Learning Strategy Framework for the Inkomati Catchment Management Agency

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SECTION 1: INTRODUCTION

1.1 INTRODUCTION

The ultimate purpose of this document is to guide initiatives towards formal mainstreaming of the kind of learning culture necessary to deal with the challenges faced by the Inkomati Catchment Management Agency. The document suggests a series of actions and concepts to consider that encourage staff to debate the meaning of what organisational learning means in their context. The intention is that this ongoing process will institutionalise learning in a way that will improve effectiveness and efficiency of management of our precious water resources.

The structure of the document is largely based on the process of adaptive management.

The contents of this document are a consolidation and refinement of the strategy and underlying learning philosophy presented in the WRC report Roux et al., (2009a).

1.2 LEARNING ORGANISATIONS

This section is based on Roux et al. (2008).
See also Chapter 2 in Roux et al., (2009a) for more detail on the nature of learning organisations.

When change, uncertainty and surprise are common features of everyday life, our capacity to learn takes on special meaning and urgency. One needs to reflect on and extract lessons from past experiences, unlearn outdated habits, consider options for the most appropriate future direction, anticipate change, and strategically acquire new knowledge - all at the same time.

The degree to which organisational learning takes place is determined by the quantity, quality, focus and coherence of learning that is practiced by its members. It would thus make sense for organisations to have strategies in place to understand the learning process in relation to their mandate and strategic objectives. It should also deliberately advance those conditions that enable good learning practices. However, such enabling conditions may vary widely and may be deeply contextual.

A learning organisation is one that is particularly skilled at acquiring knowledge (from external sources), creating knowledge (internally), and sharing knowledge (internally and externally), and, most importantly, at modifying its behaviour to reflect such new knowledge and insights. It is the availability of special human skills and attitudes that will ultimately determine the quality of the learning journey and the effectiveness of responses to external forces.

1.3 REALITY CHECK

Reacting to external forces first requires acknowledging their existence. The natural resource management environment is very demanding for many reasons:

The rate of knowledge production world-wide is ever-increasing. Many knowledge workers suffer from information overload. Knowledge mobility, both electronically and through people relocating, is increasingly easy. There is also acknowledgement of the increasing interdependence of those with knowledge and those who need to apply it (e.g. between scientists and policy makers).

Managing natural resources is about managing social-ecological systems, i.e. linked systems of people and nature. They are complex systems, inherently unpredictable on many levels. The strategic importance of common property resources, like water, also remains undervalued by many.

There are also learning-related realities, each with its own implicit challenges. Learning is context specific. We interpret new information based on theory and past individual experiences. We can learn faster if we have access to willing mentors of superior experience. Learning proficiency is better when it is about something we already know something about.

1.4 THE STRATEGY IN CONTEXT

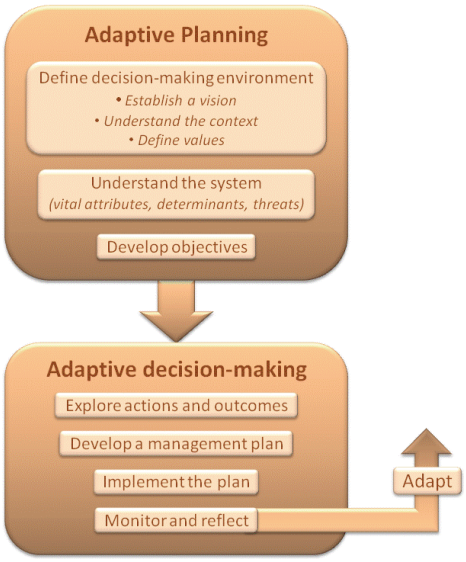
The learning strategy framework below aims to make organisational learning specific to each organisation. The strategy itself is generic although specific organisations may have slight variations.

The actions in the strategy call for staff to reflect on, and debate, what learning and knowledge management means to them now and what it should mean in future. Importantly, it requires consideration of both the personal and organisational relevance. A variety of associated concepts are proposed for discussion.

The outputs of this reflection and debate are entirely organisation-specific, i.e. deeply contextual. These outputs include the learning-related vision, the chosen operating principles, the understanding of the social-ecological system, the learning-related management objectives and associated goals, the management plan, and the way of learning will be monitored, reflected upon and adapted to. It is not likely that two different natural resource management organisations will produce the same outputs.

1.5 ADAPTIVE MANAGEMENT

Adaptive management is an intuitively sensible framework for learning. By its very nature it is about learning by doing in a scientific way to deal with uncertainty. It is a structured iterative process of decision making which treats human interventions in natural ecosystems as experimental probes.



Adaptive management is forward-looking, explicit in its purpose, inclusive, based on co-learning, pragmatic, action oriented, flexible, and continually improving.

Management planning involves consciously predicting and documenting the likely outcome of decisions while acknowledging the uncertainties. The management plan itself is a set of actions, with targets, that follow up on that planning.

