
The knowing organization as learning organization

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Abstract

Examines the information processes that support organisational sense-making, knowledge creation and decision making. Sense-making involves interpreting the raw data of the environment by enactment, selection and retention. New knowledge is created by knowledge conversion, knowledge building, and knowledge linking. Completely rational decision making would involve identifying alternatives, projecting the outcomes of each alternative and evaluating the alternatives and their outcomes according to known preferences and objectives. In the organisational knowing cycle, a continuous flow of information is maintained between sensemaking, knowledge creating, and decision making, and the outcome of information use in one mode provides the elaborated context and the expanded resources for information use in other modes. An illustration is given of a knowledge cycle in the World Health Organisation Smallpox Eradication Programme in which continuous cycles of interpretation, innovation and adaptive action underpinned the success of the project.

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Introduction

Organizations use information in the three arenas of sensemaking, knowledge creation, and decision making. Organizational knowing emerges when the three modes of information use are connected to each other to constitute a larger network of processes through which the organization constructs shared meanings about its actions and identity; discovers, shares, and applies new knowledge; and initiates patterns of action through search, evaluation, and selection of alternatives.

The knowing organization possesses information and knowledge that confer a special advantage, allowing it to maneuver with intelligence, creativity, and occasionally, cunning. The knowing organization is well-prepared to sustain its growth and development in a dynamic environment. By sensing and understanding its environment, it is able to prepare for adaptation early. By marshalling the skills and expertise of its members, it is able to engage in continuous learning and innovation. By applying learned decision rules and routines, it is primed to take timely, purposive action. At the heart of the knowing organization is its management of the information processes that underpin sensemaking, knowledge-creating, and decision making (see Figure 1).

Sensemaking is precipitated by a change or difference in the environment that creates discontinuity in the flow of experience engaging the people and activities of an organization (Weick, 1979). These discontinuities provide the raw data from the environment which have to be made sense of. The sensemaking recipe is to interpret the environment through connected sequences of enactment, selection, and retention (Weick, 1995). In enactment, people actively construct the environments which they attend to by bracketing, rearranging, and labeling portions of the experience, thereby converting raw data from the environment into equivocal data to be interpreted. In selection, people choose meanings that can be imposed on the equivocal data by overlaying past interpretations as templates to the current experience. Selection produces an enacted environment that is meaningful in providing cause-effect explanation of what is taking place. In retention, the organization stores the products of successful sensemaking (enacted

Figure 1 Sensemaking, knowledge creating, and decision making

Model	Process	Modes	Interactions/Resources
SENSE-MAKING	Environmental change → Enactment, selection, retention → Enacted interpretations "Looking backward": Retrospective sensemaking	<ul style="list-style-type: none"> • Belief-driven processes • Action-driven processes 	
KNOWLEDGE CREATING	Knowledge-gap situation → Tacit, explicit, cultural knowledge → Knowledge conversion, building, linking → New knowledge "Looking across many levels": Multilevel learning from individuals, groups, organizations	<ul style="list-style-type: none"> • Knowledge conversion • Knowledge building • Knowledge linking 	
DECISION MAKING	Choice situation → Alternatives, outcomes, preferences → Rules, routines → Decisions "Looking ahead": Goal-directed, future-oriented	<ul style="list-style-type: none"> • Rational • Process • Political • Anarchic 	

or meaningful interpretations) so that they may be retrieved in the future.

Organizational sensemaking can be driven by beliefs or by actions (Weick, 1995). In belief-driven processes, people start from an initial set of beliefs that are sufficiently clear and plausible, and use them as nodes to connect more and more information into larger structures of meaning. People may use beliefs as expectations to guide the choice of plausible interpretations, or they may argue about beliefs and their relevancy to current experience, especially when beliefs and cues are contradictory. In action-driven processes, people start from their actions and grow their structures of meaning around them, by modifying the structures in order to give significance to those actions. People may create meaning in order to justify actions that are visible, deliberate, and irreversible (committing actions), or they may create meaning in order to explain actions that have been taken to induce changes in the environment (manipulating actions).

