KM 4D Casebook:

Sectoral and Thematic Knowledge Management at the National, Regional and Global Levels

Alexander G. Flor

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For
my mentors
Felix Librero
and
Serafin Talisayon

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ALEXANDER G. FLOR
UPOU Faculty of Information and Communication Studies

Knowledge of speech, but not of silence
Knowledge of words, and ignorance of the Word,
All our knowledge brings us nearer to our ignorance
All our ignorance brings us nearer to death
But nearness to death, no nearer to God.
Where is the life we have lost in living?
Where is the wisdom we have lost in knowledge?
Where is the knowledge we have lost in information?

T.S. Eliot, *The Rock*

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List of Acronyms

AAS	Agricultural Advisory Services
ACB	ASEAN Center for Biodiversity
ADB	Asian Development Bank
AFMA	Agriculture and Fisheries Modernization Act
AGRIS	Agricultural Information System
AIBA	Agricultural Information Bank for Asia
AIKM	Agricultural Information and Knowledge Management
ALM	Adaptive Land Management
ANR	Assisted Natural Regeneration
APEC	Asia Pacific Economic Cooperation
API	Academic Program Improvement
APIRAS	Asia-Pacific Islands Rural Advisory Services
APR	Asia-Pacific Region
ASEAN	Association of Southeast Asian Nations
ATEP	Agricultural Technology Education Project
ATM	Automated Teller Machine
BAR	Bureau of Agricultural Research
BSWM	Bureau of Soils and Water Management
C5	Core Community of Champions for Climate Change
CENRO	Community Environment and Natural Resources Office
CERN	European Organization for Nuclear Research
CGIAR	Consultative Group for International Agricultural Research

CLSU	Central Luzon State University
CMS	Content Management System
CoC	Communities of Champions
CoI	Communities of Interest
CoP	Communities of Practice
CPU	Central Processing Unit
CRM	Coastal Resource Management
CSO	Civil Society Organization
CSR	Corporate Social Responsibility
DA	Department of Agriculture
DAO	Department Administrative Order
DASA	Documentation of Agricultural Sciences in Southeast Asia
DCMI	Dublin Core Metadata Initiative
DENR	Department of Environment and Natural Resources
EA	Enterprise Architecture
ERDIS	Environmental Restoration Document Information System
EU	European Union
FAO	Food and Agriculture Organization
FGD	Focus Group Discussion
FGDP	Farmers Group Development Planning
FICS	Faculty of Information and Communication Studies
FLR	Forest Land Restoration
GEF	Global Environment Fund
GFAR	Global Forum for Agricultural Research
GFRAS	Global Forum for Rural Advisory Services
GIS	Geographic Information System
GIZ	Gesellschaft fuer Internationale Zusammenarbeit
GMO	Genetically Modified Organism
GoP	Government of the Philippines
GPRS	General Packet Radio Services
HDI	Human Development Index
HDR	Human Development Report
HPI	Human Poverty Index
IAALD	International Association of Agricultural Information Specialists
IBM	International Business Machine
ICT	Information and Communication Technology
ICT4D	Information and Communication Technology for Development

IFAD	International Fund for Agricultural Development
IK	Information and Knowledge
IK4D	Information and Knowledge for Development
IKM	Information and Knowledge Management
IKSP	Indigenous Knowledge System and Practices
IMD	Instructional Materials Development
IP	Indigenous People
IRDP	Information Resources Development Program
ISP	Internet Service Provider
IT	Information and Technology
ITU	International Telecommunication Union
IVLE	Integrated Virtual Learning Environment
KC3	Knowledge Center for Climate Change
KII	Key Informant Interview
KM	Knowledge Management
KM4C2	Knowledge Management for Climate Change
KM4D	Knowledge Management for Development
KMNE	Kababaihang Masigla ng Nueva Ecija
KU	Kasetsart University
LAN	Local Area Network
LGU	Local Government Unit
LIFDC	Low Income Food Deficit Countries
LMS	Learning Management System
LSN	Local Sub-Nodes
M&E	Monitoring and Evaluation
MIS	Management Information Systems
MOA	Memorandum of Agreement
MOOCs	Massive Open Online Courses
MOODLE	Modular Object Oriented Dynamic Learning Environment
NAES	National Agriculture Education System
NAFTA	North American Free Trade Agreement
NARC	National Agricultural Research Centers
NARDSAF	National Research and Development System in Agriculture and Fisheries
NAU	National Agricultural University
NCIP	National Commission on Indigenous Peoples
NCIP	National Council of Indigenous Peoples
NFRDC	National Fisheries Research and Development Center
NGO	Non-Governmental Organization
NN	National Nodes

NRKM	Natural Resources Knowledge Management
NRM	Natural Resource Management
OEKC	FAO Knowledge and Capacity Development Office
OER	Open Educational Resource
OLPC	One Laptop Per Child
PACE	Professional Association for Customer Engagement
PC	Personal Computer
PENRO	Provincial Environment and Natural Resources Office
PHILCAT	Philippine Conservation Approaches and Technologies
PHRDF	Philippines Australia Human Resource Development Facility
PMU	Project Management Unit
PSP	PlayStation Portable
PTIA	Provincial Technical Institutes of Agriculture
R&D	Research and Development
RAC	Regional Agricultural Colleges
RBM	Results-Based Management
RC	Regional Coordinator
RCO	Regional Coordination Office
RIARC	Regional Integrated Agricultural Research Centers
SAAS	Strengthened Agricultural Advisory Services
SAIMS	SPFS Asia Information Management System
SDGs	Sustainable Development Goals
SEAFAR	Southeast Asian Forum for Agricultural Research
SEAMEO	Southeast Asian Ministers of Education Organization
SEARCA	SEAMEO Regional Center for Graduate Study and Research in Agriculture
SEASAKNET	Southeast Asian Sustainable Agriculture Knowledge Network
SEATO	Southeast Asia Treaty Organization
SLM	Sustainable Land Management
SMS	Short Message Service
SOA	Service-Oriented Architecture
SOC	Statement of Commitment
SOD	Science of Delivery
SPFS	Special Program for Food Security
SUCs	State Universities and Colleges
TNA	Training Needs Analysis

ToC	Theories of Change
TOR	Terms of Reference
TRI	The Restoration Initiative
TV	Television
UC	University Consortium
UNDP	United Nations Development Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UP	University of the Philippines
UPLB	University of the Philippines Los Banos
UPOU	University of the Philippines Open University
USAID	United States Agency for International Development
WAICENT	World Agricultural Information Centre
WCMS	Web Content Management System
WFP	World Food Programme
WOCAT	World Overview of Conservation Approaches and Technologies
ZAU	Zonal Agricultural University

PROLOGUE: Horizontalization

In 2009, the UP Open University released a book that was based on my 1986 dissertation titled *Developing Societies in the Information Age: A Critical Perspective*. Among other things, it presented a counter argument against what was then a very popular view of the impact of information and communication technologies on the Third World.

In his much read and quoted treatise on globalization, *The World is Flat*, Thomas Friedman of the New York Times declared that the competitive economic playing fields between and among First World and Third World countries are now leveling primarily because of ICTs. However, deeply rooted inequities still exist between developed and developing nations, even in an age where information is the primary economic commodity.

The inequities are structural in nature with dominance relationships between center and periphery nations. Since the problem is structural, Galtung (1971) offers a similarly structural solution, which he calls *horizontalization*. Galtung refers to this concept as: exchanges between centers and peripheries "on more equal terms"; the "reduction of vertical interaction" between the centers and peripheries; self-reliance; and even the "destruction of multinational asymmetric organizations." In a world where data, information, and knowledge are the three most critical resources, dominance relationships between centers and peripheries or, if you will, hubs and nodes, should be kept to a minimum and eventually fade away. Nowhere is this most obvious than in the case of knowledge management.

Knowledge management or KM, is an evolving discipline that considers a system's intellectual capital as a manageable and potentially profitable asset. Every organization possesses some form of human capital, made up of individual talents and knowledge. The latter is sometimes referred to as intellectual capital, considered by many as a fundamental input to all wealth

generating processes. Prior to the development of ICT, intellectual capital was not thought of as manageable because it primarily resides in the individual. A paying organization can lay claim to a paid individual's time or even skills. But it cannot ordinarily share ownership of an individual's knowledge permanently unless it is documented and copyrighted, which is relatively rare. With ICT, such knowledge can be captured, stored, and shared electronically—in short, managed. In its electronic form, knowledge is known as content.

There is more to knowledge management than managing content. One also has to manage the system that carries the content. Knowledge management is based on systems theory. Bill Gates uses the digital nervous system metaphor, comparing an organization to an organism with a nervous system technologically enabled by computer hardware, software, and networking. This network of workstations and servers (or KM system) programmed to facilitate knowledge sharing and reuse is, to an organization, like a nervous system to an organism.

Knowledge management began in the private sector but has since been adopted by governments and international development agencies alike. In the mid-1990s, Stephen Denning established the Knowledge Management Program of the World Bank, which has served as the model for applying KM to international development assistance or KM4D.

In an entry that I contributed to the ***Encyclopedia of Information Science and Technology, Fourth Edition*** (Hershey, PA: IGI Global Academic Publishers, 2017) titled *Knowledge Management for Development*, I differentiated KM4D from conventional KM by its application not only to organizations or "going concerns" but to projects, development sectors, and development themes as well. This casebook presents a number of these initiatives at the national, regional, and global levels.

Among the current array of ICT tools, knowledge management is the optimum solution that can be made available to the international development assistance sector. But it has to be done equitably between and among central and peripheral stakeholders, in Galtung's words, ensuring exchanges on more equal terms, reduction of vertical interaction, self-reliance, and dissolution of asymmetric relationships. The cases contained in this volume highlights the need for these qualities, all of which will result in horizontalization.

PART A.
Networks

CHAPTER I.
KNOWLEDGE NETWORKING

Horizontalization is best operationalized and realized through non-hierarchal networks. This chapter is about networking. It is also about the efforts of the SEAMEO Regional Center for Graduate Study and Research in Agriculture, to employ the knowledge networking model in agricultural and environmental education development.

SEARCA is known for its thematic areas of natural resources management and sustainable agriculture, as well as its mission areas of graduate study and R&D. There is, however, a third less conspicuous area that has been linked with the Center's 64-year old history. This area, both thematic and mission in nature, is information and knowledge management.

In 1965, Ministers of Education from seven Southeast Asian nations banded together to form an organization that would enhance educational and cultural exchange within the region. The organization was named the Southeast Asian Ministers of Education Organization or SEAMEO. Perhaps, these seven gentlemen shared a forward-looking vision to initiate such a prelude to *globalization*[1]. Considering the Cold War environment wherein SEAMEO emerged however, its organizers may have thought of it as a parallel initiative (or a cultural buffer) to SEATO, the mutual defense treaty among the same Southeast Asian nations. Thirty-six years later, SEAMEO has outlived both SEATO and the Cold War, and has become a firmly established organization with several centers all over Southeast Asia.

[1] *sub regionalization being a step prior to regionalization which then leads to globalization*

UMALI'S VISION

I was a first-year high-school student of UP Los Baños when SEAMEO was born. I remember distinctly how our Social Studies teacher drilled us on the acronym and what it stood for. Neither she nor I suspected then that in less than a year, SEAMEO's first center was to be built within our midst.

The SEAMEO Regional Center for Graduate Study and Research in Agriculture, or SEARCA, was established in Los Baños in 1966. Its first Director was Dioscoro Umali, Dean of the UP College of Agriculture and later on, Undersecretary of Agriculture then Deputy Director General of FAO for Asia and the Pacific.

Early on, Umali harbored a vision to make SEARCA the center for documentation of agricultural sciences in Southeast Asia. He even had an acronym for it, DASA. Perhaps it was this vision that prompted SEARCA to build the UPLB Library as its initial contribution to the University's Five Year Development Program. During its early years, the basement of the Library housed SEARCA's offices.

It was during my last year in college when Umali's vision eventually came to pass. Nineteen seventy-four was a landmark year for SEARCA. In that year, the Center established the Agricultural Information Bank for Asia (AIBA). The entire west wing of the SEARCA building was financed out of AIBA funds. In the same year, AIBA became the regional hub of the Food and Agriculture Organization Agricultural Information System (FAO-AGRIS).

The succeeding years saw the Center's continued support to information and communication. In 1975, SEARCA became the first institution worldwide to sponsor a professorial chair

on development communication. A year later, the Center published the first two monographs on this field of study. I was then a junior faculty member of the UPLB Department of Development Communication. Seven years later, I found myself conducting a SEARCA-funded doctoral dissertation titled *The Information-Rich and the Information-Poor: Two Faces of the Information Age in a Developing Country*. It was the first Asian research study on the Digital Divide.

SEARCA'S KM PROGRAM

In 1992, SEARCA formed the Information Resources Development Program. I began my involvement with SEARCA as the Program Officer of IRDP in March 1998. At about the time when the love bug virus struck, I was having a series of discussions on what strategic moves would be appropriate for IRDP with my predecessor, the Dean of the UP School of Information Science, Josefina Sison. She said something that intrigued me then but would eventually be proven right. She said that IRDP "may have to die in order to stay alive." It turned out that the SEARCA agreed with her, because less than six months later, it was decided to transform IRDP into the Knowledge Management Program. This move made SEARCA the first Asian institution to establish such a program or unit, preceding the Asian Development Bank by a good three years.

From 1992 to 1998, there occurred a reorientation in the information sciences from information products to knowledge products. Knowledge management or KM emerged from this reorientation. KM is an evolving discipline that considers an organization's intellectual capital as a manageable and potentially profitable asset. Every organization possesses some form of human capital, made up of individual talents and knowledge. The latter is sometimes referred to as intellectual capital, considered by many as a fundamental input to all wealth generating processes. Prior to the development of information and communication technology (ICT), intellectual capital was not thought of as manageable because it primarily resides within the individual. A paying organization can lay claim to an employee's time or even skills. But it cannot ordinarily share ownership of an individual's knowledge permanently unless it is documented and copyrighted, which is relatively rare. With ICT, such knowledge can be captured, stored, and shared electronically—in short, managed. In its electronic form, knowledge is known as content.

