities focused on keeping alive the knowledge carried around by people. Some themes are repeated since we feel them to be vital!

Knowledge Management emerged as a discipline in the 1980s, bringing together practices of data collection and sharing and harnessing the power of information and communications technologies. The initial emphasis on data and ICTs has now shifted in most practical examples of successful KM. This is mostly as a result of the realisation that these technologies on their own frequently fail to deliver the aims of KM initiatives; they lack the crucial people dimension.

The next question is how to start managing knowledge better. The review suggests that readers start where they are, usually by asking some simple questions such as what are we trying to achieve, what are our most significant challenges, and who already has relevant knowledge? Although simple, these questions may not be easy to answer. The review points to a range of flexible tools such as self assessment, synthetic reviews and peer assists as means for becoming clearer about where you are now and where you might need to go to improve your KM.

All the way through, this report emphasises the value in balance and simplicity. IT-based solutions need to be kept simple. Summaries of knowledge need to be brief, and need to help people to connect with each other. Written knowledge needs to be balanced with activities aimed at cooperation and knowledge sharing.

The report then asks how knowledge is managed within the field of fisheries at present, drawing on a range of sources and a previous survey to show that, as in other fields of complex expertise, there is a range of chronic, long-term and structural problems that block effective knowledge management. These problems could be addressed through leadership and goodwill on the part of many of those involved; they can also start to be overcome through some simple approaches and a shared willingness to learn from each other.

In conclusion, there is great potential for KM within the fisheries community of researchers and policy-makers. Current practices have significant weaknesses, even at the most basic of levels such as the sharing of raw data. The amount of interaction and cooperation between institutions seems limited at present, which contrasts sharply with a situation in which there could be thriving communities of practice around any of the dimensions of the fisheries challenge. An investment in knowledge management could significantly improve the productivity of the investments made in research. Individuals involved could benefit greatly from learning from others; scientists from each other, policy-makers, and vice versa. The questions that now need asking are: who will take the lead? And is the prize valuable enough to be worth the inevitable effort that will be required to start shifting a set of entrenched cultures, behaviours and expectations?

## What is Knowledge Management?

Knowledge management can sound scary. For some, it implies huge databases and centralised control, while for others it raises the prospect of yet more forms to fill in. It need be none of these things. At its best, it offers simple questions and methods to enable knowledge to work harder for you. Most of us manage knowledge every day: the question is how to do that better.

Most readers have experienced the problem of information overload and the feeling that there must be someone who has grappled with the same problems as you, if only you could find them. Who are these people? Where and how do they store the knowledge they have generated over the years? How can we make sure that the right knowledge reaches the right people at the right time?

All of these questions and more are addressed by the field of knowledge management (KM). As we shall see, there are heated arguments about what we mean by knowledge, and to what extent it is possible to manage knowledge. While it is useful to consider these questions - and we shall do so briefly in this review - it is also easy to become hopelessly lost in such debates.

We take the view that KM is a deeply practical activity. We have concluded that **knowledge management is anything that can help you, your organisation, and those with whom you work to learn better in real time and to make decisions and take action as a result of that learning.** In this view, knowledge is not a static thing, and it exists to serve various purposes, rather than being an end in itself. Put at its most simple, Knowledge Management is about **learning to do things better.**

It may be useful to provide a different perspective on KM here. For the authors Collison and Parcell, KM is about 'capturing, creating, distilling, sharing and using know-how. That know-how includes explicit and tacit knowledge. Know-how is used as shorthand for know-how, know-what, know-who, know-why and know-when. It's not about books of wisdom and best practices, it's more about the communities that keep know-how of a topic alive by sharing what they know, building on it and adapting it to their own use. It is not a snapshot of what is known at a single point in time, but an evolving set of know-how kept current by people who regularly use it' (Collison and Parcell 2005: 9).

As you may have already detected, we are committed to a deeply practical approach to KM. So here's our first practical recommendation. Of all the resources we read in the course of this review, one book stood out: *Learning to Fly* by the authors we have just cited: Collison and Parcell. The book's authors have had experience across a range of organisations in the private and public sectors, and the book is accessibly written, deeply pragmatic and also encouraging for the reader.

