# Potential Roles of Research in Enhancing the Performance of Management in Securing High Quality Visitor Experiences in Wilderness

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**Abstract**—Does research help managers provide opportunities for visitors to have high quality experiences in wilderness? Difficulties in applying visitor experience research result from several factors: the nature of wilderness itself, the character of the wilderness visitor experience challenge as a research and management topic, and the paradigm of research applications employed by wilderness scientists. Many wilderness visitor research applications seem to be built upon a "hypodermic needle" model of knowledge transfer rather than the more interactive approach needed in a context of rapid policy and social change and uncertainty. This paper suggests scientists and managers consider the long-established, but little used, approach to research applications of forming a community of practice.

## Background

The unique qualities of wilderness landscapes in the United States provide a diverse range of opportunities for visitors to experience naturalness, wildness, a sense of challenge, adventure, and solitude. Wilderness landscapes may serve as the virtual crucibles that enhance one's spiritual well-being and strengthen families and friendships. The landscapes preserved through wilderness designation afford opportunities to learn about the natural world and appreciate the role of nature's ingenuity in providing for human life. The breathtaking beauty, absence of human development, and dominance of natural processes improve our understanding of our heritage and our future.

Opportunities for visitor experiences are explicitly recognized and mandated in Section 2(b) of the Wilderness Act of 1964 which describes wilderness in part as containing "outstanding opportunities for solitude or a primitive and unconfined type of recreation". Section 2(b) of the Eastern Wilderness Act (1975) provides a more inclusive description of a desired visitor experience to include not only solitude but also "physical and mental challenge…inspiration and primitive recreation." Of all the congressional legislation dealing with parks, wilderness and other types of protected areas in the U.S., these are the only two national-scale laws that prescribe the type of opportunity wilderness affords visitors, although similar phrases to the one appearing in the Eastern Wilderness Act do appear in a few state and individual wilderness designation acts. As a result, these experiences are vulnerable to lapses in attention because nowhere else in the American landscape are opportunities for such experiences formally preserved.

I assume this description of a visitor experience is something that Congress was serious about and for which it expected agencies to provide stewardship. While providing for visitor experiences of the type described in the legislation may not be judged a required obligation of wilderness management agencies, the social and cultural importance of opportunities for specific components of visitor experiences cannot be denied.

Relationships between biophysical, social and managerial conditions and these experiences have been subject to a wide variety of research over the last 50 years, beginning most notably with Lucas's work in the Boundary Waters Canoe Area (1964a,b). The diverse character of those studies demonstrates the importance of solitude and primitive recreation to visitors, that experiences are multi-dimensional, that not all visitors to wilderness come to experience solitude, that there are many ways to conceive of visitor experiences, and that the relationships between setting attributes and experiences are probabilistic rather than deterministic.

And yet, despite this extensive research and the explicit mandate from Congress to provide opportunities for specific types of experiences, there are problems in implementing management strategies, policies and techniques to ensure that such opportunities exist. For example, Cole and Williams (in press) argue that managers have been challenged in managing opportunities for the experiences described in the Wilderness Act and Eastern Wilderness Act. In part, this challenge is derived from what can be broadly termed as "inefficiencies" in the transfer of knowledge from this science to actual practice.

In this paper, I focus principally on the underlying structures and mental models of research application in use by science to transfer knowledge and understanding needed to meet the unique visitor experience opportunities mandated by the Wilderness Act and the Eastern Wilderness Act. In

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writing this paper, my observations are impressionistic rather than explicitly empirical and thus remain as hypotheses to be explored, assessed and debated. The paper first puts forth four characteristics of wilderness that make research and its application challenging even to the most competent scientist and the most capable manager. Then the paper moves on to a description of what appears to be the "mental model in use" in contemporary research applications. This mental model will only work if its fundamental assumptions prove to be valid, an issue discussed in a section which re-interprets the character of wilderness visitor management research and suggests the need for another model of research applications. The final section suggests an approach to research applications that should work more efficiently in the 21st century context of post-normal science.