The goal of knowledge management is to enable the sharing and reusing of knowledge within an organization and its knowledge environment. In the case of SEARCA, state of the art knowledge on sustainable agriculture and natural resources management can be captured in a knowledge base made available to its knowledge workers and its partners, and should be brought to bear upon the multitude of problems that confront the Southeast Asian region.

Like in T.S. Elliot's poem quoted at the beginning of this book, it should be acknowledged that a distinction exists between the terms knowledge, information, and data, which more often than not are used interchangeably. Data are recorded empirical measurements or observations. They may come in quantitative (numbers, degrees, scales, or ranks) or qualitative (audiovisuals or narratives) form. Information, on the other hand, is measured in bits (binary digits), one bit being equivalent to one unit of negative uncertainty. Processed data produce bits of information. When information is joined to a user, it becomes knowledge. As the

Indian philologist, P.R. Sarkar aptly puts it; knowledge begins with perception and ends with realization. In other words, it requires subjectivization, a knower, or in information science parlance, a user. Utilized information becomes information with added value. This distinction follows between information systems and knowledge systems. The latter goes beyond the traditional input-throughput-output model. The user is a central element in a knowledge system.

An appropriate metaphor can be found in food. The raw ingredients of food correspond with data. Cooking these ingredients results in a dish. Similarly, processing data results in information. The dish is transformed into nutrients upon its consumption and digestion. In the same manner, information is transformed into knowledge upon its assimilation by the mind. Continued absorption of nutrients lead to health. Continued assimilation of knowledge leads to wisdom.

DEFINITION

Paraphrasing Microsoft, knowledge management is an evolving discipline that considers an organization's intellectual capital as a manageable and potentially profitable asset. Each and every organization possesses some form of human capital, which is made up of individual talents and tacit knowledge. The latter is sometimes referred to as intellectual capital, which is considered as a fundamental input to all wealth generating processes.

Prior to the development of information and communication technology or ICT, intellectual capital was considered difficult to manage because it primarily resides in the individual. A paying organization can lay claim to a paid individual's time or even skills. But it cannot ordinarily share ownership of an individual's knowledge permanently unless it is documented and copyrighted, which is relatively rare. With ICT, such knowledge can be captured, stored, and shared electronically—in short, managed. In its electronic form, knowledge is known as content.

However, there is more to knowledge management than managing content. One also has to manage the *system* that carries and holds the content. Knowledge management is based on systems theory. Bill Gates uses the *digital nervous system* metaphor, comparing an organization to an organism with a nervous system technologically enabled by computer hardware (work stations and servers), software (Microsoft's, naturally), and networking (LAN, Internet, and Intranet). This network of workstations and servers (or KM system) programmed to facilitate knowledge sharing and reuse is, to an organization, like a nervous system to an organism. Although management scientists and academics have written volumes on the subject, seldom has it been applied to the development sector.

The literature suggests that knowledge management covers three distinct areas: organizational dynamics or culture; knowledge processes and capture; and information and communication technology. Hence, it combines organizational dynamics, knowledge engineering, and ICT to manage the intellectual assets of an organization or, as in the case of SEARCA, the Southeast Asian agriculture education *system*. The goal of knowledge management as stated earlier is the sharing and reusing of knowledge. Hence, central to knowledge management is the concept of knowledge networking.

NETWORKS

NAES. The potentials of KM in education is quite promising, considering the natural affinity and interfaces between knowledge management and the teaching professions, not to mention their common goals. In agricultural education in particular, a KM model was attempted in the operationalization of the National Agriculture Education System (NAES) with the piloting of the Instructional Materials Development Network from 1989 to 1994 during the implementation of the ADB Agricultural Technology Education Project (ATEP). The case of the ATEP IMD Network may be considered as a prototype knowledge network without the benefit of ICT.

Today's knowledge network is a complete Intranet system. Its main function is to facilitate the sharing and re-using of information and knowledge between and among the nodes of the network. In the case of the ATEP IMD Network, it was more of an institutional network that was meant to operate within the NAES.

Adopting the so-called "flagship" model, the NAES was a centralized network with the national agricultural university (NAU) as the hub. Linked to the NAU were the zonal agricultural universities (ZAUs). Linked to the ZAUs, in turn, were the regional agricultural colleges (RACs). At the provincial level were the provincial technical institutes of agriculture (PTIAs), which were situated at the periphery of the network.

The ATEP IMD Network followed the exact same centralized configuration as the NAES, with a national IMD Lab at the center, surrounded by three zonal IMD Labs, which, in turn, were linked to regional IMD Labs that served as hubs for provincial IMD partners. Unfortunately, the network died soon after the termination of the ADB-ATEP.

Why was the network not sustainable?

In retrospect, the fate of the ATEP Instructional Materials Development Network may have been a function of the organizational form that it assumed, i.e., a centralized network. Experience has shown that centralized networks are short-lived compared to decentralized networks. Decentralized networks have more reciprocity. Furthermore, network activity does not originate from the center only but all throughout the structure. Similarly, interconnectivity does not flow radially from the center, but from all the hubs.

It should be noted, however, that the ATEP-IMD Network formed as a logical recourse to the NAES. It was an inevitability insofar as the project implementers were concerned. Yet, like all networks, it behaved like a living system that required inputs of materials,

energy, and information. As a matter of fact, towards the later years, the network's largest need was that of content – the instructional materials themselves.

With the lessons learned from the ATEP IMD Network experience, other attempts to employ networking in agriculture and environment educational development are being attempted.

CRM Knowledge Network. Southeast Asia is home to the two largest archipelagos in the world, Indonesia and the Philippines. The Sulu-Celebes area is the Vavilov Center for marine diversity. However, coastal resources in Asia are fast dwindling because of mismanagement. Because of the alarming rate of resource depletion, countries within the region have undertaken several resource management projects. Best practices and lessons learned have been documented in these projects. However, these best practices and lessons learned should be shared among these countries since coastal resources in archipelagos recognize no geopolitical boundaries. A regional knowledge network enabled by information and communication technology was proposed for this purpose.

The Southeast Asian Coastal Resource Management Knowledge Network intends to compile best practices and construct models on non-material CRM interventions based on the Southeast Asian experience. Further, the proposed network would develop knowledge bases on these experiences and establish an active exchange among CRM professionals in the region. Best practices and innovations related to non-material marine and coastal resource management interventions will be documented, assessed and analyzed. Scientific generalizations and appropriate applications will then be made for purposes of model building. These models may be validated in other settings or, if enough scientific insights have been generated in the course of project implementation, may be inputted directly into the curriculum and instructional materials development processes in Southeast Asian universities. Initially, this could be conducted through

the SEAMEO-SEARCA University Consortium, which covers the most prestigious universities in Southeast Asia. Eventually, the respective higher educational systems of Southeast Asian countries may opt to integrate these into their programs through national policies.

Knowledge bases involve both documented and non-documented knowledge assets of the participating projects and agencies. Unlike conventional databases, these include reports, publications, and fugitive materials. Non-documented knowledge assets include so-called communities of practice. In the proposed project, these communities refer to the expertise that the respective projects and agencies have in marine and coastal resource management interventions, specifically those that are considered as non-material. These communities of practice should be linked to the Knowledge Network through: email discussion groups; quick response teams; chat rooms, and others. Hence, each expert should have access to a workstation.

SEASAKNet. Two knowledge networks were hosted by SEAMEO-SEARCA: the ASEAN Integrated Pest Management Knowledge Network, established in 1998; and the Biotechnology Information Center, established in 2000. A third knowledge network known as the Southeast Asian Sustainable Agriculture Knowledge Network (SEASAKNet) was attempted in 2001.

The objectives of SEASAKNet were as follows:

1. Develop and package for electronic dissemination, models on sustainable agriculture based on the Southeast Asian experience, which in turn may be used for planning, policy-making and decision-making;
2. Synthesize, establish trends, and meta-analyze information on sustainable agriculture in the region to be inputted into the curriculum development process in Southeast Asian universities and centers of higher learning;
3. Design and develop knowledge bases on sustainable agriculture; and

4. Establish a regional Sustainable Agriculture Knowledge Network that would serve as a quick-response mechanism for food security, resource depletion and environmental degradation crisis situations.

SEASAKNet, being a regional network, was to be composed of nodes and links located in different Southeast Asian countries. The network, however, was planned be developed in three phases. *Phase I* was devoted to establishing the Philippine nodes and their capabilities. Hence, during the initial year, SEASAKNet would have focused on the Philippines. *Phase II* would gradually build the peripheral nodes to be strengthened in *Phase III.*

The Network would be composed of SEARCA as a central hub supported by national nodes (NN) and local sub-nodes (LSN) in the different countries in the region. In collaboration with their respective ministries of agriculture, the following universities in the UC member countries will serve as the national nodes: Institute Pertanian Bogor and Universitas Gadjah Mada, both in Indonesia; Universiti Putra Malaysia; University of the Philippines Los Baños; and Kasetsart University, Thailand. National nodes in Cambodia, Lao PDR, and Vietnam will be identified during the later phases of establishment of SEASAKNet.

As the main node, SEARCA would serve as the main coordinating center with its metaserver. Its focus was on the following:

- Systems, methodology, and tools development necessary for information or data syntheses;
- Data analyses and interpretation for policy purposes; and
- Information products development in multi-media formats and delivery systems.

The main node would work in partnership with the national nodes in each country on information packaging. It would ensure that coordination and links are maintained between and among the national nodes, local sub-nodes and other affiliate members or cooperating institutions.

The National Nodes (NNs) were responsible for data collection, information packaging, and information dissemination in their respective countries. They would also be in-charge of establishing linkages and coordinating with the different local sub-nodes and seeing to it that SEASAKNet activities in their respective countries are sustained. In certain cases, the LSNs may be composed of different institutions (i.e., academic, government, non-government, people's and business organizations) with the capability of contributing to SEASAKNet. They were to assist the NNs in the collection of research results, packaging, and dissemination of synthesized and analyzed research data to target users.

In addition to sharing responsibilities in information processing and dissemination, cooperative research and training activities between and among the members would be undertaken through the Network.

Unfortunately, SEASAKNet never took off beyond the proposal stage. What were the constraints of putting up the SEASAKNet?

Documented success stories on knowledge management primarily come from the private sector where activities are focused on key objectives (i.e., sales and profit) and resources are abundant in this case. In the Southeast Asian sustainable agriculture sector, the inverse is true: concerns are abundant and resources are limited. The cost of the requisite hardware, software, and expertise may be quite prohibitive in a developing country context.

Secondly, the magnitude of the content appeared to be staggering. Again, there may be a technological solution to this problem as storage media become miniaturized and CPUs become more and more powerful.

The third and, perhaps, the biggest constraint was the lack of de facto standards in knowledge capture and information exchange.

This relates not only to front-end platforms and database templates but even to the language used by the UC members in knowledge capture and storage. SEAMEO member countries ultimately have to agree on these standards to make knowledge networking at the regional level work.

RECOMMENDATIONS

This chapter forwards the following recommendations:

Firstly, given the new information and communication technology environment (ICT), the knowledge management model for agriculture and environment educational development should be pursued.

Secondly, the role of networks in agricultural and environmental education should be explored further.

Thirdly, the behavior of networks as organizational systems should be seriously studied for its implications to the educational sector.

Chapter 2
KM NICHE MAKING IN THE ASEAN

INTRODUCTION

For the past decade, globalization has spawned its champions and detractors within and outside academic circles. Many of our peers consider globalization as a boon to Asian higher education since it opens up our academic programs to Western students. Consider, for instance, the increasing number of North American and European graduate students pursuing their degrees in Thai universities through English language programs. However, an even greater number among us consider globalization as a bane not only to our educational system, but also to our Asian societies in general. Localization of resources seems to be the remedy of choice for the perceived ills of globalization. One would assume that this would likewise follow in the area of education and human resource development.

This chapter adopts a slightly different point of view.

From where I stand at the moment and that would be from the vantage point of the open campus of the University of the Philippines System, *globalization is a product of technology*. Although as an academic, it is very tempting to analyze globalization from a geopolitical point of view, I see it realistically from the standpoint of technological determinism. From this perspective, globalization is seen as the natural consequence of information and communication technologies. New ICTs have resulted in the death of distance and are thus actively undermining national as well as regional boundaries in the economic, financial, communicational, and educational spheres.

To me, it is quite clear that globalization, particularly in education, is not a product of a conspiracy perpetrated by an ideology or an economic bloc. It is merely the natural outcome of a networked world that has shrunk virtually due to advances in telecommunications and transportation.

COMPETITION, COMPETENCE, AND COMPETENCIES

How does the academe situate itself in such a global educational environment? How would universities, and subsequently industries, cope to the challenges of a knowledge society?

ASEAN universities and industry clusters should position themselves according to their relative strengths and strategic advantages. Such is the fundamental ground rule in the globalized playing field, be it in the area of trade or education.

We could very well learn from the example of Indian educational institutions that are now the largest supplier of software developers in the entire world. Indian manpower exports of programmers amount to billions of dollars annually. The Philippines ranks a poor second compared to India, based on foreign exchange earnings attributed to this sub sector. On the other hand, India tails the Philippines as the largest global supplier of call center operators. A strategic advantage that both India and the Philippines have is that their medium of instruction in computer education as well as in communication is English.

However, Asia in general and Southeast Asia in particular should not be engaged in cut-throat competition against one another. Each country should focus on their respective niches, be these in computer science, information science, or communication science. These niches may actually be found in the list of competencies expected from individuals to lead in a knowledge-based economy. These competencies are clustered under a growing field of study, information and communication technology.

ICT as a Body of Knowledge

Information and communication technology may be regarded as a body of knowledge, built and shaped over time by its practitioners. The building blocks of this body are generated by research, both scientific and anecdotal, involving the documentation of best practice and lessons learned.

Like all bodies positioned within time and space, this body of knowledge possesses three dimensions. In this particular case, however, continua constitute these dimensions: the hard - soft continuum; the front end - back end continuum; and the high end - low end continuum.