Reflection on the monitoring results is done against the targets and predicted outcomes. Future plans, objectives or understanding are adapted accordingly.

Should there be a formal organisational adaptive management process in progress the actions proposed here should take place in an integrated way with that main process.

SECTION 2: THE LEARNING STRATEGY - ADAPTIVE PLANNING

2.1 DEFINE THE DECISION MAKING ENVIRONMENT

2.1.1 Establish a vision

The Vision, Context and Values referred to in this section should be in line with and form a subset of the greater vision of the ICMA in the Catchment Management Strategy of the ICMA.

Action: Engage with staff and selected stakeholders to establish a vision and high-level objective relating to learning and knowledge that will clearly support the organisation's overall vision. This process will aim primarily to establish a common future focus and buy-in in respect of learning and knowledge management.

Concepts to consider: A prototype vision upon which to base the process will be the following:

The Inkomati Catchment Management Agency (ICMA) commits itself to "Learning for work excellence" in striving for its vision of "Water for all in the Inkomati". It also acknowledges that the very nature of learning is such that it pervades every aspect of water resource management in the Inkomati water management area.

The ICMA specifically commits itself to becoming a highly-effective learning organisation, with a particular emphasis on co-learning. This entails becoming very successful at the following:

- Acquiring knowledge from (*i.e.* learning from) external sources.
- Creating knowledge internally by effective processing of acquired knowledge.
- Transferring knowledge amongst staff members, to stakeholders in the water management area, and to other interested parties.
- Adapting when necessary, based on the insights of sound new knowledge, to remain focussed on its learning vision and associated objectives.

2.1.2 Understand the context

Action: Discuss and understand the context within which learning will take place with the ICMA Board, all staff members and selected external stakeholders.

Concept to consider: The discussion will include refinement and ultimate consensus on the underlying knowledge- and learning-related assumptions representing the global, national, and regional realities of water resource management. The discussion should be guided by issues that are **S**ocial, **T**echnological, **E**conomic, **E**nvironmental, and **P**olitical. The following are some examples:

- **There is one learning system**. In this system, all knowledge (*e.g.* scientific, local, traditional, practical, political, etc.) is acknowledged. Each is produced, validated and legitimised through different processes. The ICMA acknowledges that a deep understanding of, and genuine participation in the broader learning system is critical.
- **Social-ecological systems exhibit complexity**. The ICMA acknowledges the relevance of complex systems in their water management area and within the ICMA itself. In effect, this acknowledges that a degree of bottom-up self-organisation will play a significant role in the functioning of the system for which the ICMA is responsible. Importantly, the ICMA also

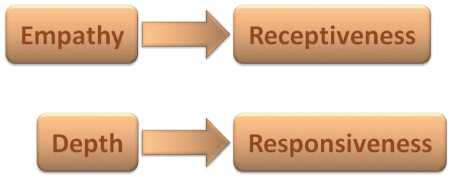
acknowledges that unpredictability goes hand-in-hand with complexity. Both self-organisation and unpredictability have profound implications for the ICMA's management approach.

- **External knowledge-related realities**. Globally there is ever-increasing potential for data and information overload and an increasing rate of knowledge production, availability and mobility. These all increase the interdependence between those with knowledge and those without it (the "haves and the have nots"). South Africa is also faced with limited resources for scientific development.
- **External knowledge-related uncertainties**. A variety of uncertainties exist relating to the future political situation, future tertiary graduate quality, attitudes towards the environment, and the implementability of the Water Act.
- **Internal knowledge-related realities**. Being the first CMA to be established, there are no other local water resource management models from which to learn directly. Dependence on DWAF remains high and difficulties are being experienced attracting highly qualified staff to the ICMA. A number of operational systems are also not yet fully functional.
- **Internal knowledge-related uncertainties**. Uncertainties exist relating to the exact model under which CMAs will function, the capacity of the ICMA to discharge its mandate, and who might emerge as the ICMA's future learning partners.

2.1.3 Define values

Action: Identify, discuss and adopt the values (or operating principles) that will guide learning-related management.

Concepts to consider: An efficient and effective organisation responsible for natural resource management must be both acutely receptive and convincingly responsive. This is achieved by being empathetic on the one hand and having knowledge depth on the other.



2.1.3.1 Enabling ideals

See Chapter 3 in Roux et al., (2009a) for more detail on a philosophy of learning.