We would suggest that if you want to take KM forward in your organisation and need more detail than is provided in this review, use *Learning to Fly* as a standard text. It will provide a common framework and language for you and your colleagues to use in your KM initiatives, as well as a range of useful, flexible tools that have been tested in different contexts and can be adapted to yours.

We will draw on this book throughout this review, as well as other sources.

Inevitably, in a brief review of this sort it is not possible to provide the same level of detail as a 300-page book, let alone the thousands of pages available in the other books and resources cited in the rest of this review. Instead, we seek to provide some key insights that can trigger the beginnings of a practical, more conscious engagement with KM.

Given the above definitions of KM, what more is useful to say at this stage? Most authors on KM make various key distinctions early on in defining KM. One is the distinction between tacit knowledge - what's inside people's heads - and explicit knowledge - knowledge that can be written down. Another is to outline the differences between data, information and knowledge. One way or another, the attempt to define knowledge management quickly turns into a need to be clear about what we mean by knowledge.

## **What is knowledge?**

When we start thinking about what we mean by knowledge, many of us quickly realise that we have only a hazy definition of what it is. The question 'what is knowledge?' can almost seem too basic to bother with. Most people probably feel that they know - instinctively or otherwise - what knowledge is, but a definition can be surprisingly hard to pin down.

However, questions about the nature of knowledge have exercised philosophers' minds for thousands of years. Indeed, questions of knowledge and knowing are so complex that they have produced their own branch of philosophy - epistemology - or the theory of knowledge. Epistemology dates back to Plato, and has continued to inspire lively debate for over 2000 years. Much of this tradition concerns the differences between knowledge and beliefs; more recently it has also come to explore the differences between various *types* of knowledge and between knowledge and information.

In his comprehensive review, 'Knowledge Management in Organisations', Hislop focuses on contemporary conceptions of knowledge; those that have directly informed, and still shape, KM as a practice today, arguing that a detailed discussion of 2000 years' worth of philosophical debate will not help to inform management practices. A similar focus will be adopted in this report: as the ultimate aim is to identify useful KM practices, a full philosophical history is redundant.

### ***What do we need to know about knowledge in order to manage knowledge better?***

We have already seen a distinction between tacit and explicit knowledge. This basic distinction is useful to understand as it gives rise to some fundamentally different ideas about knowledge and how to manage it. In modern epistemology, these distinct forms of knowledge link with two major conceptions of knowledge: the objectivist perspective, and the practice-based perspective.

Briefly, objectivism holds the view that knowledge is something that arises *out of* experience, derived from the analysis of raw data and information. Under this view, knowledge can be separated from experience, knowing from doing; objective knowledge is possible. Mostly, this separation is achieved by writing the knowledge down so that it can be displayed and communicated.

The practice-based perspective, by contrast, views knowledge as intrinsic to human *activity*; inseparable from everyday actions; all knowledge is subjective (Hislop 2005: 15 and 28). The practice-based perspective assumes that knowledge is embedded into all we do, but much of it is therefore highly individual and hard to extract.

These two ways of thinking about knowledge coincide with the two different forms of knowledge already mentioned: tacit - knowledge that is inside people's heads - and explicit - knowledge that can be written down. Much early effort in the field of KM was driven by an objectivist philosophy and focused on capturing and storing codified knowledge, but as Collison and Parcell state: 'It is not possible to capture the full richness of what's in people's heads. If you don't believe us, try writing down your knowledge of how to ride a bicycle!' (Collison and Parcell 2005: 18). This hard-to-pin-down quality even applies to scientific knowledge, where it has been shown, for example, that scientific methods can be hard to replicate from one lab to another due to the tacit dimensions involved (see e.g. Collins and Pinch 1998).

Collison and Parcell point to a continuum of activity within KM, where KM needs to encompass both tacit and explicit knowledge and enable them both to be managed better. At the explicit knowledge end of the continuum is 'Capture', while at the tacit knowledge end is 'Connectivity'. In other words, you'll need to be doing some things that capture explicit knowledge, and some that connect people together so that they can share tacit knowledge. Capture often involves technology and Connectivity involves people, while both call for improved processes; these are the three key dimensions that all need developing: People-Processes-Technology.