Knowledge creating is precipitated by a situation which identifies gaps in the existing

knowledge of the organization or the work group. Such knowledge gaps stand in the way of solving a technical or task-related problem, designing a new product or service, or taking advantage of an opportunity. An organization possesses three kinds of knowledge: tacit knowledge embedded in the expertise and experience of individuals and groups; explicit or rule-based knowledge codified in organizational rules, routines, and procedures; and cultural knowledge expressed in the assumptions, beliefs, and norms used by members to assign value and significance to new information or knowledge. New knowledge is created by knowledge conversion (Nonaka and Takeuchi, 1995), knowledge building (Leonard-Barton 1995), and knowledge linking (Badaracco, 1991; Wikstrom and Normann, 1994). In knowledge conversion (Nonaka and Takeuchi, 1995), the organization continuously creates new knowledge by converting between the personal, tacit knowledge of individuals who develop creative insight, and the shared, explicit knowledge by which the organization

develops new products and innovations. Tacit knowledge is shared and externalized through dialogue that uses metaphors and analogies. New concepts are created, and the concepts are justified and evaluated according to their fit with organizational intention. Concepts are tested and elaborated by building archetypes or prototypes. Finally, concepts which have been created, justified and modeled are moved to other levels of the organization to generate new cycles of knowledge creation. In knowledge building (Leonard-Barton, 1995), the organization identifies and nurtures activities that build up knowledge which strengthens the organization's distinctive core capabilities, enabling them to grow over time. These knowledge building activities are: shared problem solving, experimenting and prototyping, implementing and integrating new processes and tools, and importing knowledge. Individuals with diverse signature skills work together on solving a problem. Through experimentation and prototyping, the organization extends its existing capabilities, and builds new ones for the future. Successful implementation of new tools and processes requires users and technology to mutually adapt and to complement each other. Knowledge about the technology as well as the market is imported from outside the organization and absorbed. In knowledge linking (Badaracco, 1991), the organization forms intimate learning alliances with other organizations in order to transfer knowledge that is embedded in the specialized relationships, work cultures and operating styles of the partner organization. Wikstrom and Normann (1994) see an organization as a knowledge-creating value star at the center of many incoming flows of knowledge from suppliers, customers, and other partners. Knowledge is transformed into value not only within the organization, but also through knowledge-based interactions with its customers, suppliers, and other partners.

Decision making is precipitated by a choice situation, an occasion in which the organization is expected to select a course of action. Completely rational decision making involves identifying alternatives, projecting the outcomes of each alternative, and evaluating the alternatives and their outcomes according to known preferences or objectives. These information gathering and information processing requirements are beyond the

capabilities of any organization or any individual. Depending on the degree of uncertainty about the goals to be pursued, and the degree of uncertainty about the methods and procedures available to attain these goals, an organization adopts one of four modes of decision making. In the boundedly rational mode, when goal and procedural clarity are relatively high, choice is simplified by performance programs (March and Simon, 1993) and standard operating procedures (Cyert and March, 1992) which execute the search and decision rules and routines that the organization has learned. In the process mode, goals are strategic and clear but the methods and alternatives to attain them are uncertain. Decision making becomes a dynamic process of search or development marked by interruptions and iterations. The process shows a general structure: it begins with problem identification, followed by development of alternatives through searching for ready-made solutions or designing custom-made ones, and ends with the evaluation and selection of an alternative. In the political mode (Allison, 1971), when goals are contested by multiple groups but each group is clear about its preferred alternative, decisions and actions are the results of the bargaining among players pursuing their own interests and manipulating their available instruments of influence. Political decision making may then be likened to game-playing, in which players take up positions, stands, and influence, and make their moves according to rules and their bargaining strengths. In the anarchic mode, when goal and procedural uncertainty are both high, decision situations consist of relatively independent streams of problems, solutions, participants, and choice opportunities. A decision happens through chance and timing, when problems, solutions, participants, and choices coincide; and when solutions are attached to problems, and problems to choices by participants who have the time and energy to do so.