The hard-soft continuum refers to the range of systems involved from hardware technologies to software technologies and on to content. Somewhere in this continuum, information and knowledge is situated, the latter being the *softest* of the lot. The front end refers to utilization or user technologies while the back end refers to design and development technologies. High and low ends refer to the level of complexity and sophistication of the technologies.

Situate these dimensions in a matrix and we arrive at the following cells: the hard front high end; the hard front low end; the hard back high end; the hard back low end; the soft front high end; the soft front low end; the soft back high end; and the soft back low end.

Table 2-1. Dimensions of ICT

	FRONT		BACK	
	HIGH	**LOW**	**HIGH**	**LOW**
HARD	Hard front high end technologies	Hard front low end technologies	Hard back high end technologies	Hard back low end technologies
SOFT	Soft front high end technologies	Soft front low end technologies	Soft back high end technologies	Soft back low end technologies

These eight cells likewise represent ICT competency niches that are available in the global educational environment.

ICT Industry Competency Niches

Hard front high-end Competencies. These competencies encompass both the practical and theoretical skills and knowledge involving state-of-the-art industrial and enterprise ICT hardware and infrastructure. Computer engineering competencies involved in the architecture and installation of high-end enterprise or network solutions for corporations and agencies fall under this category. Examples of such skills and knowledge are those required in the provision of systems and services by IBM, Hewitt Packard, Xerox, and Sun Microsystems.

Hard front low-end Competencies. These competencies cover both the practical and theoretical skills and knowledge involving the assembly and mass production of personal ICT gadgets, gizmos, and their components. Computer engineering, marketing and financing competencies (including the generation of venture capital) involved in the provision of personal computers, notebooks, personal digital assistants, digital devices, and their parts (processors, chips, motherboards, etc.) fall under this category. Examples of such skills and knowledge are those required in the provision of parts, products, and services by Nokia, Sony Eriksson, BlackBerry, and iPhone. The biggest providers in Asia of hard front low-end parts, products and services are currently found in China.

Hard back high-end Competencies. These competencies involve both the practical and theoretical skills and knowledge involving the design and testing of state-of-the-art industrial and enterprise ICT equipment. Computer engineering competencies involved in the development and fabrication of high-end hardware for corporations and agencies fall under this category. Examples of such skills and knowledge are those required in the development of products by IBM, Fujitsu, Xerox, and Sun Microsystems, recently acquired by Oracle.

Hard back low-end Competencies. These competencies include practical and theoretical skills and knowledge involving the design and testing of personal ICT gadgets, gizmos and their components. Computer engineering competencies involved in the development and fabrication of personal computers, notebooks, personal digital assistants, cellular phones and their parts (chips, processors, motherboards, etc.) fall under this category. Examples of such skills and knowledge are those required in the development of products by Nokia, Sony Eriksson, Palm Pilot, and Dell.

Soft front high-end Competencies. These competencies encompass both the practical and theoretical skills, and knowledge involving software enterprise solutions. Programming competencies involved in the architecture and installation of high-end enterprise or network solutions for corporations and agencies fall under this category. Examples of such skills and knowledge are those required in the provision of systems and services by IBM, Cisco Systems, Xerox, and Sun Microsystems.

Additionally, these competencies include the provision of knowledge management solutions (i.e., management information systems or MIS in its current form) to organizations, agencies, communities of practice and even sectors. Content provision and its attendant skills (i.e., database management) figure prominently under this category. In the area of ICT4D (information and communication technology for development), soft front high-end competencies include poverty mapping and GIS skills, as well as ICT program planning and development. Hence, government programs and agencies are likely clients of these services.

Soft front low-end Competencies. These competencies cover both the practical and theoretical skills, and knowledge involving the development of operating systems, platforms, and software for personal computing. Programming competencies for personal computers, notebooks, personal digital assistants, cellular phones, and all-in-one models fall under this category. Examples

of such skills and knowledge are those required in the provision of products and services by Microsoft, Yahoo, and Google. Web maintenance, multimedia utilization, and digital documentation all fall under this category.

Additionally, these competencies include the generation of venture capital and the provision of knowledge management solutions to projects and work groups. Content packaging and provision, specifically for individual users figure prominently under this category. In the area of ICT4D, soft front low-end competencies include service provision for telecenters and last-mile linkages.

Soft back high-end Competencies. These competencies involve both the practical and theoretical skills, and knowledge involving the design and testing of software enterprise solutions. Programming competencies involved in the development, beta-testing, and debugging of high-end software for corporations and agencies fall under this category. Examples of such skills and knowledge are those required in software development for the so-called tech giants, IBM, Cisco, Xerox, etc.

Additionally, these competencies include the design and development of knowledge management solutions for organizations, agencies, communities of practice, and even sectors. In the area of ICT4D, soft back high-end competencies include GIS programming, knowledge networking, and ICT policy formulation.

Soft back low-end Competencies. These competencies include practical and theoretical skills, and knowledge involving software development for personal ICT gadgets or gizmos. Programming competencies involved in the development of operating systems for personal computers, notebooks, personal digital assistants, cellular phones, and all-in-one models fall under this category. Examples of such skills and knowledge are those required in the provision of products and services by Microsoft, Yahoo,

and Google. Interface design and development, Web writing, multimedia authoring, and database development all fall under this category.

Additionally, these competencies include the design and development of knowledge management solutions to projects and work groups. Content provision and packaging for specialized thematic areas and sectoral concerns figure prominently under this category. In the area of ICT4D, soft back low-end competencies include the planning and design of telecenters and last-mile linkages.

TOWARDS A REGIONAL COOPERATION STRATEGY

Regionalization as a Prelude to Globalization

One common indictment for globalization is that it is just happening too fast and too sudden for developing countries to cope. To allow the globalization phenomenon to grow naturally and organically, some economists suggest regionalization as a prelude. Indeed, regional aggregations such as the EU, NAFTA and APEC have been established to consolidate regional power. Within the ASEAN sub-region, perhaps SEAMEO can take the lead in consolidating the educational resources of the ten ASEAN nations in order to better cope with the challenges posed by globalization. Again, these nations should focus on their individual strengths and strategic advantages and develop their niches.

The ASEAN Educational Fitness Horizon

Nowhere else in the world is the Digital Divide considered more of an enigma than in Southeast Asia. This region boasts of countries that are in the forefront of digital technology. Singapore, Malaysia, and Thailand are producers and exporters of such technology. Also in this region are countries which may be considered as the most deprived in ICT – Lao PDR, Cambodia, Myanmar, and Vietnam.

To begin with, the differences in the standards of living among countries within the region are quite glaring. Based on the UNDP Human Development Report, the human development index (HDI), human poverty index (HPI) as well as the HDI ranks of ten ASEAN countries is given in Table 2-2.

Out of 174 countries, Singapore is ranked 22nd in human development, while Loa PDR is ranked 140th. Brunei Darussalam is ranked 25th while Cambodia is ranked 137th. Malaysia is ranked 56th, while Myanmar is ranked 128th. Within the same region, we find countries classified under high, medium and low human development.[2]

Singapore and Brunei's poverty indices are negligible while Myanmar and Lao PDR's (32.3 and 38.9, respectively) are quite high. The poverty index of Malaysia, Thailand, and the Philippines (14.2, 18.7, and 16.3) are within the same range, while those of Indonesia and Vietnam (27.7, 28.7) are moderate.

The HDR database also offers some interesting insights on the correlation between ICT and poverty. Data on four major ICT indicators, namely internet hosts per 1000 persons, telephone lines per 1000 persons, personal computer ownership, and television ownership were placed side by side with the aforementioned poverty indices. The correlation is unmistakable.

The higher the HDR rank, the higher the ICT indicator values. The higher the human poverty index, the lower the number of ISPs, telephone lines, PCs and TV sets per 1000 persons. The higher the value of ICT indicators (as in the case of Singapore, Brunei, and Malaysia), the lower the poverty index.

[2] ***Human Development Report***, *United Nations Development Program and Oxford University Press: New York and Oxford, 1999.*

Table 2-2. Poverty and ICT indicators

HDI Rank	COUNTRY	Human development index	Human poverty index	ISPs/ 1,000	Telephone Lines/ 1,000	PCs/ 1,000	TV/ 1,000
22	**Singapore**	0.887911	-	15.11	513	216.8	361
25	**Brunei**	0.877795	-	2.41	263	-	417
56	**Malaysia**	0.768328	14.2	2.09	183	42.8	228
67	**Thailand**	0.753147	18.7	0.03	70	16.7	167
77	**Philippines**	0.739973	16.3	0.21	25	9.3	125
105	**Indonesia**	0.680862	27.7	0.11	21	4.8	232
110	**Vietnam**	0.663824	28.7	no data	16	3.3	180
128	**Myanmar**	0.579768	32.3	-	4	-	7
137	**Cambodia**	0.514409	no data	0.01	1	-	9
140	**Lao PDR**	0.491107	38.9	no data	6	1.1	10

The gap between hardware and software capabilities also exists. For instance, as mentioned earlier, the Philippines is considered to be the second largest exporter of ICT professionals and software developers next to India. Yet, it has hardly caught up with broadband and wireless technologies. The Digital Divide within sectors is likewise formidable. In Thailand and the Philippines, the business sector is fast catching up with its counterparts in Singapore ICT-wise. However, the educational sector is lagging far behind. At the tail end of the ICT utilization spectrum, is the agricultural and rural development sector with the least number of ICT users, applications, and solutions. In these sectors, we find the preponderance of the information-poor.

Based on these figures, what is the fitness horizon for Southeast Asia to produce globally competitive ICT workers?

The following matrix presents a fitness horizon that situates clusters of the ten ASEAN nations within particular niches. Each cell has a focal point that takes the lead among the countries in the cluster. These focal points occupy the upper-half percentile of Table 2-2 based on the HDI rank. Brunei has not been included in the analysis because of its current economic status, strategies, and priorities. On the other hand, the comparative strengths and strategic advantages of Myanmar, Cambodia, and Lao PDR in ICT remain undetermined at this point.

Apart from the given indicators, the matrix is also based partially on perceived educational strengths within each country. Thus, at best, it should only be regarded as an indicative scenario for niche-carving.

Table 2-3. Indicative Niches

	FRONT		BACK	
	HIGH	**LOW**	**HIGH**	**LOW**
HARD	Thailand Malaysia Singapore	VietNam Thailand	Malaysia Singapore	Brunei Thailand Vietnam
SOFT	Singapore Philippines Malaysia	Cambodia/ Laos Philippines Vietnam	Indonesia Malaysia Philippines	Philippines Vietnam Indonesia

Potentially, each of the remaining six countries in our analysis – Indonesia, Malaysia, the Philippines, Singapore, Thailand, and Vietnam - has more than one niche in this scenario. Five of them can be focal points in the eight areas identified.

Thailand is perceived fittest to take the lead in the hard high front end and hard high back end technologies. As a matter of fact, it may have been taking this role on a de facto basis because of the high-end components being manufactured in the country

for the past two decades. Thailand could very well supply North American and European hardware companies with the parts and components for their hardware. Thus, its educational institutions should focus on strengthening their computer engineering curricula to provide adequate manpower back stropping for such a role.

Singapore is seen as the fittest in soft front high end and soft back high-end technologies. Excellent technological education coupled by proficiency in English has garnered Singapore these niches for quite some time now. More so, among the ten ASEAN countries, Singapore is the most advanced in content management particularly for corporate clients. Hence it should continue to focus on their computer science and information science offerings.

Malaysia is perceived to dominate hard front low-end and hard back low-end technologies. The country may become the sub-regional hub for the development and provision of consumer ICT products ranging from personal computers to cellular phones. Thus, its colleges and universities should beef up their computer engineering and computer science offerings and revert back to English as the medium of instruction in these programs.

Indonesia is expected to lead in the soft front low-end technologies, i.e. the provision of software packages and content for individual users and consumers. Indonesia has the largest consumer base in Southeast Asia. It has inadvertently focused on strategies that are addressed to these consumers, ranging from marketing to utilization. Furthermore, Indonesia's concern for bringing the Digital Divide has been a tradition that dates back to the launching of the *Palapa* satellite during the late seventies. It has the potential to lead in ICT4D.

Finally, the Philippines is the potential leader in soft back low-end technologies, involving the design and development of software packages, and content delivery systems for individual users and

consumers. Is it any wonder that Microsoft's IT manager is a Filipino? Consider the talent that spawned the Love Bug twenty years ago, a computer virus that wreaked havoc around the world, being put to productive use.

The strength of the Philippines lies in the early convergence, in the academe as well as in the world of work, of the information, computer, and communication sciences in proficient English.[3] Additionally, Philippine universities pioneered in programs such as development communication and knowledge management among ASEAN institutions. This background provides the impetus to lead in ICT4D policy and planning.

Knowledge Management Competencies

From the preceding list of ICT niches, the most promising set of competencies can be found in knowledge management. Knowledge management or KM is a newly emerging discipline that treats intellectual capital as a manageable asset. Its goal is the sharing and reusing of knowledge. KM is now being offered formally as a course in two campuses of the University of the Philippines System, a third one (UPOU) soon to follow. Sets of competencies for the KM student, which can best be illustrated in the following diagram, have been identified particularly in the Los Baños campus.

Assuming that the goal of knowledge management is the sharing and reusing of knowledge, the following competencies are deemed required: referencing skills; documentation skills; proficiency in digital capture; proficiency in document management; writing and presentation skills; multimedia packaging; Web design and Web writing; messaging and collaboration skills; proficiency in content analysis; proficiency in network analysis; proficiency in using portals and search engines; networking skills; and materials development skills. Note that

[3] *After all, the Love Bug would not spread far and wide had it not been packaged enticingly as a love letter written in English.*

this range of skills encompasses information science, computer science, and communication science, and there is a very sound rationale for this.