Science plays important roles in assisting management in providing for experiential opportunities. One significant role is "simply" helping frame the question of visitor experiences. As Bardwell (1991) has noted, natural resource problems are often challenging to frame in such a way that they can be successfully resolved. An outstanding example where science has helped frame visitor experience management was the shift from asking the question "how many visitors are too many?" to one that enquires "what are the appropriate and/or acceptable conditions to be maintained in wilderness?" The former oversimplifies questions of visitor management while the latter compels a discussion of the underlying values of wilderness and visitor attitudes.

A second role is to provide empirically-based understanding of what people expect and experience during a wilderness visit. This role encompasses the traditional view of science in visitor management as an "objective" activity that provides management with the data and information needed to not only determine what management direction should be chosen but also to increase understanding of the consequences of each alternative. This role also encompasses developing and testing new concepts and methods for thinking about visitor experiences.

A third role involves helping managers develop frameworks and systematic approaches to the application of science. While data and information are often required as a basis for decision-making, management often needs to "work through" the difficult and messy challenges of visitor management. Frameworks can help management think more critically. Stankey and Clark (1996) suggested that an effective framework (1) identifies tradeoffs between provision of recreation opportunities with the resulting local economic impacts and protection of biodiversity values, (2) appreciates and addresses complexity (rather than suggesting reductionistic approaches), and (3) accommodates the array of constituencies with interests in the specific area or issue.

Recreation and tourism planning frameworks make decision making (1) efficient by focusing attention on important elements of the political and social environment, (2) effective by gaining the public support that is needed for implementation, and (3) equitable by forcing consideration of who wins and who loses in different choices. In an overall

sense, a framework increases the opportunities to practice the "mindfulness" Weick and Sutcliffe (2001) argued is important to deal with the inevitable surprises occurring in an uncertain context.

The saliency and efficacy of such roles, however, are a function of the mental models of knowledge transfer and research applications that both scientists and managers hold and which influence their behavior (Senge 1990). The fundamental assumptions about science, management and systems to transfer research determine the behavior of scientists and managers with respect to their own work and how they perceive and respond to each other. When there are inefficiencies in carrying out these roles due to mental models that are no longer appropriate, science may be inaccurately cast as being irrelevant or unhelpful. In these situations, research problems are rarely framed with the definitive sideboards that classic scientific empiricism requires.

## On the Context for Conducting Research About Visitor Experiences in Wilderness _____

Wilderness is not an easy place to conduct research of any kind, including that on visitor experiences. Not only are visitors often widely dispersed among trails, trailheads, campsites and areas, they often visit to escape the very intrusions social scientists pose as they seek to better understand the experiences these visitors desire. Beyond these practical considerations, there are four specific characteristics of wilderness (McCool 2003a) that make research particularly challenging, even though it may serve as an ideal "laboratory" for visitor experience research.

First, wilderness exists within a dynamic social, political and biophysical context. Change is ever present, at all scales and domains. Wilderness is deeply entrenched in and influenced by trends and patterns occurring within larger social, political and biophysical contexts. Writing about the increased interest in community based conservation advocated by so-called "social constructionists", Belsky (2000) notes

> "A fatal implication of the social constructionists' ascendancy is lack of attention to how political and economic institutions and relations operating at the global or "nonplace based level" affect social and ecological interactions at multiple scales."

When this context changes, such as the importance of various wilderness related values, the character of visitor experiences also changes. In particular, the acceptability of wilderness conditions that facilitate experience may change. For example, changes in preferences for solitude may mean that visitors are willing to accept a greater use density than they formerly did. Changes in preferences may be linked to larger scale social changes. Such changes may occur at speeds and scales that are imperceptible at one time and revolutionary at other. Thus, the meaning of science, conducted at local, site level scales, needs to be interpreted within the context of social processes and preferences occurring at larger scales.

Second, wilderness as a social-ecological system (Andereis and others 1994) is characterized by uncertainty. By system, I mean a holism consisting of a variety of components interacting at different scales with such interactions described by varying temporal delays and spatial discontinuities. Andereis and others (1994) proposed that such systems consist of the resource (wilderness), resource users (visitors), infrastructure (accesses, trails, campsites, information, and so on), and infrastructure providers (the managers, as well as supporting scientists). This system is, of course, nested within the larger dynamic context identified above.