The organizational knowing cycle

In the knowing cycle, a continuous flow of information is maintained between sensemaking, knowledge creating, and decision making, so that the outcome of information use in one mode provides the

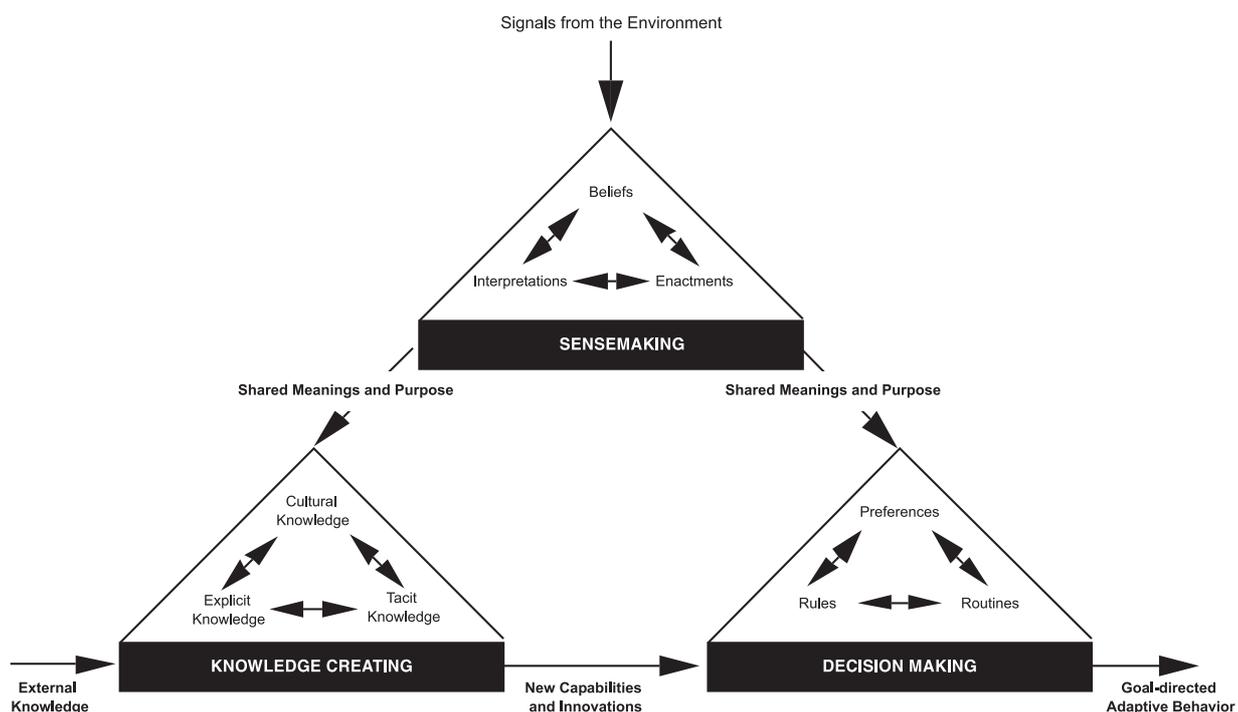
elaborated context and the expanded resources for information use in the other modes, as shown in Figure 2.

Through sensemaking, organizational members enact and negotiate beliefs and interpretations to construct shared meanings and common goals. Shared meanings and purpose are the outcome of sensemaking, and they constitute the framework for explaining observed reality, and for determining saliency and appropriateness. Shared meanings and purpose help to specify a shared organizational agenda, a set of issues that people in the organization agree on as being important to the well-being of the organization. While they may not agree about the content of a particular issue, and may adopt diverse positions on how it should be resolved, nevertheless there is collective recognition that these issues are salient to the organization. Shared meanings and purpose also help to define a collective organizational identity, or perhaps more accurately, a set of multiple identities, since an organization assumes different identities in different situations. Defining an organizational identity establishes norms and expectations about the propriety, accountability, and legitimacy of the organization's choices and behaviors. A framework of shared meanings and purpose is therefore used by organizational members to assess consequentiality and appropriateness,

and to reduce information ambiguity and uncertainty to a level that enables dialogue, choice and action making. Where messages from the external environment are highly equivocal, shared meanings reduce ambiguity by helping members to select plausible interpretations. Where messages from the external environment are highly incomplete, shared meanings reduce uncertainty by supplying assumptions and expectations to fill in the voids. Shared meanings need to be continuously updated against new events and conditions. By allowing ambiguity and diversity in interpretations, an organization can constantly monitor its shared meanings against the environment to ensure that they are still valid.