Receptiveness and responsiveness are ultimately underpinned by the following fundamentally enabling learning ideals:

- "**Common future focus**" strives to ensure that all stakeholders have agreed to a well-defined vision of the future and that this actively determines what is learned.
- "**Social knowledge sharing**" strives to facilitate freely interactive sharing, inquiry, debate and negotiation of new information between learners and those with the knowledge that should be shared.
- "**Empathy**" strives to stimulate co-creation of new knowledge by nurturing a culture in learners to interact and share with other knowledge systems (cultural, political, scientific, etc.) and knowledge levels (novice, expert) with understanding and an ethic of mutual respect for knowledge (in all its forms), wisdom, culture, language, abilities, concerns and inputs of all stakeholders.
- "**Learning by doing**" strives to ensure that knowledge is also created through hands-on practical experience.
- "**Prior knowledge engagement**" strives to ensure that knowledge creation acknowledges, monitors, adapts to, and builds on what learners already know.

- "**Patience**" strives to ensure that adequate time is allowed for absorbing appropriate knowledge and that the expectations during the learning process, of all concerned, are realistic.
- "**Experimentation**" strives to completely embrace (allow, plan for, and learn from) provisional or exploratory initiatives that are not necessarily guaranteed to succeed or produce short-term desirable results.
- "**Positive persistence**" strives to ensure that learners have determined yet positive and enthusiastic attitudes to acquiring new knowledge.
- "**Transdisciplinarity**" strives to ensure that the knowledge that is created (in individuals and in organisations) is appropriate and adequate at each level in a hierarchy of disciplines (*e.g.* from technical through political to ethical) and, where necessary, adequately detailed (*i.e.* based on deep understanding).
- "**Adaptability**" strives to ensure that individuals learn to manage their own resilience, that is, their capacity to react constructively to disturbance and to change when necessary.
- "**Synergism**" strives to ensure that teams are able to apply routine strategies that result in achievements greater than that attainable by the individuals operating separately ("the whole is greater than the sum of its parts").

Social-ecological systems, as well as organisations, are complex systems. Complex does not mean complicated. An engine is complicated. It is also predictable, at least by those who put it together. A complex system has particular properties that make it *inherently* unpredictable. Being able to recognise a system as complex allows one to better understand that system at least to the extent that one understands why, in a general sense it is the way it is.

It is the unpredictability of such systems that has fundamental implications for their management.

See Chapter 4 in Roux et al., (2009b) for more detail on complex systems.

The following ideals acknowledge complexity and should also underpin adaptive management.

- "**Sensitive persuasion**" acknowledges that self-organising natural and human systems are of such a nature that they cannot function optimally within formal "command and control" management approaches.
- "**Up close and personal**" acknowledges that the nature and extent of interpersonal relationships are core drivers of dominant social behaviours and so strives to make such relationships the focus of learning-related management actions.
- "**Expecting the unexpected**" strives to create and maintain an ever-present mindset of expecting to be surprised.

2.1.3.2 The right people

Consider the following to attract and retain the best minds:

- **Exploit potential environmental attractiveness**. The best professionals tend to have options and will choose a workplace based on perceived attractiveness. Geographic location and physical appearance contribute to such perceptions. For example, the Inkomati CMA has offices in Nelspruit. Marketable factors associated with a move to the "Slowveld" include a higher quality of life and an escape from the rat race.
- **Seek and acquire exceptional skills**. Remember that bright minds attract bright minds. Technical professionals love to work with and learn from acknowledged leaders in their field. A recognised and respected expert that is appointed will serve as a source of organisational credibility and a magnet to new talent. The opposite is also true: The loss of

a highly valued employee may result in other employees questioning whether they should stay.

- **Retain critical expertise in feeder pool**. Don't lose critical expertise from the DWAF Regional Office (currently the primary feeder organisation). Remove some of the uncertainty regarding their potential roles in the CMA through frequent communication.
- **Create enabling support systems**. Knowledge professionals should be able to focus on their primary responsibilities and not be constrained by system shortcomings and distracted by unnecessary administrative duties.
- **Nurture a network of strategic relationships**. Don't try to own all the knowledge needed for executing your mandate. Rather create and nurture a strategic knowledge network. Nodes in the network should include stakeholders, academics, consultants and previous employees with valuable contextual knowledge.

2.1.3.3 Nurture all

Consider the following:

- **Experiment with opportunities**. Explore explicitly how to make the most of each person in the organisation. Provide opportunities for all to flourish.
- **Be receptive and responsive**. Acknowledge the existence of people who may have unaligned agendas. Don't underestimate the damage they can do. Look out for signs of emerging unacceptable behaviour. Respond sensitively and with empathy when unacceptable behaviour does emerge. Get to the core of the causes and address them.
- **Establish learning standards up front**. Sensitise new staff to the learning standards expected of them (e.g. common future focus, social knowledge sharing, and empathy).

2.1.3.4 The right environment

Consider the issues presented in the following boxes:

The right environment: Build knowledge depth and breadth

To become a Jack of all trades you must first be Master of at least one.

The concept of a Catchment Management Agency is new to South Africa. Early investment in acquiring the breadth and depth of knowledge required to adequately discharge its mandate is of utmost importance. The start-up phase presents a once-off opportunity to start with a clean slate. The type and level of skills that the CMA will acquire through recruitment and appointment will determine its ability to deliver on its mandate.