Although sharing identical roots, the information and communication sciences have developed separately in the past sixty years, the former assuming a mathematical-logical paradigm and the latter adopting a socio-psychological approach. However, the marriage of information and communication technologies (ICT), have prompted the convergence of both information science and communication science. The synergy brought about by this convergence has in turn resulted in new applications, methods, and areas of study such as ICT4D that we in Southeast Asia may excel in considering our unique environment and our tradition in these disciplines.

CONCLUSIONS

To supplement the repositioning of our curricula along the lines earlier described, ASEAN universities may consider redirecting its emphasis to flexible learning systems, specifically distance education and open learning programs, in achieving these competencies. The shift to learner-centered educational paradigms would likewise be attendant to these curricular and delivery system initiatives aimed at achieving localized competencies in a global educational environment.

Such changes may be considered radical by the conservative traditions of the academe. And it is in these traditions that we may find our biggest pitfall.

In December 1996, I delivered a paper in the UNESCO PACE Conference held in Manila. The paper, entitled *Theory of Decreasing Competencies in Communication Education*, described an observed trend wherein conservative academic institutions such as mine, could not cope with changes in technology and the attendant competencies required in

these changes. Communication curricula at the tertiary and graduate education levels cannot keep up with the new skills and knowledge requirements of equally new information and communication technologies. Why? The answer was simple. Curricular proposals were being bogged down by academic debate. Before a new course, let alone a new curriculum, can pass through the academic councils, the knowledge and skills incorporated in the course would already be obsolete.

Indeed, large prestigious universities may be too encumbered by their own bulk and inertia that they fail to seize the moment. Today, newer, smaller and "lesser" academic institutions lead in the offering of innovative ICT programs. Although serious questions about the quality of their instruction are raised, they may be getting the bulk of the future crop of leaders in this knowledge society.

One wonders at times, if these academic debates are really prompted by concern for quality and rigor. Or are they really just products of parochial minds? As the 70s IT dictum states, *"Innovate, if not, then stagnate."* We can never be truly globally competitive with a parochial outlook.

Chapter 3
FROM COMMUNITIES OF PRACTICE TO COMMUNITIES OF CHAMPIONS[4]

INTRODUCTION

Planning experts and economists have warned that the world is about to be confronted with a global food crisis unlike anything it has encountered before. Unbridled population increase combined with longer life expectancies, land conversion, biofuel production, and a shrinking agriculture sector exacerbated by rising oil prices and climate change may lead to food shortages and spiraling food prices at a global scale. Within this milieu, eAgriculture and its emphasis on information and communication technologies and applications in the agricultural sector have been perceived as irrelevant. Not many are aware that the answer to the impending global food crisis may be found in eAgriculture.

Indeed, one may argue that eAgriculture has very little to do with the factors that are causing the surge in food prices that experts from the Food and Agriculture Organization (FAO) and the International Fund for Agricultural Development (IFAD) have identified, i.e.:

- Poor harvests in major producing countries linked to extreme weather events;
- Decline of food stocks at the lowest level since the 1970s;
- High oil and energy prices raising the cost of inputs like fertilizers and irrigation as well as the cost of transport of inputs and produce;
- Lack of investment in the agricultural sector;
- Subsidized production of bio-fuels that substitute food production;
- Speculative transactions that hedge futures markets; and
- Imposition of export restrictions leading to hoarding and panic buying.

[4] *University of the Philippines Centennial Professorial Lecture Delivered on 7 July 2009, Drilon Hall, SEAMEO SEARCA, Los Baños, Laguna.*

And yet if we examine these factors, most of them may be addressed by information and communication. We live in a global information society characterized by information-based economies where information is the primary commodity and the critical resource. It is axiomatic that an impending global food crisis can be solved by information.

This crisis is a product of social entropy or societal breakdown. Cybernetics and general systems theory teaches us that entropy can be negated by information. It is therefore through the process of information exchange that the world may find its salvation. However, these may seem as empty theoretical constructs to the person with an empty stomach.

eADVOCACY

The G8 2008 Hokaido Conference underscored the importance of access to and dissemination of agricultural technology information in addressing the food crisis. However, we espouse a more proactive response that goes beyond access provision and dissemination for Asia's eAgriculture community to address the global food crisis.

In eAgriculture communities of practice or CoPs are employed to generate solutions to agricultural problems. Traditionally, communities of practice engage in information exchange, what has been quoted often enough as "the sharing and reuse of information". This approach is patterned after the corporate KM Model of Davenport et al. (1995). Unfortunately, it ends there. The failure of this approach when applied to large-scale societal crisis stems from the fact that it stops short from mobilizing sectors, and does not go beyond information and knowledge sharing. There are, of course, exceptions within the eAgriculture community such as Solutions Exchange India, but by and large, CoPs should live up to its name by engaging in practice. CoPs should disseminate information to correct unsound policies (e.g., land conversion), uninformed decisions (e.g., biofuel production), unwarranted practices (e.g., using staples as animal feed), and inaccurate predictions and forecasts, all of which are part of the entropy that is causing spiraling food prices and artificial food shortages. In other words, CoPs should engage in advocacy.

Bringing CoPs to the Next Level: CoCs

We should note that the CoP concept was a progression from the CoIs or communities of interest that characterized the early Internet workgroups that essentially shared notes, information, and insights on common areas of interest, beginning with CERN physics and Internet protocols. When CoIs began solving common problems, this brought the workgroup concept to the next level, the CoP. However, many of today's CoPs offer solutions to problems but stop short of implementing these solutions, preferring to adopt the KM business protocol of sharing and reuse.

The problems that confront eAgriculture nowadays are to a scale that often requires policy interventions, not technological solutions. We have fully dealt out the technological card by engaging into GMO research and precision agriculture. CoPs must now delve into the policy process and progress into communities of champions or CoCs. Thus from CoIs that share information and CoPs that share solutions, eAgriculture must move into CoCs that mobilize sectors through information, knowledge and advocacy.

The Four Alternative Fs

A potential advocacy theme for eAgriculture CoCs would be the four Alternative Fs: alternative fuels; alternative fertilizers; alternative feeds; and alternative foods. Under alternative fuels, CoCs should push Jethropa as a source of biofuels instead of corn, sugarcane, palm oil, and coconut oil. Under alternative fertilizers the organic initiative should be resurrected against

petroleum-based fertilizers. Under alternative feeds, CoCs should prod animal nutritionists to consider alternatives to corn and soybean as feed for livestock and poultry, considering it takes a hundred kilos of soybeans to produce one kilo of beef. Under alternative foods, upland families in Kalimantan sell 10 kilos of their sweet potato to get enough money to buy one kilo of rice. CoCs should push sweet potato, cassava, and soybeans as alternative staples.

Most of all, the advocacies of eAgriculture CoCs must involve the participation of mobile communities at the grassroots level.

MOBILE COMMUNITIES

In the 2008 IAALD Conference held in Atsugi, Japan, the eAgriculture keynote panel, which included this writer, made seven forecasts on the future of eAgriculture, all revolving around mobile telephony, all of which have come to pass:

1. Mobile phones will make telecenters or community eCenters redundant and the OLPC initiative irrelevant.
2. Mobile service providers will or are already solving the first mile/ last mile linkage challenge.
3. Mobile phone users in agricultural communities will or have already reached a critical mass.
4. Mobile phone functionalities will lead to collaboration and networking and will render intermediaries unnecessary.
5. Mobile phone content will efficiently address issues such as the language medium, auto-translations, relevance, and the lack of local knowledge.
6. Mobile phone handsets will make ICT services affordable to agricultural communities.
7. Mobile phone applications will provide the eAgriculture community with an effective Web 2.0 platform.

Web 2.0 has revolutionized how people think of the World Wide Web from a collection of individually owned static websites with

published content into a body of collectively owned dynamic websites with user generated content. The 3G mobile phone in general, and the iPhone 3G in particular, a most disruptive tool, has given eAgriculture the much needed platform for Web 2.0.

A lot of these have to do with the mobile phone itself. Mobile phones are no longer phones, but are mobile workstations and more. As early as 2005, Nokia began fining employees in Finland who referred to the Nokia 9300 as a phone, not as a computer.

The Five Cs

For the past decade, we in the eAgriculture sub sector have been confronted by the following challenges, the Five Cs:

- Carriage: There are no first-mile/ last-mile linkages.
- Critical Mass: ICT use in the rural areas has not reached the numbers required to make an impact on agriculture productivity and poverty alleviation.
- Collaboration: Intermediaries only make partnerships and collaboration possible. Generally, farmers, housewives, and rural youth do not use ICTs without the intervention of line agencies that provide basic services. This is otherwise known as Calvano's Missing Link hypothesis.
- Content: There is a lack of local content. There cannot be a universally accepted medium.
- Cost: Rural communities cannot afford ICT hardware and services.

Carriage. In one sweep, Apple's iPhone has potentially addressed all of these problems. With the current infrastructure of cellular sites in agricultural countries, the mobile phone has solved the first mile/last mile challenge. Even the need for telecenters, agricultural ATMs, or kiosks has vanished. The OLPC has likewise been made redundant.

Consider a household with an iPhone. The husband would regard it as a source of information. The wife would consider it as a medium of communication. The college student would use it as a mobile library. The adolescent sees it as an iPod wherein audio and video podcasts may be downloaded and played back. The youngest in the household would regard it as a PSP or a portable play station.

A professional can use the iPhone as a handheld Mac or a mobile office. A field worker can employ it as a documentation tool capturing images, video, and audio. The iPhone can produce user-generated, local content from documents to rich media that may be shared and reused among farming communities. It can certainly do more than what a telecenter can do.

It is not the intention of this paper to promote an Apple product. As a matter of fact, if Apple does not play its cards right and continue to disenfranchise those in the lower economic brackets, then in a few years we might just find ourselves with perfectly operational iPhone clones running on open access/open code software.

Critical Mass. In the Philippines, cellular phone ownership achieved a critical mass in 1998 with the advent of 2G or GSM technology. The exchange of text messages translated into a mutually reinforcing behavior among social networks. Now, almost everybody owns a mobile phone. The only exceptions are the very young, the very old, and the marginally poor.

Ownership transcends/cuts across economic classes (except for the marginally poor), gender, age, and sector. Latest figures reveal that four hundred million SMS messages are sent and received in the Philippines every day. That translates to ten million dollars a day spent on SMS service alone, excluding voice calls, GPRS and 3G services.

Collaboration. The mobile phone prompts the farmer, housewife, and rural youth to collaborate, to share and reuse, and to exchange information. Zazueta (2008) observes even residential students prefer online learning if they had a choice. Forty-five percent cost reduction, no significant difference in learning. Apple's MobileMe social networking platform costs US$99 per year.

Content. Given the current mobile phone ownership in rural and remote areas of agricultural countries such as the Philippines, Thailand, Cambodia, Malawi, and Lao PDR, then iPhone has the potential of bringing local content up on the Web, in audio-video. As Metcalf argues, video is the next big thing in the Internet. This makes the issue of a universally accepted medium, moot and academic. Web communities will use their language of choice effectively through video.

With current incentives for developers, we might find a complete suite of eAgriculture applications for the iPhone within the next three years.

Cost. As to cost, the iPhone retails at 200 US dollars and one can purchase a prepaid card for as low as US$1. Technology is getting better and better, cheaper and cheaper, faster and faster, smaller and smaller. The bulky Motorola bricks that were introduced as cellular handsets retailed at US$4000 in the early 80s. Signing up for a line entailed another US$4000. Compare the Motorola brick with your mobile phone today. It is obvious that technology is getter better and cheaper by the day.

CONCLUSION

With the aforementioned argument, it appears that the future of eAgriculture lies in eAdvocacy, mobile devices, and online mobile communities. With this in mind, we would be better equipped to face the global food crisis.

PART B.
Sectoral Applications

Chapter 4
KM FOR FOOD SECURITY

INTRODUCTION

This chapter reviews and evaluates the SPFS Asia Information Management System (SAIMS) within set parameters of relevance, efficiency and effectiveness.

The Special Program for Food Security (SPFS) is a major FAO initiative that began in late 1994. The main objective of the SPFS is to help LIFDCs to improve food security both at national and at household levels, through rapid increases in food production and productivity, and reduction of year-to-year production variability. SPFS has been active in over 100 countries to date.

The number of SPFS projects has increased dramatically in the last several years, resulting in a wealth of information on pilot site characterization, technical solutions that were tested and developed, and lessons learned. However, this information is not systematically documented, captured and/or recorded in a consistent manner. The lack of a coherent information management framework and tools has prevented new SPFS projects, as well as development practitioners from fully benefiting from the knowledge accumulated (Riggs, 2002).

This concern has been recognized by the SPFS Coordinating and Monitoring Service in FAO (TCOS) and the SPFS Asia Project (GCP/RAS/180/JPN) in particular, which decided to address this through the Information Management Component (GCP/RAS/182/JPN). SPFS Asia Project covers Bangladesh, Indonesia, Lao PDR, and Sri Lanka, with technical support from FAO staff in

Bangkok and Rome. In 2002, SAIMS has been installed and put into operation sequentially in these countries. The implementation of SAIMS has potential benefits not only for the four countries within the SPFS Asia Program, but also as a model for other food security related projects and information management issues covering the collection, management, and dissemination of information on field tested agricultural technologies.

Nevertheless, SAIMS is a project with a defined beginning and a predetermined end. Now nearing the end of its project life, an external evaluation of SAIMS has been commissioned by FAO. This document presents the design, methodology and framework, as well as reports the findings, analysis, conclusions, and recommendations of the external evaluation.

Objectives

This review and evaluation of SAIMS seeks to assess its relevance, effectiveness and efficiency. Its objectives are:

- To document and assess the inputs, workflows, outputs and components of SAIMS vis-a-vis identified criteria associated with relevance, effectiveness and efficiency of information systems;
- To identify factors that inhibit the performance of SAIMS within the system and its environment (policy, social and institutional); and
- To draw lessons and formulate recommendations for the improvement of planning and implementation of similar information systems.

Scope and Coverage

The technical scope of this review revolves around the following evaluation questions:

- Did SAIMS achieve its objective?
- Is SAIMS relevant, effective and efficient?
- What factors inhibit the relevance, effectiveness and efficiency of SAIMS?

