Why involving people is important: the forgotten part of environmental information system management.

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Abstract: Developing information management systems to support decision making on-the-ground cannot take place in isolation of the broader social context within which people generate and utilise information and learn. The technology and hardware components, which are the most visible aspects of such systems, receive most attention from researchers and funders. However, if we want people to use information more effectively to help change the way they look at the world -- and how they go about managing its resources -- then we must pay equal attention to the social aspects of information systems, in particular to ensure that they support learning. This paper outlines the requirements for collaborative learning, by which the differing perspectives of multiple stakeholders are coordinated to manage complex environmental problems. A process for utilising the principles of collaborative learning for developing integrated information systems to support decision making is discussed. Particular attention is paid to the new skills of relationship building, facilitation, and conflict management required by multidisciplinary teams developing such systems. Examples to illustrate how these skills could be used in practice are drawn from case studies in resource management in New Zealand.

Introduction

Availability of good information lies at the heart of effective and equitable decision making (Sarokin & Schulkin 1991). Not surprisingly then, over the past 20 years research agencies and environmental managers have been paying ever increasing attention to improving the way technical information is used in natural resource management. Furthermore many environmental challenges are complex and do not respond well to simple solutions that address only a part of the problem. To resolve them, scientists, communities, and policy makers are seeking collaborative approaches that accommodate multiple perspectives and utilise multiple sources of information.

Effective collaborative management (or co-management) requires the many participants or stakeholders associated with environmental problems to develop solutions co-operatively as opposed to acting as advocates purely in their own interest. Participation in decision making encourages stakeholders to buy into outcomes and see them implemented. Since good decision making depends on the availability of sound supporting information, the need for carefully managed participation applies equally to gathering information and developing the systems for managing it as it does to the decision making itself. However, as many reviewers observe, the involvement of people in this way is all too often neglected, especially within information technology enabled projects (e.g. Malhotra 1997).

Effective participation in information management is not always easy to arrange, especially in relation to environmental issues, which are often characterised by conflicting social perspectives. Managing the constructive involvement of stakeholders is a skill that requires as much emphasis as

does developing our abilities in technical problem solving and the design of information technology. A major challenge is to promote a more multidisciplinary approach to the development of information systems. This requires building closer partnerships between technical experts and specialists in change management, relationship building, and conflict resolution.

This paper describes the benefits of collaborative learning, by which many viewpoints and sources of information can be shared among the different parties involved, and integrated to find solutions that will guide the way forward. While information sharing is key to this, we highlight some supporting social processes that are required for this to happen. The paper outlines a three-stage process for involving people in such collaborative approaches. Aspects of relationship building, facilitation and conflict management are illustrated using case studies. Finally, we discuss the need for these skills to be incorporated in multidisciplinary approaches to information management and problem solving.

Supporting processes for collaborative learning

Collaborative (or organisational) learning is one approach that makes its primary objective changing behaviour by improving the use of information by different groups. In general terms, this refers to the capacity of a group to assess the results of their efforts, rethink how they go about their tasks, and use new ideas to change established practices (e.g. Huber 1991). Underpinning the concept is the recognition that people learn through active adaptation of their existing knowledge in response to their experiences with other people and their environment.

Within this process, more timely and relevant information is the factor that most reviewers identify as essential to improve learning. However, this is often difficult to achieve in natural resource management, where the wide range of stakeholders means that information is highly fragmented across groups. In general though, access to more information about how any given system functions increases the range of possible responses the stakeholders have to a situation, and extends the basis for comparing options (Huber 1991).

Access to such information can come from a range of sources. Science is a main contributor, and there is also a growing acknowledgement of the need to draw upon local knowledge. Formal monitoring of the results of management actions to confirm (or otherwise) their effectiveness is another key source of new information. However, to promote the sound use of information within a decision-making environment, a number of additional supporting social processes must also be provided.

Shared understanding

Collaborative learning implies that those involved experience a change of mind, or develop new ways of looking at the world. This is a cognitive process in which the richer the media of communication (e.g. face-to-face rather than printed matter) the deeper the sharing, and the greater the potential for learning and behaviour change. Participants must develop a common language about core ideas or technologies to achieve this. Developing this understanding takes time, and needs to accommodate multiple viewpoints as the presence of varied interpretations of information encourages learning (Huber 1991).