Our experience, supported by these and other authors, is that most expert organisations focus their energy on attempts to capture and store explicit knowledge, failing to realise that learning and influence come about through engagement between people and the joint learning that arises in such processes of interaction. In addition, knowledge quickly grows stale, so needs to be kept alive in a network of people if it is to avoid the old trap of ending up as 'fat reports gathering dust on shelves'.

### ***Data, information and interpretation***

While these two philosophies have their differences, they also have some similarities in what they commonly believe about knowledge, particularly around what knowledge is *not* - i.e. it is not data or information.

Data, information and knowledge are commonly represented in contemporary KM practice as existing on a continuum. So data is raw input: numbers, images, words, sounds, any of which may be derived from measurement, experience or empirical observation. Information, by contrast, 'represents data arranged in a meaningful pattern' (Hislop 2005: 15) so that rather than being a list of numbers taken from an observation of, say, fish stocks over the course of a year, these numbers have been analysed in some way, for example to show the percentage of different types of fish present at any time.

So if data is raw observations and information is data that has been processed in some way, knowledge, finally, can be understood to emerge from the application, analysis, and productive use of data and/or information. In other words, knowledge can be seen as data or information with a further layer of interpretation

and practical activity added, during which data and information are analysed, meaning is attached, and they are structured and linked with existing bodies of knowledge and systems of beliefs. Knowledge therefore provides the means to analyse and understand data/information, provides beliefs about the causality of events and actions, and develops the basis to guide meaningful action and thought (Hislop 2005: 15; see also Davenport and Prusak, chapter 1).

This continuum between data and knowledge can be represented as follows:

Data → {analysis} → Information → {analysis, action, beliefs} → Knowledge

This broad conception of knowledge is (largely) uncontroversial; partly because it does not delve in detail into deeper questions of what exactly characterises knowledge and what it is *like*. These are the questions that epistemology seeks to answer, and different schools of thought conceive knowledge in different ways.

The objectivist approach has grown out of Positivism. This branch of philosophy, founded by Comte in the 1700s, focuses on what can be objectively and independently known. The objectivist approach to knowledge concludes that it is possible to devise knowledge that is free from subjectivity - values, opinions and beliefs. Objectivism contends that knowledge is not context or person-dependent.

The rise of objectivism was important in the Enlightenment because it challenged the church's dominance over knowledge - such as that the Earth must be at the centre of creation. Objectivism has done much to put knowledge and decision-making on a more rational, evidence-based footing.

At the same time, objectivism has moved the focus of investigations into knowledge away from the tacit - knowledge that is personal, subjective, implicit and cannot be written down. The objectivist approach does not deny the existence of tacit knowledge, but privileges that which can be made explicit and is therefore codifiable and can be transferred between individuals. Indeed, objectivists see tacit and explicit knowledge as distinct and dichotomous; two separate forms of knowledge, as opposed to points on a continuum.

Because tacit knowledge is inherently hard to pin down, the explicit knowledge identified by objectivists often appears to be easier to manage. Indeed expressing knowledge in a way that will be useful to another individual can be highly problematic from a practice-based perspective because we do not take in knowledge 'whole' from outside sources; we create it by our activity and our knowledge is unique to us.

The practice-based approach is critical of the objectivist approach to knowledge, and vice-versa: practice-based epistemologists claim that an objectivist approach under-estimates tacit, embedded and subjective knowledge, and that it is difficult if not impossible to code knowledge in a meaningful, transferable way.

Objectivists, on the other hand, claim that tacit knowledge is difficult and time consuming to work with; in this view it is better and more efficient to focus on the explicit, which is straightforward and simple to communicate. The view here is that passing knowledge from one person to another is much like posting a letter; it is simply a matter of finding the right form in which to express the information, and delivering it.