Chronologically, the review and evaluation covers the years 2002 to 2005. Geographically, it encompasses the following offices: FAORAP Bangkok; Regional Coordinator's Office, Jakarta, Indonesia; FAOR Bangladesh; FAOR Indonesia; FAOR Lao PDR; FAOR Sri Lanka; SPFS Bangladesh PMU; SPFS Indonesia PMU; SPFS Lao PDR PMU; and SPFS Sri Lanka PMU.

METHODOLOGY

Design

The study adopted a logical framework design for terminal evaluation employing *problematique* analysis. The terminal evaluation was conducted within the following parameters:

- The goal and purpose of SAIMS used in a reconstructed logical framework for evaluation;
- Relevance, effectiveness, and efficiency factors based on FAO's Eight Pillars given in the Bridging the Rural Digital Divide Framework; and
- Factors inhibiting relevance, effectiveness, and efficiency and their relationships as determined through *problematique* analysis.

The word *problematique* refers to a complex cluster of interrelated problems that recur. The problematique technique is an evaluation procedure for information and communication systems developed by Molenda and Di Paolo (1978) that traces and differentiates between symptoms or *subordinate influential factors* and root causes or *superordinate influential factors* within the problematique. Molenda and Di Paolo argue that in most

information and communication systems, problems are usually interrelated and occur in clusters. Decision-makers usually fall into the trap of mistaking a symptom for the root cause. Attempts at remedying the symptom only succeed temporarily. Unless the root cause is identified and eradicated, the cluster of problems will always recur. The technique emphasizes the identification of superordinate influential factors through a series of unstructured, open-ended interviews (Ongkiko and Flor, 2003).

Procedures

Data gathering procedures for the study however, were not limited to unstructured, open-ended interviews only. The following activities were undertaken:

Documents Analysis. Review of available documents to include Project design, plans, reports, minutes of meetings, WebPages, email correspondence, as well as Project outputs and products. ***Focus group discussions and key informant interviews.*** FGDs were conducted at the start and the end of the data gathering session in each PMU. The initial FGD was for introductory purposes while the last FGD served data validation purposes. KIIs were done individually among PMU staff members between the beginning and concluding FGDs. The PMUs were based in Colombo, Dhaka, Vientiane, and Jakarta. Appendix B provides the list of key informant interviews and FGD participants. Appendix C gives the guide questions for the interviews.

Documentation. Photo documentation of the PMU offices supplemented the qualitative data.

THE PROJECT

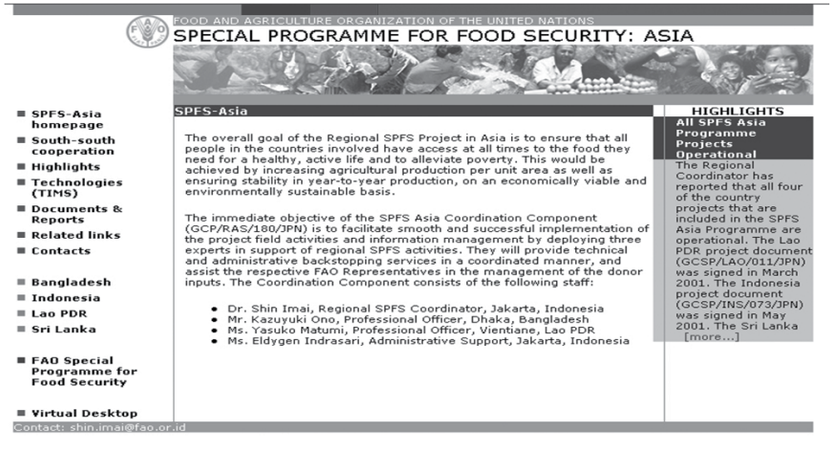
Overview

The Government of Japan supports FAO's Special Program for Food Security (SPFS) in four Asian countries: Bangladesh, Indonesia, Lao PDR, and Sri Lanka. This support includes the

setting-up of a Coordination Component and an Information Management Component under the FAO/Japan Trust Fund Agreement.

The Information Management Component covers the development of the SPFS Asia Information Management System, a Web-based system centrally maintained and administered but allows for decentralized input of content. The system was designed, developed, and launched by GILW with the active participation of FAORAP. SAIMS became available to the Bangladesh, Indonesia, Lao PDR, and Sri Lanka PMUs by late 2002. With technical support from GILF, TCOS and FAORAP, the PMU and RCO staff were trained on data entry and approval.

SAIMS was meant to reduce the workload of data management, and eliminate the need to respond to individual requests for data from other SPFS stakeholders. Information in SAIMS can be made publicly available through the SPFS Asia Website (www.fao.org/spfs/asia.) or restricted to a limited group of predefined user who will have varying rights to access and update information.



FRAME 4-1. SPFS ASIA WEB INTERFACE

The project design provided for country PMUs, the Regional Coordination Office (RCO) and other groups as appropriate to input documents, data, and metadata into SAIMS via the Internet. In most other cases, other users will be limited to viewing information. The PMUs would navigate the SAIMS Website to retrieve information from other PMUs and technical and operating guidelines provided by the RCO and FAO. The RCO, governments of project countries, FAO and the donor can use SAIMS to monitor the progress, developments, and outputs of the project sites through one single information system. The general community of public users would access SAIMS to learn about SPFS implementation and how it is improving food security in Asia.

Hence, SAIMS was originally conceived as: (i) a central information repository for the four national projects; and (ii) as a common Web-based platform for accessing information and data produced by each PMU, associated experts, and consultants. The repository would include general information about SPFS Asia and the national projects, reports and data from assessment, fieldwork and monitoring activities, and tested field technologies. In the course of the project, difficulties in incorporating a monitoring and evaluation (M&E) sub-system within SAIMS became evident and eventually were put on hold before being Beta tested. The information that was uploaded and made available in the public SPFS site became limited to program highlight and field-tested technologies (Riggs, 2002).

Reasons for Establishment

SAIMS was primarily established to provide information support to SPFS Asia. One of the major obstacles to the enabling function of the SPFS is the lack of access to relevant information, as well as standardized classifications and definitions that would insure comparability and integration of the results of SPFS projects.

SAIMS was meant to reduce the time spent to fulfill reporting requirements and responding to information requests. It was supposed to serve as an authoritative source of information on SPFS Asia activities and outputs for project stakeholders and a wider public audience. It would offer comparisons and consolidations of success stories and technologies produced by the four different countries, and improve communication among the project stakeholders.

The main objective of the Special Program on Food Security (SPFS) is to help Low-Income Food-Deficit Countries (LIFDCs) to improve their national food security - through rapid increases in productivity and food production, and by reducing year-to-year variability in production - on an economically and environmentally sustainable basis. The extent to which recipient countries derive lasting benefits from the SPFS, and their own national efforts to promote and enhance food-security, depends to a great extent on their ability to collect, analyze, interpret, disseminate, and provide access to information relating to nutrition, food security, and agricultural development among all sectors of society. This in its turn depends upon their ability to acquire and develop the technologies to add value to these resources, by integrating modern information technology and applications into their development strategies.

It was argued that SAIMS will be useful for better coordination of efforts and overall effectiveness of the SPFS at the national and regional levels, and thereby have direct impact in improving food security. The grassroots level data collected and exchanged would be important for getting timely and accurate assessments of the situation in the recipient country. It will also be useful for the donor community in formulating their own programs (Riggs, 2002).

Stakeholders

As conceptualized, SAIMS targets a range of stakeholders in the SPFS, including farmers' organizations, information professionals, researchers, senior managers, and policy makers. However, these are *potential* stakeholders whose participation is contingent to a number of factors that are beyond the system's control. The primary stakeholders are the end-users: SPFS staff at the PMU level that would profit most from the system.

Thorough consultations with the stakeholders were conducted during the initial phase:

> *We were acutely aware from the outset of this project of the need to ensure the usefulness of SAIMS to the PMUs while balancing the needs of other stakeholders. The initial activities in the project included a thorough consultation with all the stakeholders, especially the PMUs, to determine the functional requirements of the system from all perspectives. The design that resulted was circulated for comment, and there was considerable consultation during the development of the website/system (Rudgard, 2005).*

Inputs

Project inputs may be categorized under four main headings:

System Design and Development. The system was designed, developed, and launched by GILW with the active participation of FAORAP.

Hardware/ Software Provision. Work stations, notebook computers, and digital cameras were provided to each PMU and the RCO.

System Maintenance and Backend Administration. The system is maintained from Rome. The Information Management Officer of FAORAP administers the backend.

***Capacity Building*.** Training programs on SAIMS were conducted for each of the four PMUs and for the RCO. During these programs PMU editors, PMU approvers, RC editors and RC approvers were identified and trained on their roles and functions. Simulations were conducted as well as specialized follow-on training courses.

Helpdesk and List Serve Support. The help desk is manned by the Information Management Officer of FAORAP with the assistance of GILF. A list serve was initiated in 2003 for the sharing of comments and suggestions on the workflow.

Technical Assistance. Technical assistance is regularly provided by the Information Management Officer of FAORAP and staff from GILF supplemented by occasional consultant's inputs. Short-term consultants were engaged for capacity building and content development.

Outputs

The intended outputs of the project were:

- a database of technologies developed/tested and lessons learned through the SPFS;
- improved national capacities of the four countries to manage information for food security and agricultural development; and
- collaborative links for information exchange in the Asia/ Pacific to special interest networks, non-governmental organizations and other relevant international, regional, and national organizations, building upon the experience and knowledge available in FAO's WAICENT.

The outputs were intended to be sustainable through improved capacities at the national and regional level and the continuing support from FAO's Program of Work.

Products

SAIMS publishes information in the four national SPFS Asia WebPages and the regional SPFS Asia Website. As stated, the system generates two types of information for these Websites: SPFS Program Highlights at the country and regional levels; and SPFS Technologies.

A Highlight is an SPFS program or project event or an activity that should be documented and shared. This event may be at the regional or national level. A Technology, on the other hand, is a method or material employed in SPFS projects. It may be a process, a procedure, an ingredient, or an element that would contribute to food security. It may be a product of scientific research or it may be generated by local or indigenous knowledge.

FRAME 4-2. PUBLISHED HIGHLIGHT

Upon completing a process of entering and approving at the PMU and RCO levels, the Highlight or Technology is published in the public site. An example of a published highlight is found in Frame 4-2.

Workflows

There are two workflows employed to publish Highlights in SAIMS: the national and the regional. Figure 4-1 gives the algorithm for the publishing of SAIMS Highlights.

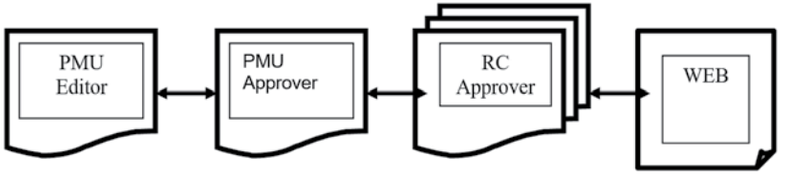


FIGURE 4-1. SAIMS Workflow

***National Workflow*.** There are four steps in publishing a SAIMS Highlight on a national web site. A user with specific responsibilities and tailored access to the system implements each step. The roles are:

- **PMU Editor** - can insert initial Highlight record and send to PMU.
- **Project Management Unit (PMU)** approver - can modify, send back, or approve Highlight record and send on to FAOR for further approval.
- **Regional Coordination Approver (RC)** - can modify, send back, publish record as well as modify and unpublish the Highlight record once it is live on the web.

A similar workflow is employed in publishing SAIMS Technologies.

Regional Workflow. There are two steps to publishing a SAIMS Highlight on the regional web site. A user with specific responsibilities and tailored access to the system implements each step. The roles are:

- **Regional Co-ordination Editor** - can insert initial Highlight record and send to RC approver.
- **Regional Co-ordination Approver (RC)** - can modify, send back, publish record as well as modify and unpublish the Highlight record once it is live on the web.

PMU Editor. The editor is allowed to create a highlight and send it for further editing by the PMU Approver. The editor also modifies and deletes records. Once a record has been sent to the PMU Approver it cannot be recalled or modified by the Editor.

Regional Coordinator Editor. The editor is allowed to create a highlight and send it for further editing by the RC approver. The editor also modifies and deletes records. Once a record has been sent to the RC Approver it cannot be recalled or modified by the Editor.

PMU Approver. The Project Management Unit (PMU) Approver can modify, send back, or approve Highlight records and send them on to the RC for further approval. The PMU approver clears all the Highlights regarding her/his country. Once a record has been sent to the RCO, it cannot be recalled or modified by the PMU approver.

Regional Coordinator Approver. The Regional Coordinator (RC) is the final node in the web publishing workflow. The RC role is to approve Highlight records for publication and then publish them directly on the web. The Regional Coordinator clears both the national and regional highlights to be published in the respective web site.

Initially, an FAOR Approver occupied a role between the PMU Approver and the RC Approver to be consistent with information flows and protocols within the organization. However, this step in the workflow was done away with due to feedback from the Lao FAOR. In the succeeding analysis, it may be gleaned that some of the PMUs also felt that this additional step made the process more cumbersome.

FRAMEWORK FOR EVALUATION

Narrative Summary

For purposes of this review, this section reconstructs the SAIMS logical framework.

Goal. From an analysis of the project documents, SAIMS was meant to contribute to the overall goal of food security through rapid increase in productivity and food production supported by information management.

Purpose. The following development objectives represent the purpose of SAIMS:

*Improved national food security***.** This would be achieved though the mobilization and development of human capacities at the regional, national, and local levels for effective participation in SAIMS. Furthermore, this will be supplemented by the development of a framework for the exchange of expertise on technical, institutional and socio-economic issues related to the identification, characterization, management, and dissemination of information on food security. Improved access and contribution to FAO's information resources and its institutional experience and lessons learned on the implementation of WAICENT may also contribute to this purpose. Lastly, this would entail the creation of a specialized information/knowledge system containing the experience (lessons learned and best practice) gained through the SPFS.