- **Cover all bases**
  - ***Have some in-house capacity in all necessary disciplines:*** The following disciplines are critical: Aquatic ecology (at least two specialisations from botany, ichthyology and entomology), botany, water quality (including chemistry, microbiology and toxicology), hydrology, geohydrology, geomorphology, GIS, water resource planning and operations, administrative, legal and financial management support, stakeholder engagement (including the functions of ecosystem governance and strategic adaptive management) and communications. A combination of social facilitation skills and technical background is required.
  - ***Leverage external knowledge through internal depth:*** The CMA needs a certain minimum, "critical mass" of in-house depth of relevant knowledge to be able to identify, absorb and exploit knowledge that exists outside the CMA.
  - ***Perform a formal capacity needs analysis***.

- **Cover core bases in depth**
  - ***Appoint some recognised experts:*** Significant depth of understanding and experience is required in the critical disciplines, namely, aquatic ecology, water quality (including chemistry, microbiology and toxicology), hydrology and geohydrology, water resource planning, management, and stakeholder engagement.

- **Fill gaps in depth from external network**
  - ***Develop strategic relationships:*** Knowledge flows across organisational boundaries are enabled by inter-personal relationships and networking which require time to establish.

- **Balance experts and novices*:*** Appoint staff to reflect a balance between seasoned professionals and novices to facilitate mentoring and succession. Attract experts first. Quality experts will tend to attract quality novices.

- **Find some integrators*:*** Ensure there are some individuals with depth of knowledge and breadth of experience who also have the skills for integrating across disciplines and knowledge forms. Create a post called, for example, "project integration manager" with a job description that is explicitly cross-cutting and multi-disciplinary.

The right environment: Learn and unlearn

Old dogs must learn new tricks.

The complex nature of organisations and social-ecological systems and the unprecedented nature of CMAs will inevitably require new learning. Although each individual in a CMA will have a history, the CMA has no collective organisational history or memory specific to its identity. The ex-DWAF staff will bring a collective DWAF history to the CMA. However, the unique nature of CMAs will necessitate continual learning of new concepts and require suppressing and discarding outdated habits.

- **Learn continuously*:*** The intellectual capital within the organisation should be nurtured and grown continuously:
  - ***Build both individual and group skills***. See Box: Facilitate individual and group learning.
  - ***Provide learning opportunities***: Support attendance of, and especially participation in, relevant conferences, workshops, symposia and training courses. Promote ongoing formal education and actively encourage exposure to fieldwork.
  - ***Build confidence:*** Use mentors and allow for making mistakes. Allow especially for reflective learning from mistakes.

- **Capture learning in explicit form:** Tacit and implicit knowledge needs to be made explicit (*e.g.* by writing a report) so that it can be shared, stored as part of the organisational memory, and be available for future reference. Capturing learning in this way should be firmly institutionalised.

- **Know when to unlearn:** Encourage the self-confidence and humility required for exposure to new ideas and mental models.
  - ***Value mavericks:*** Use them to test prevailing paradigms.
  - ***Use double- and triple-loop thinking:*** This will quickly expose when unlearning is necessary. See Box: Apply single-, double- and triple-loop learning.
  - ***Reinforce newly adopted ideas:*** Ensure there is sufficient reinforcement of new concepts to discourage falling back on old inappropriate habits.
  - ***Give it time:*** Create enough reflective time and appropriate physical space to enable disconnection from old mental models (like in a sabbatical or retreat).

- **Know how to unlearn:**
  - ***Manage with sensitivity:*** Unlearning requires people to move out of comfort zones. Imposed unlearning can therefore have emotional costs.
  - ***Do succession planning:*** Minimise the adverse effects of unlearning occurring through unplanned, and in some cases, even planned staff losses. Design innovative strategies to retain good staff.
  - ***Nurture relationships:*** Implement sensitive exit strategies with staff leaving the organisation. Create opportunities to subsequently engage with them to retain their critical knowledge within the learning network by focussing on the special interests (especially “deeply embedded life interests”).

The right environment: Respond rapidly but reflect patiently

"Quality of life depends on what happens in the space between stimulus and response."
(Covey et al., 1994)

A CMA environment is complex and surprise is inevitable. A stark reality is the need to respond efficiently and effectively to new situations as they arise. While some "fire fighting" is almost inevitable, there is also a critical need for ensuring that this does not occur at the cost of careful and reflective thought.