Hopefully it is already becoming clear why these philosophical differences matter. Even without using such concepts as objectivity and positivism, many managers may have entrenched and strong views on what knowledge is and how it can best be communicated. If they are trying to work with others who have similarly strong beliefs, but fundamentally different ones, problems are likely to occur quickly.

## **What are the challenges for KM in expert communities?**

The preceding sections have given a review of some of the ideas that underpin Knowledge Management - one could even say the theory of KM. Of course, there is a lot more that could be said, but these are the key dimensions that alert us to the main challenges involved in KM. This section briefly analyses these challenges with particular attention given to how they arise in expert communities.

The problem for KM in expert communities is that scientists tend to share an objectivist, positivist approach to knowledge, downplaying the significance of tacit knowledge. The influence of objectivist philosophy comes in various guises. 'Basic' science is more highly regarded than 'applied'. Articles published in scientific journals - no matter how few readers they attract - are more valued than reports to decision-makers let alone interactions with them. The need for independence and 'purity' is often interpreted - wrongly in our opinion - as requiring experts to stay separate from policy or media debate. Individual researchers are rewarded for producing knowledge, but not for engaging to achieve its implementation. To these problems we can also add the fact that researchers and research institutes are often in competition with each other for resources and recognition, undermining the incentives for knowledge sharing.

For all these reasons, KM in expert communities can automatically, and without debate, be seen purely as being about dealing with explicit knowledge better; a matter of more efficiently capturing and storing knowledge. The tacit, people-based, connectivity dimension can be blindsided. This has been a major finding from the main author's own research and is reinforced by the other sources already cited (Scott 2004, Scott 2007, Nightingale and Scott 2007). In addition, work previously conducted for Defra, and additional work conducted for MariFish recently, all points in the same direction (Defra 2006; Holmes 2008)

A bit of the history of KM may be useful at this point. Knowledge Management has only been recognised as a subject in its own right since the late 1980s, although many of the activities that make up the practice - from gathering data to understanding the culture of stakeholders or customers - have been studied or undertaken elsewhere for much longer, in both academia and business.

Knowledge Management originally developed from the field of 'artificial intelligence' and was initially applied to the practice of using new electronic technologies to manage and store data. The focus was generally on managing a fairly narrow field of knowledge (e.g. computers, diagnoses of disease), and the technology then became more widely used and adapted for business use (Davenport and Prusak 2000: 125-6). As we shall see later, the field of fisheries is characterised by huge amounts of data, problems with sharing this data, and relatively much less work in analysing, synthesising and ensuring effective use of data, information and knowledge.

The management of data through information technology is now seen as only one part of a much broader practice. How many database projects have failed because

they have lacked the people dimension? People have not known how to use the database, it has not been kept up to date, or it has run into technical difficulties. Our view is that any technology-based solution fails if people do not use it; it is no use blaming users' lack of technical capability. Fundamentally, IT needs to serve people, not the other way round. Keep it simple, and do not put the techies in charge!

In the last decade, the focus of Knowledge Management has moved away from an exclusive focus on the technology dimension of knowledge capture, and towards a greater emphasis on tacit knowledge; the 'secret ingredient' of any project or company that workers hold within themselves. Even in a situation where much of the knowledge employed is codifiable and easily captured in the form of data or statistics, managers will still need an understanding of how to employ that knowledge; how to share it among members of a team, and how to manage new ideas and situations that occur during a project.

The case study that Collison and Parcell give here is from Nissan. The manufacturers wanted to know why a particular design project had been so successful, but when they tried to find out they found that the members of the team had all either left the company or were unable to express the factors that had made the project successful in a useful way; that tacit knowledge had been lost forever (Collison and Parcell: 7). Many other case studies tell the same story (see O'Dell and Grayson; Davenport and Prusak).

Even when technical knowledge is the principal type of knowledge that is needed for a project, KM practitioners realise that a central factor is not just about storing knowledge; it is also about being able to enunciate and communicate that knowledge to others, sometimes in a short space of time (Davenport 126).

Managers seeking to implement KM, then, need to consider not just the data they want to convey, but also the individuals who have worked with this data. People hold the tacit knowledge that is often the factor that determines a successful project, above and beyond accurate record-keeping and planning.