The learning process itself is characterised by constructive debate of the merits of alternative goals and technologies, and reflections on the interpretation of underlying evidence and beliefs. This

dialogue is what helps stakeholders to change their views, and find a mutually understood and supportable position. Tensions result from the different perceptions surrounding much of the information relied on by different groups, and from contrasts between new ideas and traditional perceptions. This tension inevitably underlies many current debates over environmental management, and can only be resolved through suitable processes for community dialogue.

Moderate conflict

This may seem a strange addition to the list of factors that encourage learning. However, a number of authors have noted the positive value of conflict in initiating action and learning (e.g. Bouwen & Fry 1991). Conflict can be the catalyst for gaining peoples' involvement in the issue. Furthermore, the process of negotiating through a conflict over differing viewpoints expands peoples' perspectives on the problem, leading to more lateral solutions. Methods of conflict management are available to manage the balance between advantageous and negative aspects of conflict and ensure an overall positive outcome.

A supportive environment

Learning can be difficult, even at an individual level. Accepting new information that challenges the way we think and the things we do is, even with the best of will, difficult to undertake, to accomplish, and to sustain (Michael 1995). Finding out about problems also implies that we may have to act to correct them. What often stops us doing this is an anxiety, or the feeling that if we allow ourselves to enter a learning or change process, if we admit to ourselves and others that something is wrong or not right, we will lose our effectiveness, our esteem, and maybe even our identity. Most of us need to assume we are doing our best at all times, and it may prove a real loss of face to accept and even "embrace" errors. Adapting poorly, or failing to realise our creative potential may be more desirable than risking failure and loss of esteem during the learning process. Consequently the degree of support offered to individuals and groups during this learning process is one of the most important elements if we are serious about motivating people to learn and change their current behaviour patterns.

Developing collaborative approaches to information management

The challenge is to integrate these social considerations into collaborative approaches for information management. Clearly, the idea of having different stakeholders working collaboratively is by no means new, and there are many examples of successful efforts made in a number of fields. While successful approaches generally have been individually tailored to encourage stakeholders' involvement in each situation, there are some common elements that make these collaborative approaches work. One approach is to view it as a three-phase social process of:(i) entry and contracting;(ii) developing information for decision making; and (iii) implementation and review (Fig.1).
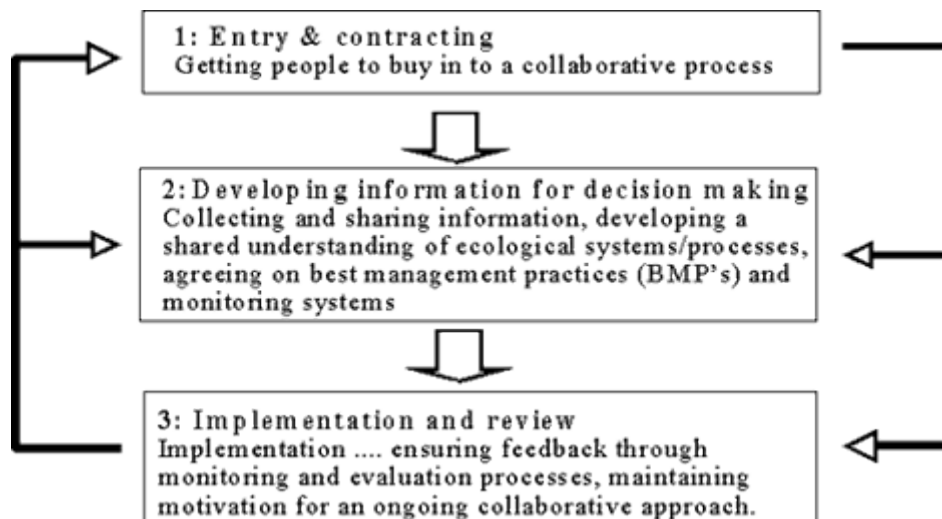
Figure 1: Possible steps in a collaborative learning approach

The skills required for managing this process will naturally vary according to the specifics of the initiative, but should be available to multidisciplinary teams seeking to maximise participation in information management. There is a substantial difference between pursuing a collaborative approach within an already well-functioning situation, and trying to initiate collaboration in a social environment characterised by existing conflict. In the latter case the need for effective facilitation and expert mediation of conflicts is definitely greater. In the following sections we will discuss the three phases of this co-management approach paying particular attention to issues of trust and relationships that may arise within an information management project, and how these might be addressed.