- **Build a supportive network**
  - ***Build knowledge breadth and especially depth***: Experience (which creates knowledge depth) will often be essential to effective response. However, both breadth and depth are important.
  - ***Nurture allies***: Create strategic alliances with organisations such as NGOs, universities, parastatals and government departments. Know the capabilities of individuals and develop deep relationships with them, sufficient to be comfortable calling them in an emergency and to involve them seamlessly in projects of interest to both parties.
  - ***Rely on experience***: Look to the experienced people in your organisation and in the wider learning network for guidance. But don't abuse them.
  - ***Take turns***. Consider taking turns to fight the fires.

- **Cultivate a reflective learning capacity**
  - ***Nurture role models***: Support, empower and learn from role models that may emerge who are able to practice reflective learning amidst the chaos.
  - ***Make the time***: Use occasional undisturbed retreats that deliberately create space for both general learning and reflective learning (*e.g.* capturing lessons learnt, double- and triple-loop thinking). These can improve the way things are done in future. See Box: Apply single-, double- and triple-loop learning.

The right environment: Facilitate individual and group learning

"Interdependence is and ought to be as much the ideal of man as self-sufficiency. Man is a social being." (Gandhi)

Learning, in essence, takes place at the level of an individual. However, most learning takes place in and is influenced by a social context (*i.e.* it is socially mediated). The CMA staff learning and broader extended learning network must grow in both size and quality. In particular, opportunities for learning in diverse social contexts should increase. Each individual, and the organisation as a whole, must find the right balance between the degree of individual learning and social learning.

- **Acknowledge that both are important.**

- **Explicitly facilitate individual learning.**
  - ***Create the space:*** Make physical space available and allow the time. Ensure the impression is created that learning takes place "on duty" and "off duty".
  - ***Cater for individual preferences:*** Allow for preferred modes of learning (for example, see Box: Use theory and practice).

- **Manage group learning.**
  - ***Create the space:*** Use anything from the tea room to stakeholder meetings.
    - Encourage the sharing of mental models.
    - Promote the use of role models, secondments and apprenticeships.
    - Support participation by allowing attendance at relevant events.
    - Acknowledge that effective group learning takes time.
  - ***Employ team players.***
  - ***Employ connectors:*** Find people who have networks and who can create them.
  - ***Facilitate connectedness:*** Use appropriate technology to connect, like cell phones, and email. Make adequate provision for subsistence and travel costs.
  - ***Know the brain profiles:*** Use this knowledge to encourage self-awareness and knowledge of the personalities and styles of others to optimise group learning.
  - ***Nurture effective communities of practice:*** Support and influence (but don't command and control) their identity, engagement, alignment, and impact. Nurture good inter-personal relationships that emerge.
  - ***Engage, don't try to own:*** Don't try to acquire all knowledge. Engage your knowledge with the network. Learn how to effectively participate in broader learning systems – to be one part of a larger process where the benefit is mutual.
  - ***Sensitively expose and rectify:*** Use group learning opportunities to sensitively expose and rectify incorrect knowledge (factual or interpretive) that may be held by an individual or sub-group.
  - ***Learn with empathy:*** To fully understand and appreciate the contexts of your learning partners it may be necessary to spend time with key learning partners, *e.g.* through a temporary secondment to an irrigation board.

- **Don't leave others behind:** Beware of fragmented "ivory tower" learning when the link between an individual's or group's mental model and the shared mental model is broken or weakened. This can result in isolation. On the other hand, in some instances it may be beneficial for the organisation to allow a group to make optimal use of a specific learning opportunity (*e.g.* a new technology) without waiting for the rest of the organisation. However, at some point care should be taken to actively share such small-group mental models to expand the base of organisational shared meaning.

The right environment: Use theory and practice

"There is nothing as practical as a good theory."

Most problems require a combination of both theory and practice in order to be tackled effectively. Optimal learning also requires data, information, experience (often deepened through learning by doing) and theory (that provides the context for interpreting the information and experience). A balanced portfolio of theorists and those who are more practically inclined, and an environment that gets them communicating, can be a powerful basis for highly constructive synergism.

- **Learn by doing**: Create opportunities for staff members to do things themselves.
  - ***Get feet wet***: Physically seeing, smelling, and feeling your water resources can provide deep everlasting perceptions and perspectives.
  - ***DIY***: Let junior staff do things themselves, like write reports or engage with stakeholders. This creates confidence and builds experience.

- **Embrace theory**: Don't shy away from it.
  - ***Understand the role of theory***: Theories and good models (especially simple conceptual models) help put data, information, observations, etc. in a broader context.
  - ***Tackle tough concepts***: Understand the basics of theories such as complexity, resilience, systems thinking, etc. They create perspectives that will not only help you understand the world around you, but also help you cope with its demands.
  - ***Combine theory and practice through own research***: Constantly formulate research questions to facilitate systematic probing, investigation, sense-making and learning.

- **Acknowledge deeply embedded life interests**:
  - ***Know your colleagues***: Bosses should know their staff better than they know themselves. Know what they are passionate about (*e.g.* are they natural theorists or natural field practitioners?).
  - ***Align tasks accordingly***: Align job descriptions with these interests. Don't simply use job description templates.