Within the framework of its constructed meaning, agenda, and identity, the organization exploits current specializations or develops new capabilities in order to move towards its vision and goals. Movement may be blocked by gaps in the knowledge needed to bridge meaning and action. When the organization experiences gaps in its existing knowledge or limitations in its current capabilities, it initiates knowledge seeking and creating, set within parameters derived from an interpretation of the organization's goals, agendas, and priorities. Organizational members individually and collectively fabricate new knowledge by converting,

Figure 2 The organizational knowing cycle



sharing and synthesizing their tacit and explicit knowledge, as well as by cross-linking knowledge from external individuals, groups and institutions. The outcome of knowledge creating is new capabilities and innovations that enhance existing competencies or build new ones; generate new products, services, or processes; or extend the range of viable organizational responses to a problem situation. The value of new knowledge is assessed locally by its ability to solve the problem at hand, as well as generally by its ability to enhance the organization's capabilities in the long run. New knowledge enables new forms of action but also introduces new forms of uncertainty. The risks and benefits of untested innovations and unpractised capabilities are compared and evaluated by invoking rules and preferences in the process of organizational decision making.

Shared meanings and purposes, as well as new knowledge and capabilities converge on decision making as the activity leading to the selection and initiation of action. Shared meanings, agendas and identities select the premises, rules, and routines that structure decision making. New knowledge and capabilities make possible new alternatives and outcomes, expanding the repertoire of available organizational responses. By structuring choice behavior through premises, rules and routines, the organization simplifies decision making, codifies and transmits past learning, and proclaims competence and accountability. Rules and routines specify "rational" criteria for the evaluation of alternatives, "legitimate" methods for the allocation of resources, and "objective" conditions for distinguishing between normal states and novel situations that may necessitate the search for new rules.

Over time, the organization has learned and codified a large number of rules and routines, so that choosing which rules to activate for a specific choice-making scenario is itself problematic. Shared meanings and understandings about the nature and needs of a particular situation are used to guide rule activation. Shared interpretations help select which rules to apply by answering the questions "What kind of situation is this?" and "What rules do we have for dealing with this type of situation?" Shared interpretations may also select rules according to the criterion of appropriateness "What kind of organization are we? What would be

appropriate behavior for an organization like ours in a situation like this one?" Sometimes shared interpretations indicate that the situation is novel, where none of the learned rules seem to apply. When rules break down, the organization attempts to make new meaning in time to initiate action, effectively prototyping new rules to prompt choice making. The end result of this interaction between shared meaning (in interpretations and understandings) and shared learning (in rules and routines) is the execution of a pattern of actions that simultaneously constitutes the organization's attempt to move towards current goals and maintain current identity, as well as its attempt to adapt to changed conditions in the environment. In this sense, the outcome of decision making is behavior that is both goal-directed and adaptive.

While each organization adjusts its behavior to perceived changes in the environment, its responses are diluted and diffracted by the concurrent actions of other actors that participate in the same arena. Thus each organization is reacting to the actions of other organizations that are also reacting to it. The resultant meshwork of interactions configures new patterns and new conditions that pose fresh ambiguities and uncertainties. A continuous stream of new events and equivocal cues necessitates iterative cycles of information processing. Where meanings or purpose change as a result of reinterpreting the environment, or where rules or routines are altered as a result of acquiring knowledge and understanding, the organization is adapting to variation and feedback in its environment.