*Improved collaboration between agencies and sectors***.** This would be achieved through the development of information exchange systems for mobilizing resources from the public and private sector in the area of food security, including policies, strategies, programmed priorities, guidelines for implementation and project portfolios. Moreover, close partnerships with other international organizations active in this area, such as UNDP, IFAD, WFP, ITU, and UNESCO would be encouraged.

Objectives. Initially, the immediate objectives of the Information Component included:

- Assessment of needs and development of an "Information Management Toolkit";
- Establishment of the network and initiation of capacity building for access and participation; and
- Expansion of fields, programmed development, and implementation of documentation electronic publishing system.

However, it was decided that the first objective be subsumed under a separate program. Hence, this review will limit itself to the last two objectives.

Outputs. Given the aforementioned objectives, the outputs to be evaluated are: the SAIMS Network; and the database of technologies developed/tested and lessons learned through the SPFS. Performance indicators for Output 1 are: the establishment of a functional system; and the existence of an operational network. Performance indicators for Output 2 are as follows: volume of technologies published; quality of technologies published; volume of highlights published; quality of highlights published.

Inputs. As discussed in the previous section, the project inputs of SAIMS are: system design and development; hardware/ software provision; system maintenance and backend administration; capacity building; helpdesk and list serve support; and technical assistance.

Key Factors for Relevance, Effectiveness and Efficiency

To assess relevance, effectiveness, and efficiency, the study will make use of FAO's framework for Bridging the Rural Digital Divide. This framework enumerates eight factors that spell the success or failure of information systems employed to bridge

the rural digital divide. These factors are: locally adapted content to context; building on existing systems; addressing diversity; capacity building; access and empowerment; strengthening partnerships and participation; adopting a realistic approach to technologies (Please refer to Appendix D). These so called "eight pillars" were translated into performance criteria that served as the basis for the analysis of key issues (Section 6). Furthermore, they served as the framework's assumptions for achieving project objectives.

Restating these factors as assumptions, we assume that SAIMS is relevant, effective, and efficient if:

- It builds upon existing systems.
- It builds capacities.
- It strengthens partnerships and participation.
- It utilizes a realistic approach to technologies.
- It generates locally adapted content.
- It addresses diversity.
- If it provides access and empowerment.
- It considers information costs.

Reconstructed Logframe Matrix

The project cycle generally provides for four evaluation points in a project's lifetime: ex-ante evaluation; mid-term evaluation; terminal evaluation; and ex-post evaluation. While ex-ante evaluation is a benchmarking exercise conducted at the very beginning of the project, both mid-term and terminal evaluations are conducted to assess project relevance, effectiveness, and efficiency given project inputs, objectives, and outputs.

Terminal evaluation usually does not cover impact and sustainability since it would be premature to measure both immediately after a project ends. Ex-post evaluation, generally conducted two years after project termination, would address project impact on the overall goal/ purpose and sustainability of effects.

Evaluations are based on logical frameworks. Since the initial objectives of SAIMS were changed, a logical framework for purposed of this terminal evaluation was reconstructed. Table 4-1 provides the reconstructed logical framework matrix. The shaded portion is not part of this review.

This review may be considered as a terminal evaluation study and hence, will not touch on SAIMS' impact on the overall goal nor on the achievement of its purposes. It will deal primarily with assessing relevance, efficiency, and effectiveness of the project in achieving its stated objectives and outputs. Furthermore, it will attempt to determine the factors inhibiting relevance, effectiveness, and efficiency through the problematique technique.

Table 4-1. Logframe Matrix for Evaluation

NARRATIVE SUMMARY	PERFORMANCE INDICATORS	MEANS OF VERIFICATION	ASSUMPTIONS/ RISKS
Goal: Food security through rapid increase in productivity & food production supported by information management.	Impact Indicators Sustainability Indicators	Ex-Post Evaluation	
Purpose1. Improved national food security **Purpose 2. Improved collaboration between agencies and sectors**	Impact Indicators Sustainability Indicators	Ex-Post Evaluation	

NARRATIVE SUMMARY	PERFORMANCE INDICATORS	MEANS OF VERIFICATION	ASSUMPTIONS/ RISKS
Objective 1. Establishment of network & initiation of capacity building for access and participation **Output 1:** SAIMS Network	Functional system and operational network	Review and Evaluation Study: *Documents Analysis*	SAIMS is Relevant, Effective and Efficient if it: · It builds on existing systems · It builds capacities · It strengthens partnerships and participation: · It utilizes a realistic approach to technologies · It generates locally adapted content · It addresses diversity · If it provides access and empowerment · It considers information costs
Objective 2. Expansion of field program, development & implementation of documentation-electronic publishing system. **Output 2:** Database of technologies developed/ tested and lessons learned through the SPFS	Volume of Technologies Published Quality of Technologies Published Volume of Highlights Published Quality of Highlights Published	Review and Evaluation Study: *Secondary Data Problematique Analysis*	
Inputs: System Design and Development Hardware/ Software Provision SAIMS Training Programs Helpdesk		Review and Evaluation Study: *Secondary Data Documentation*	

FINDINGS

On SAIMS Inputs

The findings on SAIMS Inputs are quite straightforward. Based on the documents analyzed and key informant interviews, all project inputs of SAIMS - system design and development; hardware/software provision; system maintenance and backend administration; capacity building; helpdesk and list serve support; and technical assistance – have been adequately fulfilled.

System design and development was completed in 2002. System maintenance, backend administration and the helpdesk are ongoing commitments of GILF and FAORAP. Training courses on data entry and approval were conducted in 2002, 2003, and 2005. A list serve was established in 2002 and is still operational. Short-term technical assistance was mobilized for the training in 2002-2003, content provision in 2005, and this review. In other words, there were no lapses on the Input side of the equation.

On SAIMS Outputs

***SAIMS Network*.** The findings on Output 1, the SAIMS Network, are similarly direct. The system is functional and the network is operational. SAIMS currently has a regional network of national and regional nodes composed of editors and approvers for highlights and technologies in all four SPFS Asia countries. In all of these nodes, SAIMS data gathering, composition, and entry is an add-on job, which is maintained actively if not regularly. Actively, since the PMUs continue to assume and have no intention of reneging upon this responsibility; not regularly, since the effort is occasional and not sustained.

***Technologies and Highlights*.** Output 2, which pertains to the database of technologies developed/tested and lessons learned through the SPFS, is a bit more complicated since the evaluation is not limited to the establishment and functionalities of the SAIMS database. It also deals with both volume and quality

of content. For purposes of this review, both highlights and technologies databases were assessed.

Volume of Technologies Published According to Source. An analysis of the SAIMS backend would reveal that the Technologies Database is substantively populated.

From 2002, forty-three technologies or best practices were published by SAIMS. The majority (39.58%) of the entries was contributed by the Indonesia SPFS PMU. The second highest number (31.25%) of entries came from the Lao PDR PMU. Sri Lanka contributed eight (16.67%) entries. Bangladesh has five (10.42%) published technologies while the Regional Coordinating Office published one (2.08%). Since the technologies should originate from the SPFS project sites, it is understandable that the RCO would have the least number of contributions. The second lowest number of contributions came from Bangladesh. This may be attributed to the fact that Content Specialists were hired as consultants by the PMUs during the latter half of 2005 except for Bangladesh. The Content Specialists contributed significantly to populating the Technologies Database and the publication of technologies in the SPFS Website.

Table 4-2 gives the frequency distribution of technologies published among the SAIMS nodes.

Table 4-2. Technologies Published per Source

NODE	TECHNOLOGIES PUBLISHED	PERCENTAGE
Bangladesh PMU	5	10.42
Indonesia PMU	19	39.58
Lao PDR PMU	15	31.25
Sri Lanka PMU	8	16.67
RCO	1	02.08
TOTAL	48	100

Volume of Technologies Published According to Year. With 48 published technologies from 2002 to 2005, the average number of publications amounts to 12 per year. However, contributions were not spread over this duration. As a matter of fact, there were no technologies published in 2002 and 2003. Most (68.75 %) of the entries were published in 2005. Only 10 (20.83%) entries were published in 2004. Table 4-3 gives the frequency distribution of technologies published on an annual basis from 2002 to 2006.

The Year 2005 had the highest number of technologies contributed since this coincided with the hiring of a Content Specialist in three of the four PMUs. It may be noted that the Bangladesh SPFS PMU had more entries published in 2004 than in 2005 while the rest of the PMUs increased their output from 300 to 1200 percent in a year's time. It would be safe to assume that data entry in SAIMS depended primarily on the Content Specialist.

Table 4-3. Annual Comparisons of Published Technologies

NODE	TECHNOLOGIES PUBLISHED					
	2002	2003	2004	2005	2006	TOTAL
Bangladesh PMU	0	0	3	2	0	5
Indonesia PMU	0	0	5	13	1	19
Lao PDR PMU	0	0	1	12	2	15
Sri Lanka PMU	0	0	0	6	2	8
RCO	0	0	1	0	0	1
TOTAL	0	0	10	33	5	48
PERCENTAGE	0	0	20.83	68.75	10.42	100

Volume of Highlights Published According to Source. With the number of published entries in the Highlights Database at 71, highlights content is substantively more than those of technologies. However, trends similar to the above are easily discernable except for the source of the majority of highlights. The highest number (36.62%) of highlights publications originated from Sri Lanka; followed by Indonesia (23.94%), Bangladesh (18.31%) and Lao PDR (12.68%). The RCO accounted for six (8.45%) highlights entries.

Table 4-4 gives a frequency distribution of highlights published according to source.

Table 4-4. Highlights Published per Source

NODE	HIGHLIGHTS PUBLISHED	PERCENTAGE
Bangladesh PMU	13	18.31
Indonesia PMU	17	23.94
Lao PDR PMU	9	12.68
Sri Lanka PMU	26	36.62
RCO	6	8.45
TOTAL	71	100

Volume of Highlights Published According to Year. The distribution of published SAIMS highlights approximates the trend found for the technologies with a distinct difference. There were entries published during 2002 (15.49%) and 2003 (21.13%). However, there was a noted increase (13%) of published entries in 2005. As stated earlier, Sri Lanka posted the highest number of highlights. It was noted during the data gathering that the Content Specialist in Sri Lanka focused on highlights entries during most of 2005 until he was advised to concentrate on technologies.

Table 4-5 gives the frequency distribution of highlights published on an annual basis from 2002 to 2006.

Table 4-5. Annual Comparisons of Published Highlights

NODE	HIGHLIGHTS PUBLISHED					
	2002	2003	2004	2005	2006	TOTAL
Bangladesh PMU	3	2	0	8	0	13
Indonesia PMU	5	5	7	0	0	15
Lao PDR PMU	2	0	4	3	0	9
Sri Lanka PMU	0	7	4	15	0	26
RCO	1	1	3	1	0	6
TOTAL	11	15	18	27	0	71
PERCENTAGE	15.49	21.13	25.35	38.03	0	100

What do these figures tell us?

Firstly, although both technologies and highlights databases are substantively populated, the volume of entries was low most of the time. Secondly, the increase in volume was due for the most part to the Content Specialists. The Bangladesh PMU inadvertently acted as a control in an experiment by not engaging this consultant. The number of technology and highlights published by Bangladesh are significantly low compared with other PMUs. Had the Content Specialists not been hired by the other PMU, they would not have fared better than Bangladesh. Lastly, the number of highlights was significantly higher than technologies, implying that PMU staff may prefer writing highlights to technologies.

Observations on Volume from Other Stakeholders. Some stakeholders have critically considered the published output of SAIMS. The GILF has been aware of these observations, particularly the difficulty of the PMUs to contribute technology entries from 2002 to 2004. In email exchanges among concerned stakeholders in Rome, Bangkok and Jakarta, the causes of these difficulties have been inferred and solutions have been forwarded,

such as the engagement of short-term Content Specialists. In a letter to the RCO, the Chief of GILF expressed his misgivings on two observed causes of the problem: low commitment of PMU staff to information submission/sharing; and the complicated process for review and approval of content inputs.

Quality of Technologies and Highlights Published. To measure the quality of the technologies and highlights published, the evaluator randomly sampled approximately 20% of each database and assessed the entries on the basis of the following: understandability; presence of grammatical errors; adherence to Web writing guidelines; and number of typographical errors.

Out of the 10 sampled published technologies: five were difficult to understand; seven did not follow Web writing guideline; one had grammatical errors; and none had typographical errors. Out of the 15 sampled published highlights: two were difficult to understand; four broke Web writing guidelines; and none had neither grammatical nor typographical errors. As seen in Table 4-6, there were a total of nineteen cases of quality problems found in approximately 20% of the published technologies and highlights.

Table 4-6. Cases of Quality Problems in Published Entries

TYPE	DIFFICULT TO UNDERSTAND	HAD ERRORS IN GRAMMAR	INADEQUATE WEB WRITING	HAD TYPO ERRORS	TOTAL
Technologies	5	1	7	0	13
Highlights	2	0	4	0	6
TOTAL	7	1	11	0	19

It should be noted that SAIMS is an English medium system. Three of the PMU editors are professionally trained Content Specialists. However, none of the editors and approvers were

native English speakers/ writers. Considering this, the quality problem cases would be understandable. However, given the fact that they are published in the Web, we may consider this problem situation from the point of view of the project.

By reviewing the status of the achievement of objectives and outputs, this chapter validates that SAIMS is indeed encountering a complex problem situation. The next section provides an in-depth analysis of what may be referred to as the *SAIMS problematique*.

On the SAIMS Problematique

Based on the preceding discussion, this review defines the SAIMS problematique as a cluster of problems with two major symptoms: low volume of SAIMS published highlights and technologies; and quality difficulties operationalized as grammatical and typographical errors, as well as writing and Web-writing styles. The succeeding analysis attempts to trace the subordinate influential factors (minor causes that may be symptoms of major causes themselves) and superordinate influential factors (root causes) of the problematique. As the analysis progressed, it became apparent that most of these influential factors were shared among the PMUs.