This shift in focus holds particular relevance for fisheries management, which has undergone a similar move away from a narrow focus on raw data to a broader consideration of social and political factors; in this case, the move has been from analysing the levels of fish stocks from a numerical standpoint, to a consideration of how most effectively to bring about sustainable levels of fishing activity (Motos 7). This move is likely to make difficult demands for greater inter-disciplinarity and stakeholder engagement from research institutes; perhaps an emphasis on KM can help bring about this shift?

In addition, authors suggest the need to bear in mind the culture of organisations and groups when initiating KM. It is widely accepted among KM practitioners that knowledge is subjective to some degree. For this reason, it is worth bearing in mind that both the collection and the interpretation of hard data are influenced by such factors as disciplinary traditions. For example, this can affect the questions that are asked in research, and the knowledge that is generated from data and information can be affected in a similar way.

Recognising that culture and background can frame knowledge in this way can be important for the management of a project. If unacknowledged, cultural differences can create significant problems. This explains why many Knowledge

Management practitioners place emphasis on understanding working culture, and being able to situate knowledge within a particular culture. Imposing rules and management techniques blindly, with no appreciation of how a different group, organisation or even country works, will lead to clashes and delays.

This principle applies at all stages of the Knowledge Management process, including data gathering and knowledge generation: people are reluctant to share their knowledge when they have doubts about the way it will be used or who will have ownership of it (see Hislop, 21).

So a range of challenges face any attempt to instigate KM in expert communities. Our view is that it is wise to be as aware as possible of the nature of these challenges. At the same time, we firmly believe that with some leadership and goodwill, even seemingly the most intractable hurdles can be overcome. The following section suggests a range of straightforward steps that can be taken to start the process.

## **How do we start doing KM?**

Most of us manage knowledge every day, so the challenge is to become better at things that we are already doing. So the most basic answer to the question of how do we start doing KM is to start where you are, and ask some simple questions such as: what are you trying to achieve; what are your main challenges? Organisations and individuals frequently fall into routines where these questions do not get asked. But any KM initiative is unlikely to produce useful results unless you are clear about the answers to these know-why questions.

This stage can produce resistance from some members of your organisation, who may feel that such questions are too obvious to be of any value, and in danger of slowing things down - just another thing to do. Equally, such questions can start to challenge the dominance of certain approaches that may no longer be deemed relevant. For example, the Royal Commission on Environmental Pollution's report on the marine environment stated: 'Our report recommends changes in the emphasis of research away from management of fish populations towards a wider focus on the marine environment' (RCEP 2004: 6). In condoning ecosystem approaches, the RCEP is trying to move towards a more integrated approach to the use of marine resources, yet this may well be at odds with current priorities and institutional traditions within significant parts of the marine science community.

Experience suggests, however, that this know-why stage is a good investment as a means for putting in a solid basis for moving forward. Some patience now will pay substantial dividends later. This process can often benefit if an organisation uses an independent facilitator who takes responsibility for the process and ensures that all voices are heard; this role is often played by professional knowledge managers in larger organisations.

Once started, the process will continue to benefit from simple questions such as who should be involved, how do we learn from past activities, and what are the different dimensions of what we are trying to achieve? The development of policy on fisheries discards, for example, may have as many as 20 or 25 discrete activities. Some institutions will be expert at some aspects while having lots to learn on others. The areas where they are expert offer opportunities to help others, and vice versa.

Collison and Parcell suggest this as a basis for generating collaborations and mutual learning. They give a detailed method of self assessment with which groups can analyse their own capabilities in different areas (rating on a scale of 1 to 10), and then comparing these not only to where they would like to be (move from a 3 to a 7 within six months, for example) but also to others within their network who rate more highly in this aspect and from whom they can therefore learn.

The possibilities for self assessment and mutual learning raise cultural challenges around the degree to which people are prepared to ask for help and to give it. A culture of cooperation and asking for help can be hard to generate in situations where people may otherwise be in competition, and this will often require some leadership and changes to incentive structures.