Organizational knowing in the WHO Smallpox Program

Smallpox is the only major human disease to have been eradicated. Epidemics of smallpox had inflicted mankind throughout history, and as recently as 1967, some 10-15 million cases were still occurring annually in more than 30 endemic countries (Fenner *et al.*, 1988). On January 1, 1967, the World Health Organization launched the Intensified Smallpox Eradication Programme. Ten years later the last case of smallpox was reported in Somalia. A retrospective analysis of the organizational processes of the smallpox

eradication program suggests that the melding of sensemaking, knowledge creation, and decision making into continuous cycles of interpretation, innovation, and adaptive action underpinned the program's success (Choo, 1998).

In *sensemaking*, the program was able to unlearn its past beliefs about the nature of smallpox and to redefine the problem of eradication. Many assumptions about the epidemiological nature of smallpox were proven wrong in the field. For example, data and experience from the field showed that smallpox did not spread as swiftly as first expected, that swabbing the vaccination area was unnecessary, and that adult females were much less susceptible to the disease. The problem was poorly defined at the start of the program when the desired goal of eliminating smallpox was confused with the generally accepted means of mass vaccination. The initial belief was that smallpox could be eradicated simply by vaccinating all or nearly all persons in an endemic area. An outbreak in Nigeria where vaccine supplies were short and replenishments were delayed led fieldworkers to make do with selective vaccination, guided by detection and investigation, and followed up by isolation measures. These responses worked, and showed the value of a hybrid strategy of surveillance, containment, and selective rather than comprehensive vaccination. Here was an instance of enacted learning, in which field teams acted on the environment (by locating cases and outbreaks), changed its configuration (by separating out infected homes and villages), and made it possible to deal effectively with the environment (by vaccinating and containing only the infected areas).

As a global endeavour concurrently developing in more than 50 countries, the smallpox program evolved campaigns that were tailored to a wide range of cultures, traditions, and local practices. This diversity was held together by a unifying core of shared visions and beliefs. At the heart of the campaign was the common belief that the total eradication of smallpox was an attainable goal, that the eradication had to be done urgently, and that this was a noble, inspiring mission. One of the participants in the Indian campaign called this "management by inspiration", which was the result of a shared

belief in an attainable goal and a crisis-like work atmosphere.

In *knowledge creation*, the development of the freeze-dried vaccine and the methods for presenting the vaccine answered the needs of the comprehensive vaccination program. The freeze-dried vaccine was more potent, stable, and portable than the traditional liquid vaccine, and was economical to administer and could be mass produced. Vaccinating entire villages by novice or temporary fieldworkers also meant that the method of delivering the vaccine had to be efficient and easy to learn. The bifurcated needle invention scored highly on both criteria. These innovations had their beginnings in the tacit knowledge and personal observations of individuals working with modest tools and resources. The freeze-dried vaccine ampoules were first produced using a toy construction kit. Benjamin Rubin developed the concept of a bifurcated needle from considering a sewing needle. Compared with the jet injector, the bifurcated needle was a very simple "low-tech" device, but it was the one which became universally adopted.

Just as important as the technological innovations was the ability of the participants from various nationalities and backgrounds to work together in quickly developing innovative solutions to solve problems as they arose. Local fieldworkers drew upon their knowledge of local customs and practices to come up with practical measures that encouraged reporting and facilitated detection. Foreign staff, on the other hand, were often more effective in making contact with and persuading bureaucrats to change policies or approve resources.

One of the most important elements of the program's success was its "capacity to interpret experience and to weigh evidence with the maximum degree of openness, and to respond to that experience and evidence" (Hopkins, 1988, p. 127). Thus, while procedures, standards and indicators were specified and measured, the program at the same time maintained a "creative but insistent iconoclasm", to guard against the reification of assumptions and modes of operation:

The management of the smallpox campaign proved itself willing and able to recognize that means and ends had been confused in the original problem definition; to experiment with the new strategy of surveillance-containment and to enthusiastically adopt it as the guiding strategy; to adopt a simple technology in the

form of the bifurcated needle when a more complex technology – the jet injector – could not do the job; and to constantly search for effective, direct means of assessment (Hopkins, 1988, p. 127).