Uncertainty exists because the relationships between causes, such as management actions, and results, such as a specific dimension of visitor experience, are unknown—because of the complexity of the system, the lack of definitive research, and the nature of the coupling between causes and effects. Research-management interactions, under conditions of uncertainty, are bound to be significantly different than when cause-effect relationships are known. Such uncertainty includes how experiences can be conceptualized, defined and measured and what assumptions underlie research-management relationships. The world is uncertain, particularly in the relationship between setting attributes and the experiences visitors construct. In spite of 50 years of research, scientists have conceived of visitor experiences in diverse ways. The variety of approaches to visitor experience research documented in this volume and others (see especially Freimund and Cole 2001) indicate science will continue to raise new explanations and seek new understandings that challenge current ways of thinking. This unsettled character means that the choice of theories or conceptual frameworks to guide research requires considerable dialogue and deliberation.

Third, relationships within the social-ecological system, which not only define wilderness but in which wilderness itself is embedded, are loosely, rather than tightly, coupled. A tightly coupled system is evidenced by quick responses in the dependent variable to changes in the independent variable. In contrast, in a loosely-coupled system, there may be multiple causes for some effects as well as spatial discontinuities and temporal delays between causes and effects. For example, management actions to reduce visitation levels at one trailhead or one wilderness may result in increased use someplace else at a later date. Exactly where and when may not be predictable with any level of accuracy. And given the fragmented nature of wilderness jurisdictions, managers in a wilderness adjacent to another may see unexpected rises in visitation without any forewarning.

Loosely coupled systems are particularly challenging to understand and model, as the temporal and spatial delays involved may be considerable thus limiting our ability to understand relationships between causes and effects. Large scale changes in societal beliefs and preferences about wilderness experiences, for example, may not "appear" in visitor expectations, attitudes and behavior until such changes are well established in society. In the arena of visitor experience quality, research has repeatedly shown, for example, that the correlations between dependent and independent variables (such as use density and

satisfaction) are low with Cole (2001) noting: "Where $r^2$ has been used, density and encounter measures have never explained more than 10 percent of the variation in total satisfaction."

Fourth, wilderness social-ecological systems tend to be non-linearly dynamic. In some cases, for example, a small change in one variable may lead to a large change in another. The well established relationships between use level and both biophysical and social consequences are examples of such nonlinearity. Research has demonstrated, for example, that changes in use level when use is relatively low lead to rather substantial changes in biophysical conditions but at higher levels of use, biophysical changes are relatively small (Cole 1987; Hammit and Cole 1987). In research linking visitor encounters with satisfaction regarding solitude, for example, Stankey (1973) found that above a very low level of encounters per day—say in the range of four to six—visitors become rapidly dissatisfied with their experience.

Thus, relationships between variables are not only loose, but are non-linear, further challenging our ability to understand them. As a consequence, management actions that unintentionally raise encounter levels, however small in an absolute sense, may decrease the flow of benefits to visitors. Actions that limit daily entries on trailheads and river access points that previously had a great deal of daily variation may have effects opposite what is intended. When entry levels are "evened" out, some visitors lose opportunities for solitude that they may have been seeking when choosing a specific day to enter.

The dynamic complexity of wilderness social-ecological systems means that both researchers and managers should expect surprises. Cause-effect relationships established at alpha < .05 may not be true at all times and all places. The research-management relationship then needs some type of resiliency built into it, requiring periodic monitoring, assessment and evaluation, followed by change in management.

In a very real sense, then, the problem of visitor experience management is a wicked (Rittel and Weber 1973) or messy one (Ackoff, 1974). Batie (2008) states: "The causes and effects of the problem are extremely difficult to identify and model; wicked problems tend to be intractable and elusive because they are influenced by many dynamic social and political factors as well as biophysical complexities."

A characteristic of wicked problems is that there is a lack of scientific agreement on cause-effect relationships and broader society lacks agreement on goals. Lack of scientific agreement is clearly visible in the technical discourse when researchers propose and critique various conceptual approaches to wilderness visitor experiences (such as the normative approach debate). There is confusion over what is a "primitive and unconfined" experience. The lack of social agreement leads to conflict and contention over how visitor use of wilderness should be managed not only in civil society but among managers as well.