Anyone involved in fisheries science can ask for help, and in the process start to generate a community of practice around their particular challenge simply by asking those they ask for help 'who else should I be asking'. This 'snowball' method, if pursued with some persistence, will often result in the creation of a virtual network of practitioners, all of whom are grappling with the same or similar challenges. Such a network can form the basis for a 'peer assist' exercise as identified by Collison and Parcell. It can often help people to gain access to others who may have already solved a particular problem, at least for their context, and this solution can be adapted for the new demands of a different situation.

Such communities of practice often benefit from some sort of facilitation, either by a KM professional or, for example, as part of a willing scientist's job - perhaps one day per week for a year. A mixture of virtual and face-to-face activities is recommended, in addition to various attempts to 'capture' the knowledge within the network. Again, the secret to the latter is often to keep it simple: one-page summaries of a project which, rather than giving a dry technical account, convey the human realities, mistakes, triumphs and lessons learnt. Crucially, these need to be shared, made available perhaps on the internet, and the authors' contact details included, preferably linked to a similarly brief but personalised web page about the author. The inclusion of some personal details (an interest in a sport, for example, or an insight into your personality) will help break the ice when people are first in touch with each other.

This section has been deliberately short. It has given the bare bones of an approach that may seem simplistic to some readers. To reiterate, Collison and Parcell's book contains many practical ideas in detail that readers can apply in their situation. Our aim has been to provide a brief and simple introduction, and through the brevity and simplicity of the approach to invite readers to explore further.

The section that follows seems to confirm, for the field of fisheries, what was said earlier about the challenges facing KM in expert communities. That is why, all the way through this report and in this section, we are emphasising the need to develop the people dimension. We would recommend that in future, those who invest in fisheries research place emphasis on the creation of communities of practice among those involved in fisheries - research and policy - as an explicit condition of research funding. In this way, and through some of the simple measures outlined here, knowledge processes can be made more efficient and more effective. Duplication will be reduced, experience and knowledge will be kept alive (institutional memory), and people will know who to talk to when they need help. This will help to address many of the current problems experienced within the field of fisheries research, as outlined in the next section.

## **KM in Fisheries: current practice**

The evidence seen during the conduct of this review suggests that the field of fisheries science and policy suffers from some chronic, long-term and structural problems with respect to knowledge management.

The good news is that this is not unique to the world of fisheries: other multi-disciplinary problems similarly suffer from the poor development of KM processes and communities of practice. The bad news is that the structural nature of the problems means that the situation is likely to persist in the absence of leadership and goodwill on the part of many of those involved. But there is more good news: many individually simple measures, such as those outlined in the previous section, can be taken now by those with goodwill to move towards better KM, and many of these measures will bring benefits for those prepared to put in the effort.

This section gives a brief overview of what other authors have written about, or relevant to, the development of better KM in the area of fisheries management.

In the field of fisheries management, there is a vast array of raw data and information available from many sources, all of which could be considered and included before managerial/policy decisions are taken. Yet this presents hugely complex challenges. The European Commission itself has acknowledged: 'the overall need for scientific advice is likely to continue growing' (CEC 2003), but as Hegland concludes: 'The system [of advice] is already stretched beyond its capacity' (Hegland 2006: 234: brackets added).

As researchers Daw and Gray concluded: 'Within the European Union, scientific fisheries research and advice is passed down a chain of central European institutions before being incorporated into policy. However, advice is often poorly or only partially implemented and the system has largely failed to achieve sustainable fisheries management'.

The book edited by Motos and Wilson - the only book that we were able to find that promised to combine fisheries and a focus on knowledge - entitled 'The Knowledge Base for Fisheries Management' (the result of an EU research project) gives scant attention to knowledge management, particularly when it comes to scientific knowledge. It gives a brief airing to topics such as 'the communication gap' and 'delivering complex scientific advice to multiple stakeholders', but rarely acknowledges that there may be significant challenges around knowledge management for the scientific community itself, although it is acknowledged that the lack of scientific collaboration between countries can be a significant problem (see e.g. chapter by Nielsen et al: 190).