Bangladesh PMU

The Bangladesh PMU is perhaps the most successful among the four national offices in terms of field projects and achieving SPFS targets. This success is due, for the most part, to the staff. The zonal coordinators are committed and dynamic, spending most of their working hours in the project sites, reporting only to Dhaka once a month for coordination purposes. The acting team leader is quite capable and very determined to make SPFS work in Bangladesh. An experienced APO provided by the Government of Japan effectively backs up the team. Through its National Project Director, the Bangladesh PMU enjoys the full support from the MOA Department of Agricultural Extension where it is based.

During data gathering, the external evaluator conducted key informant interviews with the staff on a one on one basis. The final data gathering session was a focus group discussion employing the participatory evaluation procedure. The evaluator presented his preliminary assessment to the group for validation purposes on a factor-by-factor basis. The SAIMS Problematique in Bangladesh indeed suffers from the aforementioned symptoms of low volume of highlights and technologies, and quality difficulties in published entries.

FRAME 4-3. BANGLADESH PMU FGD

Low Volume of Highlights and Technologies. The group identified four subordinate influential factors for the low volume of entries. Firstly, the timing was not favorable for abundant entries. At the early stages of SPFS, the zonal coordinators cannot be expected to identify mature technologies for sharing and reusing. Secondly, the workflow was deemed cumbersome and prohibitive.

Thirdly, there were limited technology options available since as prescribed in Farmers Group Development Planning, farmers themselves identify technologies employed in SPFS sites. As specialists in their own respective areas, the zonal coordinators are familiar with a variety of technology options available. The application of these options is narrowed down to the choices

of the farmers. Lastly, due to a shift in the project planning approach, the workload of the zonal coordinators and specialists almost doubled sometime after SAIMS was introduced to them.

Three superordinate influential factors caused the workload situation. There was a shift to Farmers' Group Development Planning, which demanded more involvement in terms of time and effort from the zonal coordinators. They had to facilitate bottom-up processes and participatory planning cycles in their respective zones, leaving little time for documentation and content development for SAIMS. Secondly, less priority was given to SAIMS since content development did not form part of their specified deliverables as zonal coordinators. In other words, compared to other SPFS components, there was an apparent lack of ownership of SAIMS among the staff. Furthermore, there were no perceived incentives to utilize their limited time for SAIMS.

Much as they were interested in the system, there was a tendency to put it off for more pressing priorities. Thirdly, the Bangladesh PMU had significant staff movements alongside these developments. The National Project Director was changed. More critically, the Team Leader resigned with no official replacement until now. The Deputy Team Leader had to assume management responsibilities alongside his role as PMU Approver.

Quality Difficulties. On the other hand, quality difficulties had two superordinate influential factors. These are the need for a Content Specialist, and the need for additional skills. There is a perception that the latter is partially caused by the lack of networking with other PMUs who could have shared their SAIMS learnings.

Although the zonal coordinators are subject matter specialists, they are not experts in crafting and packaging content for the information system. Additional skills include: feature writing; technical writing; Web writing; and editing, all in the context of

SAIMS as an agricultural information system and English as a second language. These skills are generally assumed in the course of practice among senior technical experts such as the zonal coordinators. Furthermore, SAIMS has its own set of unique requirements. Hence, the PMU felt that they could learn much from sharing of insights and comparing experiences with other PMUs.

A graphic illustration of the SAIMS Problematique in the SPFS Bangladesh PMU is found in Figure 4-2.

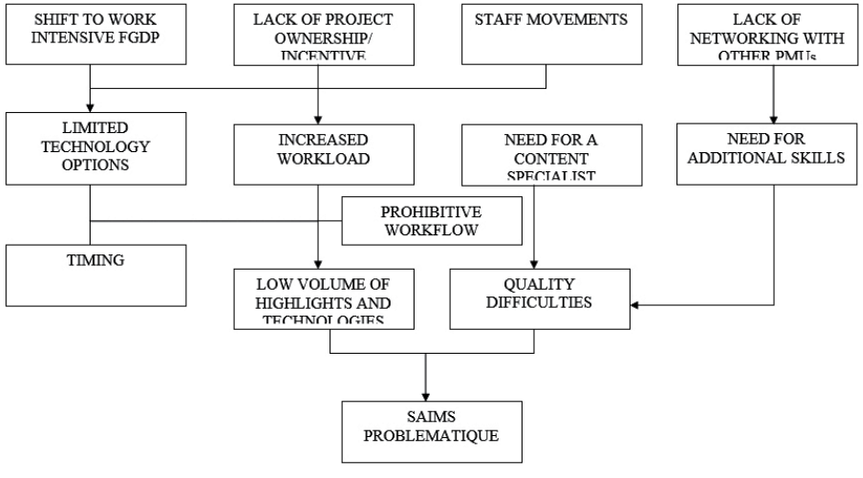


FIGURE 4-2. SAIMS Problematique Map (Bangladesh)

FIGURE 4-2. SAIMS Problematique Map (Bangladesh)

Indonesia PMU

The Indonesia PMU, on the other hand, would have a less complicated problematique. The PMU is based in the Center for Food Distribution of the Ministry of Agriculture in Jakarta. Its proximity to the Regional Coordination Office had been equated by some as personal proximity to the Regional Coordinator. This situation certainly benefits the Indonesia PMU since it can take advantage of early and direct interventions from the RCO.

Nevertheless, the Indonesia PMU has also not published any technologies during 2002 and 2003.

Low Volume of Highlights and Technologies. Like Bangladesh, Indonesia attributes its low volume of highlights and technologies on a prohibitive workload. However, this workload is not attributable to the adoption of the FGDP since the Indonesia PMU employed this approach ahead of the others. The workload has been made prohibitive by the need for the PMU to adopt the GOI's financial management system. This included adhering to the financial calendar, bidding, contracting, monitoring, liquidating, and reporting financial transactions. The PMU is subject to the accounting and auditing procedures of the Ministry of Agriculture wherein they are based. Thus, the PMU staff is being burdened with administrative responsibilities more than their counterparts in other PMUs.

Furthermore, there have been connectivity and bandwidth problems within the Indonesian MOA complex. Most of the time in 2004, the PMU was either offline or experienced slow and intermittent service. This discouraged the editors to enter their contributions since they would most certainly be timed out. The staff in general had very little opportunity to visit the SPFS Website under the conditions preventing them from receiving positive reinforcement by viewing the highlights that they published in 2002 and 2003.

There were also staff movements within the PMU. Several of the staff, including the Team Leader, resigned. Only two of the original PMU staff remained. This necessitated additional training for the new staff as well.

Then there was a problem with the workflow. In 2005, the technologies and highlights were also approved at the FAOR level before being processed by the RCO. From January onwards, it was nearly impossible for the FAOR to perform its approval function in the workflow because of the Aceh Factor.

Indonesia had been hardest hit by the December 2004 tsunami. The amount of aid and technical assistance that the FAOR had to process and coordinate immediately after the natural disaster up to the present is way beyond the capacity of the existing staff. The FAOR approver just did not have the time to edit and comment on SAIMS entries from the PMU.

Hence, the lack of technologies and highlights published by the Indonesia PMU were caused by four superordinate influential factors: administrative responsibilities; Internet connectivity; staff movements; and the Aceh Factor.

Quality Difficulties. The difficulties encountered concerning the quality of entries had two superordinate influential factors. Firstly, the editors were of the opinion that the format for technologies was too prohibitive in terms of style and visual content. Secondly, the English language medium was also felt to be the major contributing factor. Unlike in Bangladesh and Sri Lanka, English is not necessarily used as a second language in Indonesia even among the educated in general, and professionals in particular.

FRAME 4-4. INDONESIA PMU OFFICE

Figure 4-3 gives the problematique map for the Indonesia PMU.

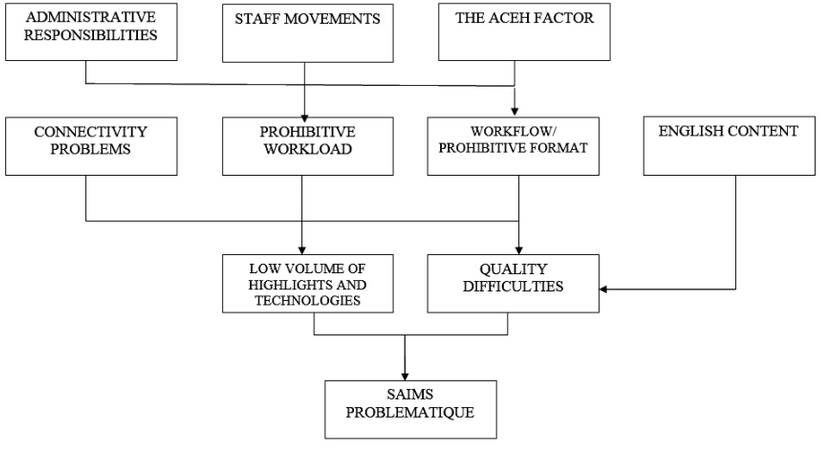
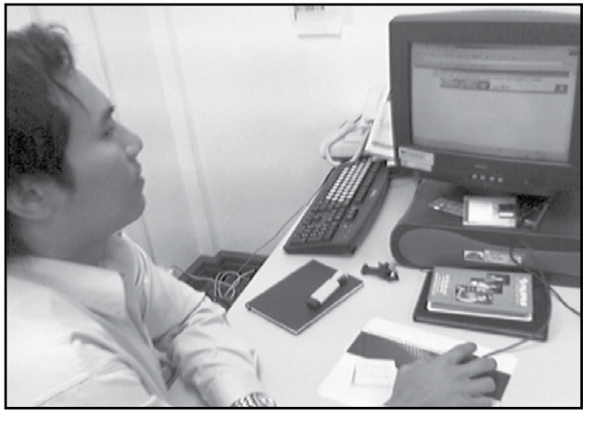


FIGURE 4-3. SAIMS Problematique Map (Indonesia)

Lao PDR PMU

The Lao PDR problematique map is quite similar to that of Indonesia. The PMU is based in the National Agriculture and Forestry Extension Service or NAFES but it enjoys the full support of the Assistant FAOR in Vientiane.

Low Volume of Highlights and Technologies. As in the Indonesian case, the Lao PMU is plagued by connectivity problems and a prohibitive workload caused by staff movements. However, the workload also appears to be a function of the inaccessibility of SPFS project sites due to poor road infrastructure. It literally takes days to get to some of the project sites, sometimes on foot. The hiring of a Content Specialist has solved this.



FRAME 4-5. LAO SAIMS CONTENT SPECIALIST

In effect, three superordinate influential factors caused the low volume of highlights and technologies published. Connectivity problems discouraged would be contributors from online entry. The inaccessibility of project sites left little time to compose technologies and highlights. Staff movements, which included the Team Leader and NPD, also added to the load of the remaining staff.

Quality Difficulties. On the other hand, quality difficulties had one superordinate influential factor: the use of English as the SAIMS medium. As in the case of Indonesia, English is not used as a second language in Lao PDR.

The Lao PDR SAIMS Problematique Map is presented in Figure 4-4.

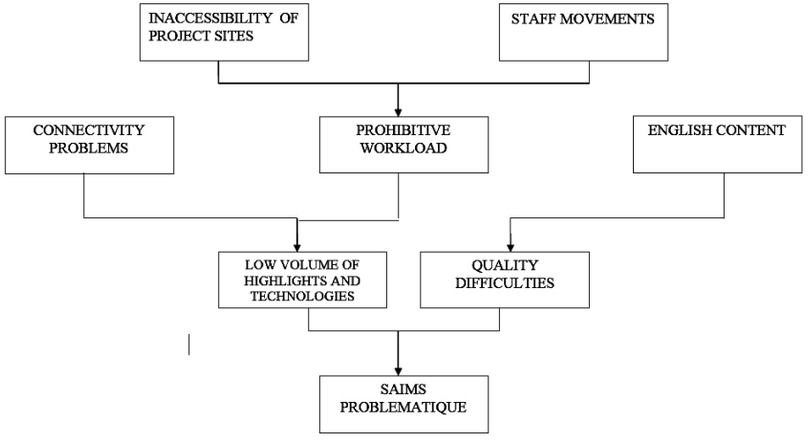


FIGURE 4-4. SAIMS Problematique Map (LAO PDR)

Sri Lanka PMU

The Sri Lanka PMU is based in the Ministry of Agriculture and Livestock compound in Colombo. The former SPFS Team Leader is now the Assistant FAOR and has been closely coordinating with the PMU from the time the project started. Like in other PMUs, the staff members in Sri Lanka have impressive credentials in their respective areas of specialization and are fully committed to the SPFS approach. Among the editors and approvers trained in 2002 and 2003, the Sri Lanka PMU staff appears to have profited the most from the training in terms of skills and knowledge gained. Yet, like in other PMUs, there were difficulties in posting technologies during the first three years of SAIMS. In other words, they were not exempted from the SAIMS problematique.

It may be noted that the problematique map given in Figure 4-5 is symmetrical. This implies that in the case of Sri Lanka, the same superordinate influential factors or root causes are perceived to have resulted in the low volume of highlights and technologies and quality problems of the published entries.

These superordinate influential factors are four in number. Firstly, connectivity problems have prevented the PMU staff from uploading highlights and technologies. These have also reduced the quality of their published highlights and technologies, because of the limited time that can be spent in the SAIMS backend. Secondly, as in the case of Indonesia, the Sri Lanka staff have had to deal with administrative concerns that added to their workload. Thirdly, the number of their project sites increased significantly to 27, allowing little time for information sharing work.

FRAME 4-6. SRI LANKA PMU FGD

Fourthly, in their list of priorities, the staff had little choice but to relegate a minor role to SAIMS. Other targets had to come first since their performance as specialists and coordinators were clearly judged through these. The fact that the highlights and technology database entries were not part of their signed-up deliverables made a difference when the crunch came.

These four factors caused both the low volume and quality difficulties of the content generated.