The role of development and transfer of knowledge in these situations is considerably different than in "tame" situations where science and society agree on cause-effect relationships and goals respectively. McCool and Stanley (2003) conclude:

> "Wicked problems and messy situations—imbued with high levels of scientific uncertainty and conflict

over goals—require new ways of thinking and acting. They highlight the need for decisionmaking grounded in learning—as a means to enhance understanding of both biophysical and social relationships—in accommodation—to address the multiple interests invested in the decision—and in consensus building—to develop the necessary political understanding and support to facilitate effective implementation."

Progress on such wicked problems requires collaboration, particularly between researchers and managers. Researchers query managers to better understand how problems are framed and managers query researchers about the kinds of knowledge and understandings they may provide. McCool and others (2007) assert that the great success of such visitor management frameworks as the Recreation Opportunity Spectrum and Limits of Acceptable Change lies in the manager-researcher collaboration that led to their development. In both cases, the collaboration resulted not only in processes for implementation but also in reframing the problem into a form more productive and useful than previous incantations.

## The Commonly Used Mental Model for Research Applications

It is within this challenging and often contentious context that wilderness visitor experiences are debated, researched and managed. In either developing a research applications program or providing data and implications, scientists are influenced by this context as well as the organizational environment and culture in which they work. That environment generally preferences and rewards publication of results in technically refereed journal articles over working with wilderness managers to see that research outcomes are applied.

It should not be surprising, therefore, that many scientists give little attention to the mental models underlying their approach to research applications and transfer of knowledge to management. It is my impression that, for many, the implicit model at the foundation of application of science to management is depicted as shown in Figure 1. Van Wyk and others (2006) describe this as a "push" approach. What scientists do in this model is provide "stuff" (defined below) to managers to enhance their professional competency such that their performance in visitor experience management will be improved. Enhanced performance may be briefly defined as greater ability to provide satisfactory experiences consistent with wilderness.

This model is based on certain assumptions about the character of the research applications system and the nature of the world. These assumptions (such as, relationships are linear and the world is predictable and with enough data, ultimately knowable), given the description of wilderness above, are likely not to be valid.

What is the "stuff" that science provides managers? For many scientists, the response to this question would be the data collected, the relationships uncovered, and the hypotheses tested and rejected (or confirmed) resulting from a specific empirical study. This perception represents a classic example of "positivistic" thinking that still dominates much of the visitor experience science today. In positivism, meaningful science is that which comes from direct observation or use of our senses, although as an approach to science, this position itself cannot be empirically demonstrated, thus making a logical inconsistency.

However, science provides other and many times more useful stuff. Ackoff (1996) provides a useful categorization of the stuff provided to managers by science: data, information, knowledge, understanding, and wisdom (Table 1). The contents of these categories (what we learn to strengthen professional competency), Ackoff argues, are not only different but also form a hierarchy of "increasing value" to decision-makers, in this case wilderness managers.
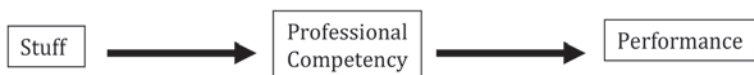


**Figure 1**—Implicit model of research applications apparently used by scientists.

**Table 1**—Character of "stuff" scientists communicate to managers, after Ackoff (1996)

| Item | Definition |
|---|---|
| Data | Symbols representing objects, events and properties—product of measurement |
| Information | Data that has been processed into forms useful for decisions—information is useful in deciding what to do, not how to do it |
| Knowledge | Consists in know-how, how to do something. Knowledge is derived from experience or others who have experience. Transfer of knowledge is the basis of training, but not of education. |
| Understanding | Provides answers to questions about why—understanding is needed to assess the relevance of data and information |
| Wisdom | The ability to perceive and evaluate the long term consequences of behavior—needed to make tradeoffs between short and long terms effects |

The stuff that is frequently transmitted to managers is comprised of data and information, the direct outputs of empirical research. For example, researchers provide managers with reports that detail preferences for site conditions (such as encounters with others), attitudes toward management actions (such as visitor use rationing mechanisms) and responses to questions about desired experiences (how important is solitude, being with friends, challenge and so on). Frequently, this data is quantitative. This is quite natural given positivist tendencies among scientists and the terms of reference for research that managers develop. They want answers to questions such as what experiences do visitors want, how many visitors are encountered in a specific wilderness or what is the relationship between inter-visitor encounters and attainment of solitude. Such data and information is transmitted through the use of written reports and in many situations, a summary oral presentation, supported by Powerpoint slides.