Entry and contracting

This first phase includes identifying and involving relevant people, building relationships, and establishing the ground rules for working together. The aim in any successful participatory approach is to build relationships that make it easy for people to talk about their needs, share information, and work together. Stakeholders develop a common understanding of the perceived issue, and collectively decide on the project goals and the different roles that groups will undertake. Building this climate for change is the single most important step in initiating any collaborative approach.

Just as with personal relationships, previous experience is one of the most important influences on community attitudes to collaboration. People may be extremely reluctant to enter into a second participatory process if they have been involved in an unsuccessful one in the past -- "we've already tried that and look what happened!". The emotional part of the conflict (which often forms a hidden barrier to uncovering the real issues) may have to be dealt with first.

A good example of how this challenge can be met was provided by Department of Conservation (DOC) staff as part of their ongoing efforts to protect the black stilt (kaki), a rare New Zealand wading bird. The agency was concerned to gain better access to bird habitat on private land, and to increase private landholder involvement in recovery efforts. However, when landholders were canvassed to ascertain their support for a meeting to resolve these issues, it became apparent that

they saw issues over the black stilt as symptoms of a wider problem of "lack of trust" between farming families and DOC. In response, addressing the issue of access to the black stilt was postponed, and a series of workshops were held to improve relationships between local DOC staff and landholders (Allen et al. 1998). Common ground was reached during these workshops and a number of positive steps to improve working relationships were identified and implemented. Building trust in this way is one of the main reasons why successful participation processes take time. Importantly, in this case, both parties regarded this exercise as being a first step in a much longer process.

Another major stumbling block in initiating collaborative approaches to environmental management is in identifying and gaining the active involvement of the right people within the process. This means time and resources must be allocated at the project level to achieve this, paying particular care to involve key stakeholders (e.g. farmers, local communities, women, indigenous peoples) who, in the past, have often been marginalised within the collective decision-making process.

However, gaining the involvement of key players is not always easy, and stakeholders may be unwilling to put time and resources into this initial phase of entry and contracting. In contrast to the black stilt project discussed above, the Whaingaroa Catchment Management Project (Kilvington 1998) is an example of an attempt at establishing a collaborative environmental management initiative that was frustrated at the initial entry and contracting stage through a failure to address a fundamental conflict between key stakeholders. The intention of this project was to establish a working group of agency and community stakeholders to address issues such as erosion of the catchment and siltation of the harbour by generating a commonly agreed catchment management plan. Although the management rights of the indigenous community (tangata whenua) and their relationship with the local government environmental management agency were of primary concern to the tangata whenua, that issue was deemed a conflict outside the process of setting up a collaborative community and agency management group. This unresolved conflict resulted in a failure of participation of one of the key stakeholders to the detriment of the project as a whole.

This initial phase is also the stage at which ground rules for groups working together need to be established. This will minimise unnecessary "process" conflict caused by misunderstandings and lack of agreement on how the rules of dialogue and decision making are set. Intervention in conflict can occur at any stage, but is clearly much more likely to be effective when it is introduced early in a process of getting stakeholders to work together.

Developing information for decision making

If information systems are going to contribute to changed behaviour on-the-ground they need to be developed within the wider decision-making contexts of the organisations and groups involved in natural resource management. An information system, in this sense, is more than just its technological components. Rather, it is a "social system", within which people interact to create new knowledge, and broaden their perspective of the world (Ison 1993).

Given the diverse set of decision environments inherent in resource management, information systems that lead to changed behaviour on-the-ground will, to an increasing extent, rely on information technology for their function. Modern technology offers interpretative, scenario-building tools and expert systems to enhance understanding and utilisation of a mixed array of

information and clearly these have a role in this phase of collaborative management. However, equally important is the ability to use these tools to support dialogue between the different stakeholders rather than replace it. Hence particularly important aspects of this phase include:(i) how participants share relevant information; and (ii) participants' ability to discuss and debate the relevance of information for their own research or management purposes.