- **Optimise your people portfolio**:
  - ***Acknowledge a range***: Some naturally theorise while the field-work junky samples and analyses everything in sight. Be tolerant of both.
  - ***Get the right balance***: The "right" balance for your organisation will emerge over time and will be dynamic.
  - ***Viva la difference***: Encourage diversity in the approaches of people. However, always nurture an effective social knowledge sharing environment.

The right environment: Build on prior knowledge but also experiment

"The group [of monkeys] moves more, is more exploratory, is more playful than there is any need for on an average day, but by so doing it is preparing for crises. The individual animals appear stronger and more intelligent than is necessary for normal activity, but survival requires coping with the rare event."
(Washburn and Hamburg, 1965)

Related prior knowledge is necessary to respond effectively to a new challenge. Therefore, the collective prior knowledge of the CMA's staff will determine how effectively the CMA can respond to everyday responsibilities and challenges. Indeed, it will also determine which challenges the CMA cannot respond to. Appropriate prior knowledge also enables the CMA to follow due process and accept accountability knowing that due process was followed to the best of their ability. The early growth phase of a CMA also offers a unique degree of freedom to explore options before standardising procedures.

Structured experimentation presents a mechanism for systematically exploring and choosing future options. In addition, when there is only limited understanding of a problem (*i.e.* when a theory is not available) experimental learning is the only way forward. Because the CMA operates in a complex system, the Water Act, associated policies and strategies, as well water use license conditions should not be viewed as "cast in stone". Rather, the social and ecological feedbacks from implementing these mechanisms should be monitored and studied to facilitate adaptive improvement over time.

- **Acknowledge prior knowledge as a strength.**
  - ***Align knowledge and responsibility:*** Ensure alignment between the prior knowledge (based on previous experience and training) and the functional responsibility of individuals. Equivalently, don't put the wrong people in the post.

- **Periodically test the relevance of prior knowledge.** (See also Box: Learn and unlearn.)
  - ***Allow experimentation***: Create some space for deliberate experimentation beyond immediately relevant boundaries of current needs and abilities. As active experimentation becomes an integral part of the culture, experimental learning will naturally help to modify beliefs and mental models that reside in the organisation.
  - ***Encourage social knowledge sharing***: Networking and active knowledge sharing (on an equal power base) within the extended learning network will help to prevent the organisation becoming self-referential. See also Box: Facilitate individual and group learning.
  - ***Learn with humility***: Learners need to be sufficiently self-confident and have sufficient humility to be open to alternative mental models when learning with stakeholders and colleagues.

The right environment: Apply single-, double- and triple-loop learning

"An unreflective fastness always returns you to the same place."
(Cilliers, 2006)

When you have created time for reflection, what kind of thinking can we use to help us reflect in a structured and meaningful way? One useful framework involves thinking at various, and ever-deepening, levels varying from single- through to triple-loop thinking. Each has its place. Each has its time. However, each also has its ramifications.

- **Continually improve:** It is important that agreed procedures are implemented correctly. Apply single-loop learning (in effect, quality control) to ensure you not only maintain high standards but improve on them when necessary. This is critical for a CMA environment in which 'due process' is an essential, if not legal, requirement.

- **Get to core:** Reflect on core assumptions (double-loop thinking) and even underlying values (triple-loop thinking) that underpinned an action or strategy (either successful or otherwise).
  - ***Prepare for and respond to unpredictability:*** Apply double- and triple-loop thinking more frequently in systems that are unpredictable, particularly when you have perhaps been caught off guard. Why did it happen? What should be done in future?
  - ***Encourage open non-threatening debate*:** Negotiate meaning and compare and analyse mental models to get to grips with underlying assumptions and governing values. Both double- and triple-loop thinking are useful when developing a common vision in a multi-stakeholder environment. The core assumptions and values of stakeholders can be identified and hence be better understood by others.
  - ***Prioritise relevance:*** Double- and triple-loop thinking help prioritise the relevance of incoming knowledge (and hence manage information overload more effectively).

- **Apply adaptive management.**
  - ***Do things better next time:*** Understand that single-, double- and triple-loop thinking and learning are the critical stages that result in doing things differently in future, *i.e.* adapting.
  - ***Have well-defined thresholds of potential concern (TPCs):*** Associate the TPCs with real actions (like "Have a management meeting to decide on how to respond. Document the decisions. Monitor follow-up actions and their effects.").

- **Share the learning.**
  - ***Capture the lessons:*** Make time to capture new experiential learning. (See Box: Respond rapidly but reflect patiently.)
  - ***Avoid fragmentation:*** Share the learning widely to avoid mental models becoming fragmented from the organisation and hence preventing the organisation from benefiting. (See Box: **Error! Reference source not found.**.)