This researcher-manager relationship assumes a "hypodermic needle" approach to capacity building. Inject managers with data and they will act accordingly. In many respects, this relationship is one characterized as a consultant-client affiliation, where researchers acting as consultants hold a contract with the client (manager) to provide certain expertise and information to the client. The contract emphasizes physical deliverables, such as reports and presentations.

Underlying the contractual agreement is an assumption that there is a direct relationship between the presentation of data and information and enhanced professional performance. This model is evident when scientists complete studies and submit reports to wilderness management clients and then move on to other projects in other places. However, reports and presentations, while perhaps efficient ways to communicate data, are not necessarily the efficient and effective approaches for transmitting the knowledge, understanding and wisdom needed to improve managerial performance.

## A Re-Interpretation of the Conditions in Which Wilderness Visitor Mangement Occurs

Science about wilderness visitor experiences has generally progressed along the framework of classical positivistic models of science as noted earlier: literature is reviewed, concepts or theories proposed, hypotheses (implicit or explicit) identified, data collected, analysis conducted and hypotheses supported or refuted. However, there is a real question about the appropriateness of this model of science for management of visitor experiences in wilderness settings characterized by change, uncertainty and contentiousness. Science may progress along the course identified above when conditions are "normal" (Kuhn 1970), but when ""facts are uncertain, values in dispute, stakes high and decisions urgent" (Funtowitz and Ravetz 1991), other approaches to science and applications are needed. Visitor management is a wicked problem and science in such situations needs an approach appropriate to this situation.

I argue here, that the conditions that contextualize wilderness and the visitor experiences afforded by it are not normal, but fit Funtowitz and Ravetz's description above. In general, these conditions can be characterized as follows:

1. A lack of certainty about who is the preferred client for wilderness experiences. This uncertainty derives in part from confusion between the ultimate beneficiary of wilderness preservation (American citizens) and a subset of those citizens who directly receive certain benefits from an on-site experience. It also derives in part from the tendency of visitor research to use averages when reporting visitor data rather than focusing on the various segments of wilderness visitors.

2. The question of what experience opportunities to provide remains problematic. On the one hand, the Wilderness Act provides the mandate of section 2(b); yet on the other hand, managers are often confronted with demands for access to areas for recreation. These competing demands represent conflicting values among visitors.

3. Visitor research does demonstrate that, when considered within the context of solitude, visitors are sensitive to the presence of others. Increases in inter-visitor encounter levels makes attainment of solitude difficult. Decisions that give preference to access over solitude represent potential irreversibilities.

4. Pressures on managers to make decisions urgently are immense, frequently accompanied by little time to conduct the type of research that would fully describe the consequences of alternative decisions.

Funtowicz and Ravetz (1991) argue that these conditions require a sort of "post-normal science", a term developed in response to Thomas Kuhn's (1970) notion of normal science—the course of research where scientists base their activity on the existing conceptual and methodological paradigm. But, as Kuhn argued, eventually evidence mounts that the existing paradigm no longer adequately explains cause-effect relationships and new paradigms are developed in response. This is what Funtowicz and Ravetz describe as a "post-normal" situation.

In post-normal settings, both facts and values are not only in dispute, but confusion between the two is often at the basis of social discourse, making problem framing fundamentally difficult. Thus, in Yellowstone National Park, is the controversy about snowmobiling in the park one about the values that Yellowstone is supposed to preserve or is it about the consequences to the biota of allowing snowmobiles in the park? The former is a statement of conflict in goals, the latter a question of technical knowledge. Even if the policy question is about the latter, managers are still confronted with making value laden decisions, such as how much impact from snowmobiles is acceptable? Acceptability is a fundamental judgment about social preferences.

Funtowicz and Ravetz (1991) contend that the conduct and use of science in a "post-normal" situation (hard decisions must be made with soft facts) must be different than in a "normal"

condition. When faced with socially problematic challenges, science engages an "extended peer community" and considers evidence other than that collected according to strict scientific protocols in addressing these challenges.