Similarly to the RCEP's conclusion cited earlier, Barange concludes that a new emphasis in marine science is needed

'to broaden and integrate the science on which management is based by establishing multi-disciplinary research teams drawn from across diverse science sectors. It is recognised that this may require new organisational structures that cut across traditional sectoral, disciplinary and institutional boundaries. Significant changes in the funding relationships between governmental and non-governmental bodies are expected as a result. The ultimate objective is to achieve a culture change in the way partners engage in this science area' (Barange 2005: 3).

In a scoping study for NERC, Defra and Seerad, Barange points out that, although a

wide array of data on fisheries is available, there are considerable problems even with ensuring that this data is shared, and it is difficult to obtain information that includes any analysis of the data (Barange 2005). Barange gives a useful overview of fisheries science within the UK, including a report on a survey conducted throughout the fisheries science community; some of the findings are germane to the topic of KM:

'Collaborations between academic centres and fisheries research laboratories are evident and successful. However, links are informal and based on personal contacts. No formal platforms of collaboration exist, with the result that the capacity of the community is not maximised. In fact, partnerships between UK fisheries laboratories and their European counterparts are stronger than between UK academic and fisheries laboratories.

Ecosystem understanding is fragmented, and modeling approaches to this end are largely academic and are generally not carried through to management applications.

In general academic institutions and Fisheries laboratories have a limited understanding of each other's strengths, research activities, delivery pressures and potential to meet each other's research needs. Institutions generally prefer to focus on work that "we can do ourselves" rather than seek out assistance and collaboration to tackle new issues. However, individuals are more flexible and willing to collaborate.

Although in principle open to competition, the funding base for applied and academic marine science, both nationally and at European level, is effectively separated, entrenching these Institutional divisions. For example, progressive changes in the European Commission research funding in support of the Common Fisheries Policy have favoured government laboratories because Universities have been reluctant to invest in policy driven science as a result of RAE pressures. Considerable intellectual synergy between academia and fisheries laboratories could be achieved through a concerted effort to coordinate funding opportunities from research councils and government departments in this area of science.

There is concern that applied scientists are driven away from academic institutions, because of the emphasis placed on high impact publications in the HEI Research Assessment Exercises (RAE). Penalties on applied research are driving quantitative scientists towards more academic problems or to other countries where applied research is better valued. As a result, the ability of the UK HEI to train future generations of applied marine ecosystem scientists is in question.

Academic institutions have little appreciation of the pressures placed on scientists from fisheries laboratories with respect to ICES working group's demands and the need to respond to and advise government (often at very short notice). A 'sharing of the burden' through MERP would be cost effective and would allow space and time for fisheries laboratories to develop collaborative innovative research.

Data access remains one of the most significant stumbling blocks in fostering better collaborative science. This refers to issues of data availability, access and knowledge. Surprisingly, this is not only a problem in terms of Academic institutions accessing fisheries laboratories data (and vice versa), but also between fisheries laboratories across UK national borders (Barange 2005: 13-14)

This long extract highlights many challenges for KM: fragmented knowledge shows up the need for effective networking of those working in an area; the view that institutions have a limited understanding of each other raises huge potential for better knowledge sharing; the significance of informal personal networking highlights the value of tacit knowledge, while the lack of support for this sort of activity shows that much more could be done to gain full advantage from people's

knowledge and goodwill. By stark contrast, the references to the Research Assessment Exercise and 'high impact publications' (always ironic given how few people read most journal articles) underscores the earlier points that were made about the privileging of written, codified knowledge as compared to tacit, people-based knowledge. Indeed, the value of Barange's review gives a sense of the value of synthesis activities, an insight that could be transferred across to inform any future work in attempts to improve KM in fisheries. It would be interesting to find out how much progress is being made to implement Barange's recommendations, including his over-arching view that research should be linked better to policy needs.

Hegland gives a competent account of the system for production and use of scientific knowledge in Europe. He notes that 'The discussion of the balance between inputs from different stakeholders in relation to the CFP's decision-making process has consequently been one of the main issues of controversy of the present reform of the system. Biologically based scientific advice might be interpreted as pivotal in some cases...and equally insignificant in other cases...The interpretation will to a large extent depend on who is asked. As a result of this, the actors involved in providing the knowledge base vary from measure to measure and over time' (Hegland 2006 in Motos and Wilson: 220).