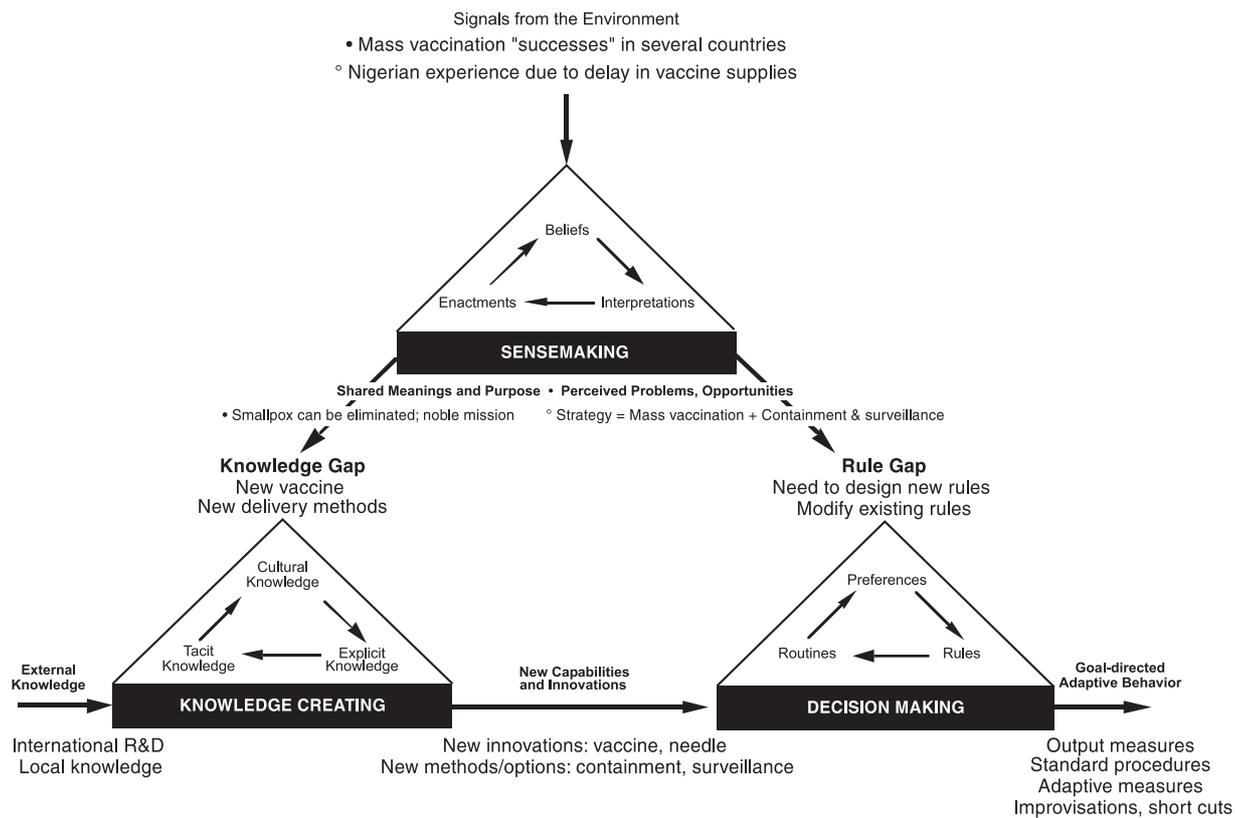
Decision making in the smallpox campaign was nestled in a hierarchy of rules, routines, objectives, and indicators that became the management tools for controlling the operational strategies of mass vaccination, surveillance-containment, and assessment. A clear definition of the problem led to the development of specific operational procedures which included quantitative performance targets and unambiguous evaluation measures. For mass vaccination, the targets were to reach at least 80 per cent of the population and to achieve a 95 per cent take-rate. For surveillance-containment, 75 per cent of outbreaks were to be detected within two weeks of the first case, and that containment should then begin within 48 hours.