Sharing relevant information

Many groups possess information of a technical, cultural, or economic nature thatis of great value for developing environmental solutions. However, the flow of this information between different levels and groups in society is often inadequate. For example, many years of experimentation with different management strategies to achieve different goals has provided individual land managers with much knowledge about local land-use systems. Unfortunately, this knowledge is seldom available to the community on a collective basis. Similarly, much of the valuable knowledge accumulated by scientists is fragmented, held in different databases and, consequently, is not readily available, even to other scientists.

Often this information remains fragmented because we do not have the mechanisms to collect it. However strong emotions associated with information also often create a barrier to its availability. Among science researchers much personal self-worth and commercial worth is linked to the information generated. Fear over misrepresentation affects the willingness of researchers to offer their information for use in systems over which they have no future control. Many other stakeholders may have similar fears, with some justification, that their information might be used incorrectly, or against them, if released. In the broadest sense, information systems need to be designed to overcome such fears by building trust and confidence between information providers and users. In many cases, as the following examples show, this will need to be achieved through the development of clear guidelines or protocols for information use.

The implications for emerging research initiatives are well illustrated in the tussock grasslands of the South Island high country. Only a decade ago, research emphasis was directed towards improving the efficiency of an extensive pastoral system. Indeed, there are few references in the agricultural research and development literature internationally that refer to participatory approaches other than those that comment on farmers and scientist dealing with agricultural management issues (Allen 1997). However, today research funding is increasingly directed towards addressing issues of sustainability, and hence meeting the needs of a range of different stakeholder groups concerned about the impact of natural resource management practices, who had for some time considered themselves in opposition to one another. When scientists in the Government-funded Tussock Grasslands Research Programme (Bosch 1998) initially approached farmers about identifying proposed research sites to look at soil and vegetation trends, access was denied. This was largely because farmers were unsure about what use would be made of the subsequent research findings. However, because the project process was prepared to openly address this conflict, and bring in the appropriate skills, the situation was able to be resolved. The subsequent conflict management exercise resulted in the establishment of information management protocols, which enabled the research to proceed. These protocols protected the rights of landowners to be advised of research results prior to their being released to third parties, and provided for discussions of the implications of research results by the different stakeholders involved before publication (Bosch pers. comm.).

Conversely, in the Whaingaroa Catchment Management Project referred to previously, water quality data held by local landowners were withheld during the process of collecting and collating information on the catchment. The landowners were uncertain as to how this information might be interpreted by other members of the community. The use of conflict resolution skills and the development of clear, commonly agreed protocols for the use of this information would have allayed their concerns.

Making sense of information

Raw information needs to be understood and interpreted so that it becomes useful for addressing the issue under consideration. However, it must be appreciated that information may have different meanings and hence values in different situations. The art of making sense of information has two principal components. Firstly, there needs to be a mutually agreed and clearly understood intended use for the information. This may, for example, be to resolve a particular environmental problem or to attain a particular resource management goal.

The second component is the context within which the information was originally collected which is a key to its strengths and weaknesses. This includes clarifying such issues as: why the information was collected and by whom?; what is its source?(such as practical experience, observations, science research etc); does the information relate to a specific situation or site?; and can it be extrapolated to other situations? Skilled facilitation is needed to ensure that all participants and stakeholders share a common understanding of these two components of new information.

Enormous gains can be made by promoting an understanding of what different stakeholders have to offer to the resolution of complex environmental problems. However, there is often an understandable reluctance on the part of agency and research staff to bring together factions where there is a risk, or perceived risk, of conflict. For example, staff in most, if not all, of the high country research initiatives that preceded the Tussock Grassland Programme have tended to work separately with DOC staff and local farming families, or solely with one or other group, largely to avoid having to deal with possible conflict. Yet, as these two groups collectively manage all the tussock grasslands in this area, and as one of the main land-use debates revolves around determining trade-offs and synergies between conservation and pastoralism, there is little doubt that both groups would have been better served by science had they been provided with more well-facilitated opportunities to come together and discuss the implications of emerging research findings.

However, poorly handled conflict may prove as damaging a strategy as conflict-avoidance. Bad experiences with former collaborative approaches may severely jeopardise the chances of building constructive future working relationships. Managing successful community dialogue processes requires the creation and managing of safe environments for debate, including finding appropriate times, developing the right questions, and ensuring that the different scales and levels that stakeholders are operating on can be addressed.