ICES is the main source of knowledge and advice to European policy-making on fisheries, and is a forum for member states to pool their knowledge resources and for about 1600 scientists to meet, most of whom are biologists (again raising questions of disciplinary balance and the need to move towards more integrated ecosystem approaches). Hegland indicates something of the tensions around the provision of scientifically based advice, including the ways in which such advice can become politicised, but again says almost nothing about the reality of the mechanisms used for managing knowledge.

Meanwhile, Daw and Gray conclude that the problems with the poor performance of the Common Fisheries Policy (CFP) can be attributed both to poor policy processes and to problems with the science, particularly the lack of certainty provided for policy by scientific research, the limited scope of scientific enquiry, and the distance between those conducting research and those involved in the fishing industry. While these may hold some validity - and are to a certain extent structural problems that may take a long time to address - this analysis similarly fails to discuss knowledge management challenges within science and between science and policy.

In conclusion, there is a large potential for KM within the fisheries community of researchers and policy-makers. Current practices have significant weaknesses, even at the most basic of levels such as the sharing of raw data. The amount of interaction and cooperation between institutions seems limited at present, which contrasts sharply with a situation in which there could be thriving communities of practice around almost any imaginable dimension of the fisheries challenge. An investment in knowledge management could significantly improve the productivity of the investments made in research. The questions that now need asking are: who will take the lead? And is the prize valuable enough to be worth the inevitable effort that will be required to start shifting a set of entrenched cultures, behaviours and expectations?

## REFERENCES AND RESOURCES

- Barange, M., 2005, Science for sustainable marine bioresources, A scoping report for the NERC, DEFRA and the Scottish Executive for Environment and Rural Affairs (SEERAD), GLOBEC International Project Office
- Collins, H and Pinch, T (1998) *The Golem: What You Should Know about Science*, Cambridge Univ Press.
- Collison, C. and Parcell, G., 2004, *Learning to Fly; Practical knowledge management from leading and learning organizations*, Capstone
- CEC (2003): Communication from the Commission, Improving scientific and technical advice for Community fisheries management. Official Journal 2003/C47/06.
- Daw, T and Gray, T (2005) Fisheries science and sustainability in international policy: a study of failure in the European Union's Common Fisheries Policy. *Marine Policy* 29 (3) 189-197.
- Defra, A. Scott, et al. (2006). *Science meets Policy: summary of research and report for the Science meets Policy Conference*, London, November 2005. London, Commissioned by Defra.
- Davenport, T.H., and Prusak, L., 2000, *Working Knowledge; How organizations manage what they know*, Harvard Business School Press
- Hegland, T (2006) *Fisheries Policy-making: production and use of knowledge in Motos and Wilson*.
- Hislop, D., 2005, *Knowledge Management in organisations a critical introduction*, Oxford University Press,
- Holmes, J and Lock, J (2008) *Improving Communication between Fisheries Managers and Researchers*, Report for MariFish task 1.10.
- Motos and Wilson (eds), 2006, *The Knowledge Base for Fisheries Management*, Elsevier
- Nightingale, P and Scott, A (2007). *The Relevance Gap: Ten Suggestions for Policy-makers*, *Science and Public Policy* December 2007.
- O'Dell, C., and Jackson Grayson, Jr., C., 1998, *If only we knew what we know; the transfer of internal knowledge and best practice*, Simon and Schuster
- Pfeffer, J., and Sutton, R, 2004, *The Knowing-Doing Gap; How smart companies turn knowledge into action*, Harvard Business School Press
- Royal Commission on Environmental Pollution (2004): *Turning the Tide: Addressing the impact of fisheries on the marine environment*. London, HMSO, 25<sup>th</sup> report.
- Scott, Alister (2004) *Relevant Science? The Case of Global Environmental Research in UK Universities*, SPRU, University of Sussex, DPhil Thesis.
- Scott, A. (2007). "Peer review and the relevance of science." *Futures* 39: 827-845