Ravetz (2004) states in reference to post-normal science:

> "This new science does not have the luxury of abstracting from the complex problems encountered in the real world; it must cope with them directly. These include not merely the complex interactions at the level of the natural world, but in addition their synergies with profit, bureaucracy, poverty, exploitation and war. For comprehending all this, a science needs clarity and self-understanding; the isolated puzzle-solving approach of traditional 'normal science' is self-defeating here."

The application of science in its purest form, Funtowicz and Ravetz (1991) assert, is inadequate alone to successfully address policy problems in complex social-ecological systems. Extended peer communities (involving researchers, research users, decision makers, and constituencies) help frame problems, determine unforeseen eventualities, identify social acceptabilities, and otherwise deal with the uncertainty of complex social ecological systems. By engaging a variety of perspectives in a dialogue about the character of the problem and the alternatives available, science can provide more useful responses.

## An Alternative Approach to Research Applications

Thus, the post-normal age in which wilderness managers find themselves requires consideration of models of not only how research is conducted, but its framing, methodology and communication of results as well. Most significantly, there remains the question of the desired output of research (such as, data or understanding). Effectively communicating research results on the applied, value-laden problems of wilderness visitor experiences requires a different model from that shown in Figure 1. That model of knowledge transfer implicitly emphasizes data and information, has little focus on learning, emphasizes capacity rather than performance and does not recognize the messy and wicked character of wilderness visitor management.

To manage for high quality wilderness experiences, managers need more than data and information; they need knowledge,

understanding and even wisdom. I follow Ackoff's (1996) argument that much of the existing learning for wilderness experience management is oriented toward transmission of data and information from scientists to managers. This "stuff" is of substantially less value for decision-making than the knowledge and understanding that would come from reflection about underlying patterns, structures and trends. Data tends to be setting specific, and could be constructed, developed and disseminated out of conceptually faulty and analytically troubled methods. A manager may be the receiver of such limited data, but be operating under an illusion of construct validity.

Ultimately, the goal of applied research, in this context, is to improve managerial performance. Improved performance is based on an understanding of the context of science-manager interaction, not just the results of research. If we use systems thinking (Senge 1990), we might conceive a model of science manager interaction which might look like Figure 2.

This model suggests the significant role of factors other than science in enhancing the performance of wilderness managers. In particular, the organization and its basic values, the opportunity to practice (for example implementing a visitor experience management regime, monitoring its effectiveness and changing management as needed) and confidence of the manager represent several factors that Cook (1997) feels are critical to enhanced performance.

While the end objective of applied science is to enhance performance of managers in providing opportunities for high quality visitor experiences dependent on wilderness, an intermediate goal is to build the technical capability (or capacity) to achieve this end result. Technical capacities deal with the knowledge and skills held by managers. For example, increased knowledge about visitor experience preferences is an enhanced capacity. However, this enhanced capacity may not turn to performance because of other factors as shown in Figure 2.

In this model, every one of the linkages contains errors and delays. For example, there is often a delay between scientists presenting the findings of a particular study and implementation of management based on those findings. Too, scientists may err in communicating findings; alternatively, managers may misinterpret findings. In some cases, one manager may commission a particular study, but be transferred elsewhere. The replacement may not attach as much urgency to the research as the original manager.
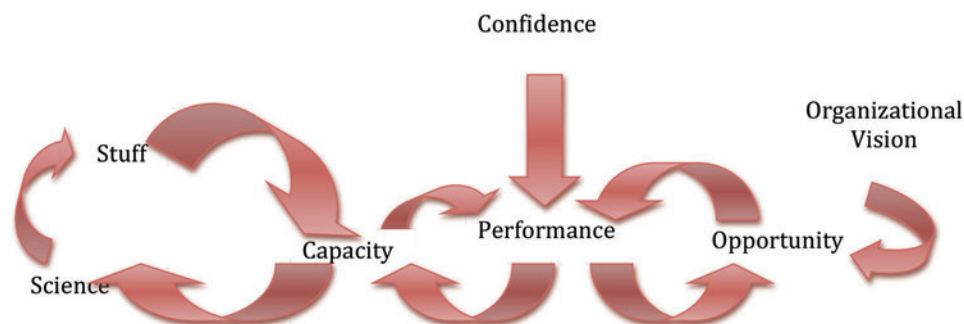