2.2 UNDERSTAND THE SYSTEM

Action: Probe in greater depth the general nature of the organisation itself and its social-ecological system. A critical input to this process is the current understanding of the status quo in the area, including all issues relating to resource use and protection. The purpose is to identify vital attributes, determinants, and values which are core factors in the way the systems (social, ecological, economic, etc.) in the area function.

Once identified, examine these in depth and identify the factors that strengthen or weaken the vital attributes.

2.3 DEVELOP OBJECTIVES

Action: Develop learning-related objectives that are agreed to by all. Break down into achievable management goals.

Concepts to consider: Given the nature of learning and knowledge, acknowledge the need for a nurturing management style rather than one that applies a quantitative "tick-box" mentality to monitoring progress and assessing staff performance. Accordingly, do not overemphasise quantifiable learning targets. Emphasis should be on job satisfaction and qualitative assessments of the value of learning-related achievements.

Relate objectives and goals to the above-mentioned contexts of the right people and the right environment and based them on the shared understanding developed within the organisation of the above learning ideals.

SECTION 3: THE LEARNING STRATEGY - ADAPTIVE DECISION MAKING

3.1 EXPLORE ACTIONS AND OUTCOMES

Action: Explore a variety of learning-related actions and explicitly consider likely outcomes in each case.

Concepts to consider: This brainstorming prepares the organisation for making decisions and helps weigh up options.

- **Identify potential advantages**. Identify the main reasons for adopting each action.
- **Consider the practical implications**. How will the action be executed in practice? Is the manpower and competence available?
- **Identify potential pitfalls**. Identify explicitly what might go wrong or what might impede implementation of the action.

3.2 DEVELOP A MANAGEMENT PLAN

Action: Identify, discuss and adopt the values (or operating principles) that will guide learning-related management.

Concepts to consider: Specific actions can include:

- **Establish data management facilities.** Information management relies on a sound data management system. Put in place appropriate systems for data acquisition, storage, and retrieval.
- **Establish information management facilities**. Knowledge management relies on a sound information management system. Examine information requirements of staff members. If appropriate, establish a library of relevant publications. Both data and information management facilities address the organisation's vision of an effective learning organisation being able to acquire knowledge effectively.
- **Identify group learning facilities**. Give specific attention to allocating pleasing and practical locations for groups to come together, either at a moment's notice or with more foresight, possibly at more remote locations for more in-depth interactions and social knowledge sharing.
- **Identify opportunities for group learning and "learning by doing"**. Identify opportunities for staff to work and learn together in an integrated manner on real natural resource management projects.
- **Capture reflective learning**. Devise a system that facilitates learning-based deep reflection on successes and failures. Consider how the outputs of such sessions will be captured and how the learning will subsequently be made available. This issue directly addresses the organisation's vision of an effective learning organisation being able to create and transfer new knowledge.
- **Develop a poster of learning ideals**. Develop a poster (or series of posters) that capture the basic learning ideals in a simple, pleasing and communicative manner that is relevant to the water management area. Displayed in the organisation building especially including locations frequented by visitors and external stakeholders.

- **Predict and document the expected outcomes**. For each of the above specific actions, the consequences for learning and knowledge management will be predicted and documented.

3.3 IMPLEMENT THE PLAN

Action: Implement the plan in a spirit of receptiveness, sensitivity, responsiveness and a willingness to adapt.

Concepts to consider:

- The learning journey is about constant vigilance.
- Employ an external learning specialist to facilitate your process and add to the richness of your journey.
- Nurture tacit knowledge. Store explicit knowledge.
- Be a gardener sensitive to the environment and feedbacks from the garden. Facilitate richer growth.

3.4 MONITOR, REFLECT AND ADAPT

Action: Every two years (or more frequently) reflect on the degree to which the installed learning-related systems have achieved the documented objectives and outcomes. Between such formal overall reviews, more frequent monitoring of sub-processes will also take place.

Concepts to consider: Ask staff members to qualitatively assess the effectiveness of the systems in an open and honest manner. Consider a reward system, at least entailing recognition within the organisation, for outstanding contributions to learning and facilitating an organisational learning culture. If learning-related systems are not up to expectations, ensure there are specific management decisions to refine or replace the systems.

- The attainment of specific high-level and low-level objectives.
- The effectiveness of recruiting appropriate staff.
- Progress in updating and maintaining data and information processes.
- Effectiveness of group learning and “learning by doing” projects.

SECTION 4: EXPLANATION OF TERMS

Community of practice

A community of practice is a group that emerges naturally, organising itself. They share a passion and meet regularly and informally to learn and practice how to do things better. Identity is defined by the task (e.g. fishing or photography) and the specific area of knowledge (e.g. yellowfish or underwater photography). The community typically develops relationships that enable very effective knowledge sharing and problem solving. It is not merely a community of interest – they actually practice something and accumulate considerable practical knowledge (i.e. depth) over time. One of the primary implications for management is that such self-organising communities don't take kindly to command and control. They need nurturing and sensitive persuasion.