Implementation and review

Ongoing, and structured, community dialogue as described above provides those who participate in the process with immediate access to new ideas and perspectives, which may help them re-evaluate their current research, management, or policy strategies. There is still a need to capture, store, and

provide this information for the benefit of those who did not have the opportunity to be directly involved. In this regard, the processes described above also provide the structured resources to support the development of a number of technologically based information components that are relevant to the needs of the wider community of potential users, and consequently more likely to gain their acceptance.

However, as with the other steps of a collaborative approach, there remain a number of issues that are related more to managing a social system than its technical component. Here, one of the major challenges is to promote the use of this technology as part of a socially based information network which conveys the reality that an information system is a collection of participating stakeholders rather than a particular information project or item of technology.

Clearly, for such a information system to advance sustainable natural resource management successfully in the long term it needs to be continually refined and updated. Many of the issues already raised in this paper will continually re-occur as the process continues. As new science emerges from the work of different groups and agencies, ways of ensuring its debate and dissemination will need to be renegotiated. As we seek to encourage the provision of new information from stakeholders (e.g. community-based monitoring systems), we will also have to provide the climate and assurances that such information will be used constructively to guide new ways forward -- and not as a means of penalising the very people that are providing this information.

Participatory evaluation processes are particularly important in these kinds of long-term endeavours, not only to ensure that the project stays on track, but also to help reinforce to researchers and stakeholders alike that continued involvement is worthwhile (Allen 1997, Kilvington 1998). Tracking and acknowledging success can be combined with a number of other initiatives to avoid "burn-out" among the different participants and maintain enthusiasm and motivation.

Collaborative approaches should be flexible, and designed to grow. It may be appropriate to defer involvement of reluctant stakeholders in the beginning, and new stakeholders may be identified along the way. The process must be able to change to accommodate this growth. Community involvement helps create ownership and a feeling of accomplishment in working together to solve a problem. This group dynamic will encourage others from the community and government agencies to participate and provide and manage the information required for making decisions about sustainable resource use.

Concluding comments

In the broadest sense, information systems such as those described in this paper are intended to improve efforts to share information by building trust and confidence between information providers and users. Transparency in information use, breaking down of barriers to information flows, and demonstration of real and tangible benefits, are the key justifications for developing information management systems. The aim is to help information providers and users work together to address important issues collaboratively.

Under such a collaborative approach the guidelines and strategies developed by the stakeholders will draw on a larger base of information than available to any one of the parties acting alone. Because these are developed against this richer information base, they are likely to result in more

effective outcomes. The probability of commitment to, and adoption of, changed practices is also likely to be higher.

Allotting appropriate time and skills to manage conflict and build relationships is an important component of planning projects if the aim is to help different stakeholders share information and develop solutions to shared problems. This should not be avoided, and indeed well-managed conflict can build trust and promote motivation and action. In most of the case studies, closer attention to conflict management would have benefited all parties in their different situations.

Finally, this paper has identified some critical factors in ensuring the success of a collaborative learning approach to improve the use of information within natural resource management:

- effective processes for building and maintaining trust

- the ability to communicate clearly and place problems and information in their wider context

- time to develop a common context or language

- an appreciation that people do not learn easily and without effort

- the infrastructure and information technology (IT) tools to support sharing the necessary information.

- the need to balance the development of technologically sophisticated information systems with social processes to ensure that such information is effectively shared, understood, and used to change behaviour on-the-ground.

In this paper we have chosen to place least emphasis on the infrastructure such an information management system might use. As the most tangible element of information systems management, infrastructure frequently receives the most attention, while ironically it is possibly the easiest part to work on. In fact, as Reynolds and Busby (1996) point out, "it has become clear that the major obstacles to increased use of information in decision making are organisational, not technical in nature, meaning that investments in information technology alone will not provide or deliver a solution". In seeking an information system that is truly part of the broader social system by which information is translated into knowledge and action, we are accepting that there are inevitable challenges. To take up these challenges, multidisciplinary approaches need to include personnel with complementary skills in the management of participation and conflict, and the integration of biophysical and social aspects of problem solving.

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