**Figure 2**—More realistic model of capacity building in post normal situation

For example, the model suggests that an organization's vision may impact its priorities. This, in turn, may lead to increased or decreased opportunity which then may affect performance in either a positive or negative way. Of course, there may be other factors in an organization affecting performance, so incentives are just one example. The figure also shows that enhanced performance can increase capacity. As managers are able to practice and learn from that practice, their capabilities to ask more sophisticated questions and absorb more complex data and knowledge also improve.

Application of the results of wilderness visitor experience research thus requires a process to enhance the transfer of understanding and knowledge that is needed for the change in paradigms that Funtowicz and Ravetz propose. As noted earlier, managers generally suffer from a greater lack of acquisition from scientists in these areas than in data and information. Managers often experience a data overload, much of it irrelevant, that is perhaps promoted by researchers as necessary to making decisions.

What sort of process would facilitate understanding appropriate for post-normal situations? One such process might be the model of research applications suggested by Havelock (1972) many years ago (Figure 3). In this model, managerial and scientific systems are linked through a series of interactions or dialogues. The dialogues serve to transmit problems to scientists, as well as understanding of those problems (need processing). They serve to transmit "solutions" (word used by Havelock, not mine) and understandings to managers. They serve to enhance user (manager) self-servicing and they serve to build methodological and theoretical competency (solution building).

Micro-systems processing is the engine of this knowledge transfer model. Micro-systems processing involves the interpersonal interactions and relationships between scientists and managers. A sense of collegiality is needed for effective communication and, as van Wyk and others (2006) argue, helps build shared values and cultures upon which knowledge transfer can occur.

While data is often important in a specific situation, building competency and enhancing performance requires more in the way of knowledge and understanding than data. Can managers and scientists develop the macro-systems needed to enrich the efficiency of research application? This is a good question for the Havelock model has long been proposed in recreation and protected area research applications (McCool and Schreyer 1977; McCool 2003b).

This model can be implemented, but would require changes in the macro-system environment for both scientists and managers. Scientists generally work in academic settings and their behavior is greatly influenced by the reward systems emplaced by those institutions. This reward system generally favors publication in technically refereed journals over iterative discourse with managers. Publication raises the profile of a university and is influential in securing competitive grants and awards.
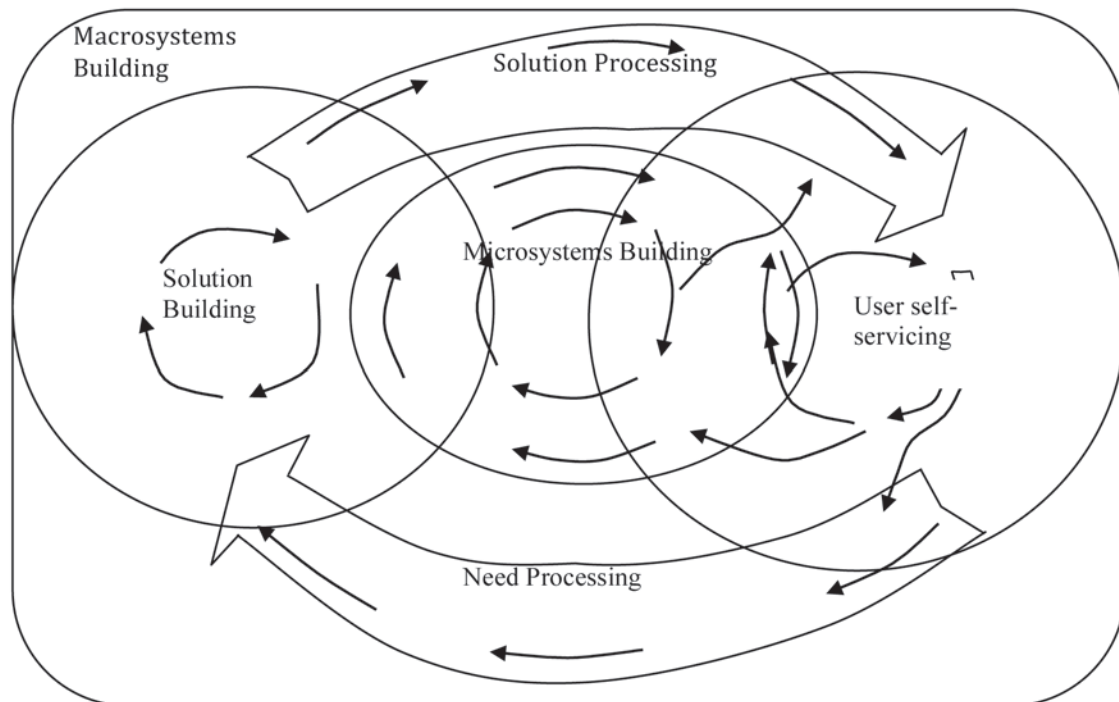