Complex systems

Social-ecological systems, as well as organisations, are complex systems. Complex does not mean complicated. An engine is complicated. It is also predictable, at least by those who put it together. A complex system has particular properties that make it *inherently* unpredictable. Being able to recognise a system as complex allows one to better understand that system at least to the extent that one understands why, in a general sense it is the way it is. It is the unpredictability of such systems that has fundamental implications for their management.

See Chapter 4 in Roux et al., (2009b) for more detail on complex systems.

Deeply embedded life interests

Deeply embedded life interests are subjects or activities about which people are profoundly passionate and that make them happy. Examples include application of technology, quantitative analysis, theory development and conceptual thinking, creative production, counselling and mentoring, managing people and relationships, enterprise control, and influence through language and ideas (Butler and Waldroop, 1999).

Knowledge

Knowledge is that which is known, or knowable by a person that can contribute to their capacity to act effectively (partly based on Dawson 2000). It can be explicit or tacit. It can be information that has been deeply contextualised using theory or experience (or both). An example is a water quality measurement (the datum) that has been assessed against a water quality guideline where (a) the theory of origin of the guideline is well understood or (b) there is long experience of the historical trend of this variable and its management. In either case, this extra contextualization can significantly contribute to a greater capacity to act effectively in the management of that variable.

Knowledge depth

Knowledge depth refers to the acute factual and contextual understanding of the subject to the extent that tacit knowledge becomes an integral part of communicating that understanding.

Knowledge, explicit

Explicit knowledge is information in explicit form (e.g. stored in written form, equations, in databases, specifications, guidelines, etc.).

Knowledge, tacit

Tacit knowledge is knowledge that exists only in a person's head. It is often highly personal, context specific and difficult to make explicit and share (Nonaka et al., 2001).

Learning

Learning is the creation of knowledge.

Learning organisation

A learning organisation is one skilled at (a) creating, (b) acquiring and (c) transferring knowledge, and (d) at modifying its behaviour to reflect new knowledge and insights (Garvin, 1993).

Organisational memory

Organisational memory refers to how organisations encode, store, and retrieve the lessons of history despite the turnover of personnel and the passage of time (Levitt and March 1988). It provides a means to retain and transmit information from past to future members (Stein 1995).

Reflection

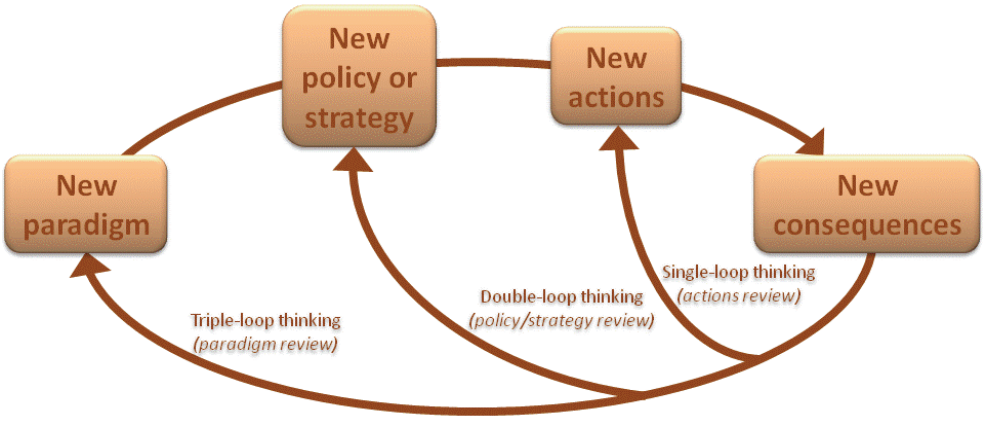
Reflection is the practice of stepping back to ponder the meaning to self and to others in one's immediate environment about what has recently transpired (Raelin, 2001).

Self-referential

Self-referential refers to being internally focussed, based on the individual's or group's own experience and lacking in external peer review.

Single-, double- and triple-loop thinking

Apply single-loop thinking (much like quality control) to ensure you not only maintain high standards in what you practice but improve on them when necessary. Reflect on core assumptions (double-loop thinking) and even the underlying values (triple-loop thinking) or paradigms that underpinned an action or strategy whether it was successful or not. Capture the learning explicitly. Do things differently in future. This kind of thinking also helps prioritise the relevance of incoming knowledge (and hence manage information overload more effectively). All three kinds of thinking are fundamental to effective adaptive management.



Unlearning

Unlearning means abandoning the application of previous knowledge in favour of newer knowledge considered to be more appropriate (Nystrom and Starbuck, 1984).

SECTION 5: REFERENCES

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