Many of the targets were set, at least initially, based on limited information and on what was possible to achieve, and had a “satisficing” quality about them. For example, the belief that mass vaccination was the best strategy was derived less from rigorous epidemiological analysis than from a “simplistic search” of recent vaccination experiences which concentrated on the overall success of these experiences but ignored certain other aspects (such as their isolated locations or well controlled conditions). The 80 per cent mass vaccination target was set because it was what experience had shown that a well-run vaccination program could accomplish. Targets and indicators were continually elaborated and broken down into secondary objectives and guidelines for execution at the village or municipal level, and it was in the field that the viability of the procedures and targets was tested. Adaptive organizational learning took place whenever existing goals and targets were not being met and new searches (for solutions, not smallpox) were initiated to find out why. This would typically involve better understanding the local customs or conditions that might have impeded progress, or analyzing patterns and trends of disease incidence in order to improve operational planning. New procedures incorporating new rules and targets emerged, and when they proved effective, the methods were rapidly

disseminated in the program. The cycles of learning and adaptation repeated, so that standard procedures, targets and indicators continuously evolved to fit the specifics of the local task environment, and often became more stringent as the programs advanced and as more experience and knowledge accumulated.

Control was central to the program: control of the quality of the vaccine; control of the operational procedures and targets to carry out mass vaccination, surveillance and containment measures; control of the reporting procedures to ensure that reliable information was available in time to solve problems as they arose; and control of the assessment procedures to provide an independent and realistic evaluation of a campaign as it was being implemented. The specification of a structure of rules and routines that provided management control was particularly vital in an international program being waged by numerous countries in very different parts of the world. Yet, paradoxical as it may seem, control was effective because it kept an open heart and an open mind. Procedures and rules, though carefully defined at a general level, were interpreted and elaborated into field tactics and targets by adjusting them to a complex variety of indigenous cultures, religions, health systems, and governmental structures (Briljant, 1985). Experimentation and improvisation were encouraged as necessary tactics of learning and getting things done. Shortcuts that bypassed standard procedures, simplifications that cut costs or saved time, and people who skipped over formal levels in the hierarchy were all tolerated and recognized as legitimate responses justified by their ends.

Finally, the smallpox program was also a triumph of effective *information management* (see Figure 3). The surveillance system, containment system, and assessment system, which were central to the program, were all in essence, information systems. Information needs were clearly defined and derived from specified procedures and targets. Soon after its inception, the program avoided the trap of going only for easy-to-collect data about program inputs (such as the number of vaccinations), which measured effort not results, and moved its focus to data about program outcomes (trends of the disease incidence). Information gathering was

Figure 3 The knowing cycle in the smallpox eradication program**WHO Intensified Smallpox Eradication Programme 1967 – 1977**

comprehensive, involving participants at all levels of the program, including local villagers and community leaders. A longstanding problem was the gross under-reporting of smallpox cases. Incentives were offered to encourage reporting, and these were designed to capture accurate data, rather than data which people thought the program managers wanted to see. Since accurate and timely information reporting lies at the heart of the containment strategy, a major organizational step was the separation of the surveillance and containment functions in order to avoid a conflict of interests. Information use was sensitive and expeditious. Data collected were analyzed to discern patterns of incidence and spread, sometimes employing sophisticated methods from operations research. Unbiased minds used the data to test hypotheses which challenged existing beliefs. Where warranted by the information, shifts in strategy and operations were willingly implemented. Significant findings and innovations were promptly disseminated and shared with others in the program through periodic review meetings, conferences, and newsletters and other publications. Effective information

management was the glue that held together the cycles of interpretation, innovation, action, and feedback which moved the program towards its remarkable achievement.

In 1977, the last case of smallpox was reported in Somalia. For the first time, a major disease has been completely vanquished. Dr H. Mahler, WHO director-general, described the smallpox program as "a triumph of management, not of medicine." It is said that at a meeting in Kenya in 1978 the then director-general, on announcing the end of smallpox, had turned to Donald Henderson who had directed the smallpox program, and asked him which was the next disease to be eradicated. Henderson reached for the microphone and said that the next disease that needs to be eradicated is bad management (Hopkins, 1988).

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