**Figure 3**—Model of research applications and technology transfer developed by Havelock and Havelock 1972.

In addition, at the micro-systems processing level, scientists would need to understand the culture and priorities of management. Engaging managers through professional meetings and workshops, on-site assessments and field trips, classroom discussions, joint problem framing, and informal dialogue helps bridge the cultural gap between management and science and lays the foundation for better communication. Transfer of knowledge, understanding and wisdom is an iterative and symmetrical process.

But more than micro-systems processing is needed to effectively address management of wilderness visitor experiences. One reason concepts such as the Recreation Opportunity Spectrum and Limits of Acceptable Change have become popular is that scientists and managers worked jointly to produce frameworks for implementing the concepts. These frameworks were based on insights gained from research and essentially archived knowledge and understanding. These frameworks were developed by acknowledging the presence of formalized agency planning processes and mandates. To some extent, both ROS and LAC can be integrated into these processes, thus making them easier to adopt.

While there is a substantial research record with respect to wilderness visitor experiences, that record at this point has not been translated into an effective, consumable framework for implementation. The macro-system indicates that experiences need to be attended to, but there is a question whether the micro-system exists to support the scientist-manager discourse to develop a framework for implementing a management regime.

One way to address the question of micro-systems is to develop a community of practice. Wenger and Snyder (2000) define such communities as "groups of people informally bound together by shared expertise and passion for joint enterprise". Advancing knowledge and enhancing performance in a community of practice is facilitated through voluntary engagements, critical discourse, shared experiences and "creative ways that foster new approaches to problems." Rather than focusing on implementation and monitoring of contractual agreements for research, the output is enhanced knowledge and learning, something difficult to quantify and measure. Ultimately the goal is enhanced performance.

A community of practice, as Wenger and Snyder state, is not a team within an agency nor a formal work group initiated to develop a product, service or policy. What makes a community of practice distinctive is the passion with which members pursue learning and excellence in a voluntary way. Such a community of practice involving both practitioners and scientists in the arena of wilderness visitor experience management does not now exist. Developing and maintaining a community of interest works only if membership is voluntary and potential members share commitment to learning.

## Conclusion

The arguably fragile and scarce opportunities for experiences mandated by the Wilderness Act and the Eastern Wilderness Act can only be sustained if managers have the opportunity, confidence and technical proficiency to do so.

Research plays a significant role in building technical proficiency, but I believe has been too focused on communicating data and information rather than the knowledge, understanding and wisdom important for improving performance.

There are many reasons for this, both in the managerial and scientific realms. Structural issues with respect to academic performance incentives and mental models of research applications can be seen as responsible for scientist behavior. Models of data transfer developed out of formal contractual agreements fail to improve managerial performance in a post-normal context because (1) the focus is on data and information rather than knowledge and understanding and (2) do not sustain the micro-systems processing needed to bridge the cultural gaps between science and managers that prevent effective communication.

The post-normal character of visitor experience management requires approaches to scientist-manager interaction that differ from those used in the past. This interaction emphasizes joint learning and problem framing. In the long term, building a community of practice will enhance both managerial and scientific performance. A community of practice focusing on visitor experience management involves scientists and managers on an equal footing with shared goals. Production of data and information in this context will be far more useful than at present.

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