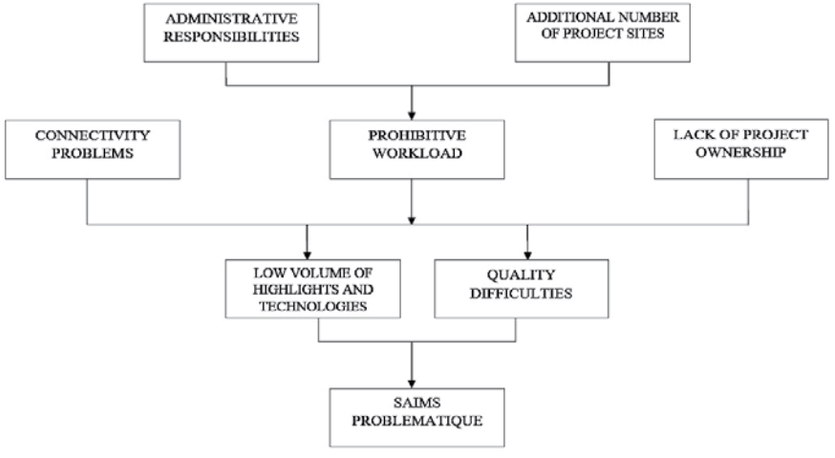


FIGURE 4-5. SAIMS Problematique Map (Sri Lanka)

ANALYSIS OF KEY ISSUES

The Eight Pillars given in the Bridging the Rural Digital Divide framework were meant to guide the design and development of rural networks or information systems of which SAIMS obviously is not. The primary users of SAIMS are not the farmers, fisherfolk, rural housewives, and rural youth who are the ultimate beneficiaries of SPFS. The primary users are the staff members of SPFS Asia who were meant to profit from the so-called *network effect,* wherein synergies are released within a network through mutual reinforcement and the sharing of experiences and insights. However, the Pillars can serve as a basis for assessing relevance, effectiveness and efficiency.

Relevance, Effectiveness, and Efficiency

Did SAIMS build on existing systems and work within existing policies? The SAIMS project document states that it would avoid the duplication of services or information, making the most effective use of existing infrastructure and capabilities. Indeed, SAIMS made use of existing infrastructure and capabilities within FAO.

However, even if intensive stakeholder consultation were conducted at the beginning, SAIMS may have overlooked fundamental organizational processes within the PMU by assuming that the assigned editors and approvers may make adequate amounts of time available. Furthermore, the organizational culture within developmental agencies adheres strictly to terms of reference and targets. Considering that information sharing was not part of the contractual obligations of the actors, it would be difficult to assume that these would be prioritized when workloads are strained. Moreover, institutional incentives that drive information sharing and reusing may have been neglected. There were no perceived or expected incentives to individuals for contributing information.

Did SAIMS build capacities? Yes, SAIMS built capacities within the PMUs for data entry and the use of Web tools. These are knowledge and skills that would otherwise have eluded many of the PMU staff considering their profiles, backgrounds, and current careers. A retired Ph.D. or government official with specialized skills and knowledge in agriculture may no longer be expected to imbibe new skills, particularly database delivery and Web writing.

Did SAIMS strengthen partnerships and participation? SAIMS was designed to do so but it fell short of this outcome for reasons stated above.

Did SAIMS utilize a realistic approach to technologies? Connectivity problems and their attendant disincentive for data inputting due to system time outs may not have been realistically considered.

Did SAIMS generate locally adapted content? Yes. Perhaps the preoccupation for locally adapted content limited the options of the editors, thus preventing them to contribute a wider range of technologies. The emphasis on locally adapted technologies may not have been a prerequisite for SAIMS. However, it stems from the Framers Group Development Planning process, which was adopted by the PMUs.

Did SAIMS address diversity? The structured nature of the technologies database (or any database for that matter) made it difficult to embrace diversity.

Did SAIMS provide access and empowerment? Yes and no. SAIMS allowed access to the backend but it did not empower its users to change or modify it.

Did SAIMS consider information costs? SAIMS has not been able to consider the volume of work involved in the writing and editing of useful, publishable technologies. Many undertakings treat this as a full-time professional job. Perhaps it was too much to expect non-professionally trained editors who have limited English proficiency to assume these roles. In other words, SAIMS may not have considered the cost of publishable information.

The Primacy of Content

Among information and knowledge managers, there is a tendency to be preoccupied with hardware-software-networking technology. This tendency is reflected in the pecking order assigned to the systems administrator, network administrator, and the Web Master. The latter, who generates the content, often occupy the lesser role. However, there is no dearth of past lessons on the primacy of content in an information system.

The case of SAIMS again reminds us of this principle. During 2002 – 03, there was little content published because there were few technologies to feature considering the process that the SPFS projects underwent in all the countries. Nevertheless, some stakeholders tended to assess SAIMS in the light of the volume of its content in spite of the realities in the field.

Furthermore, the hiring of Content Specialists in Indonesia, Lao PDR, and Sri Lanka dramatically improved the volume of content. Bangladesh, which was unable to engage such a specialist, had difficulties in approximating the volume of content generated by the other countries.

To ensure the sustainability of these gains, memoranda of agreement (MOAs) between FAO and national institutions in two countries were signed in December for the provision of content. In Indonesia, the Center for Agricultural Data and Information would provide this service to the SPFS PMU.

Generalizations

Ten years ago, the father of knowledge management, Thomas Davenport, argued that knowledge management systems have three prerequisites. Firstly, one needs a good IT infrastructure with respectable bandwidth to accommodate the functionalities and applications associated with the storage, share and reuse of digitized or captured knowledge. Secondly, one requires an appropriate workflow or process for knowledge sharing and reuse. Lastly, the organizational environment or culture for knowledge sharing and reuse is an absolute imperative.

Davenport was writing about corporations and private organizations that can leverage their intellectual assets for profit. However, these prerequisites hold true in the development sector as well, with one main difference. The goal of knowledge management in the development context is not limited to the sharing and reusing of knowledge to increase the bottom line, but covers a much more complicated set of outcomes, which we refer to as the Millennium Development Goals. The third prerequisite – a conducive organizational environment or organizational culture for knowledge sharing – seems to be the factor that has generally been neglected in Web-based information systems.

Does the proper organizational culture exist for knowledge sharing and reuse? Do workflow nodes and focal points, mainly agricultural staff already overworked with monthly targets, consider the inputting of electronic forms and uploading of information as part of their core business? Or is it another chore similar to the regular reports that they need to file while at the office? In other words, does the *push* exist for them to

perform these tasks? Furthermore, are they rewarded for sharing information? In other words, does the *pull* exist?

At the level of potential partners and identified intermediaries, is there a sense of ownership for the system? Perhaps not, because at times, this feeling of ownership is associated with the location of the server or the office of the systems administrator, which in the case of SAIMS is in Rome. Furthermore, it is not difficult to see why project ownership becomes an issue among information networks, considering the almost authoritarian control of the backend structure by the systems developers, which of course is the norm in any system.

CONCLUSIONS, RECOMMENDATIONS AND LESSONS LEARNED

Conclusions

Did SAIMS achieve its objectives? SAIMS achieved its objective of establishing a functional system and an operational network. It has adequately fulfilled its first targeted output.

Likewise, SAIMS achieved its objective of compiling databases of technologies and highlights. Both databases are substantively populated. However, there are concerns regarding the volume and quality of published entries.

Is SAIMS relevant, effective and efficient? There are serious questions regarding the relevance, effectiveness, and efficiency of SAIMS given the volume and quality of published entries.

It may have overlooked fundamental organizational processes within the PMUs by assuming that the assigned editors and approvers may make adequate amounts of time available. Considering that information sharing was not part of their contractual obligations, it would be difficult to assume that this would be prioritized when workloads are strained. Moreover,

institutional incentives that drive information sharing and reusing may have been neglected.

Connectivity problems and their attendant disincentive for data inputting due to system time outs may not have been realistically considered. Additionally, the structured nature of the technologies database (or any database for that matter) made it difficult to embrace diversity. Furthermore, it allowed access to the backend but it did not empower its users to change or modify it. Lastly, SAIMS may not have considered the cost of publishable information.

On the other hand, SAIMS built capacities within the PMUs for data entry and the use of Web tools.

What factors inhibit relevance, effectiveness and efficiency of SAIMS? The factors that inhibited the relevance, effectiveness, and efficiency of SAIMS were: prohibitive workloads, which in turn were caused by a variety of factors including the shift to the FGDP approach, staff movements, expansion and inaccessibility of project sites, administrative responsibilities, connectivity problems, and the Aceh factor; connectivity problems; English language problems; and the lack of project ownership and built in incentives.

Recommendations

The chapter recommends that content specialists should be engaged on a continuing basis, but not necessarily full-time, to populate the technologies and highlights databases of SAIMS. The possibility of providing built-in incentives to SPFS/PMU staff should be explored. The publication of highlights and technologies should be made part of the explicit output of PMU staff. Organizational cultures and environments should be thoroughly considered in the design of Web-based information systems.

Lessons Learned

The following lessons may be learned from the case of the SPFS Asia Information Management System.

Information Networks work better if embedded into the organizational culture. There should be a culture of knowledge sharing between and among agencies, between and among officials and the rank and file, between and among colleagues. Knowledge sharing should be considered part and parcel of the agency's core business. Agricultural personnel should be provided with adequate incentives for expending time and effort into knowledge sharing activities. In other words: the mandate should exist; the priorities should be clear; and the reward system should be in place.

Data, information and knowledge come with a cost. Providers require adequate resources of time and manpower to generate quantity and quality of content. Some agencies estimate that content can actually account for 70% of an information systems' budget. We can only expect system output that is commensurate to resources input particularly where content is concerned. Hence, the provision of material or non-material incentives may be in order.

Partners should have a sense of ownership of the network. This may require a rethinking of acknowledged principles, known procedures, and rigid protocols in system administration and maintenance. Participation should not be constrained to specific entry points excluding the design and development process. Access should not be limited to the front-end.

Chapter 5
KM MODELING for NATURAL RESOURCES MANAGEMENT[5]

INTRODUCTION

Southeast Asia is beset with natural resources management problems. Decades of unhampered resource exploitation in the watersheds of the Philippines and Indonesia by logging concerns are exacting their toll through landslides and flashfloods in the Visayas and Central Java. Land-locked areas in the Greater Mekong Subregion are now suffering the same fate. Coastal resources in the Sulu-Celebes Sea, home of the most biologically diverse marine ecosystems in the world, are being endangered by destructive fishing practices, mangrove destruction, and oil spills.

The collective expertise of the region should be brought to bear on these problems through the establishment of a regional knowledge management (KM) system for natural resources. Along this line, the capacities of both individuals and institutions for natural resources knowledge management should be built and strengthened.

This chapter analyzes the feasibility of the community of practice or CoP concept as a KM model for natural resources management. At the theoretical level however, it tests the CoP as a capacity development platform specifically in the design of a learning program. It revisits the curriculum development process with an added dimension, the Internet. The Internet has not only caused the death of distance. It has also destroyed exclusivity, undermined hierarchy, enabled nonlinear/asynchronous interaction, and globalized education. The educational process now assumes a new label: *knowledge management*. Communities of practice may eventually become to knowledge management what invisible colleges were to the educational process.

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[5] *Based on the SEARCA research study* ***Design, Development and Testing of a Knowledge Management Model for Natural Resources Management in Southeast Asia****. Grateful acknowledgement is due to my co-investigator Dr. Narong Sampong, Kasetsart University, Bangkok.*

If, indeed, such is the case, can a community of practice transcend institutional, geographical, disciplinal, and language barriers to design new curricula?

The objectives of this chapter are:

1. To analyze a knowledge management (KM) model for natural resources management in Southeast Asia;
2. To test a system appropriate to the KM model; and
3. To determine the feasibility of designing a post baccalaureate program on NRM Knowledge Management for Southeast Asian professionals employing the above model and system.

THEORETICAL FRAMEWORK

Review of Literature

The conceptualization of this chapter was inspired by what educational historians refer to as the "invisible college."

Invisible College. The invisible college is described as a precursor to the Royal Society of the United Kingdom. It consisted of a group of scientists including Robert Boyle, John Wilkins, John Wallis, John Evelyn, Robert Hooke, Christopher Wren, and William Petty. In letters in 1646 and 1647, Boyle refers to "our invisible college" or "our philosophical college". The society's common theme was to acquire knowledge through experimental investigation:

> *The idea of an invisible college became influential in seventeenth century Europe, in particular, in the form of a network of savants or intellectuals exchanging ideas (by post, as it would have been understood at the time). This is an alternative model to that of the learned journal, dominant in the nineteenth century. The invisible college idea is exemplified by the network of astronomers, professors, mathematicians, and natural philosophers in 16th century Europe. Men such as Johannes Kepler, Georg Joachim Rheticus, John Dee and Tycho Brahe passed information and ideas to each other in an invisible college. One of the most common methods used to communicate was through annotations written in personal copies of books that were loaned, given, or sold from person to person.*
>
> *The term now refers mainly to the free transfer of thought and technical expertise, usually carried out without the establishment of designated facilities or institutional authority, spread by a loosely connected system of word-of-mouth referral or localized bulletin-board system, and supported through barter (i.e. trade of knowledge or services) or apprenticeship. In earlier times the term also included certain Hegelian aspects of secret societies and occultism.*

The above description of the invisible college may very well be applied to the CoP concept.

CoP. The community of practice concept itself refers to both a process and a group of people. The CoP is defined as the process of social learning that occurs when people who have a common interest in some subject or problem collaborate over an extended period to share ideas, find solutions, and build innovations. It refers as well to the stable group that is formed from such regular interactions.

> *The term was first used in 1991 by Jean Lave and Etienne Wenger who used it in relation to situated learning as part of an attempt to "rethink learning" at the Institute for Research on Learning. In 1998, the theorist Etienne Wenger extended*

the concept and applied it to other contexts, including organizational settings. More recently, Communities of Practice have become associated with knowledge management as people have begun to see them as ways of developing social capital, nurturing new knowledge, stimulating innovation, or sharing existing tacit knowledge within an organization. It is now an accepted part of organizational development.

Others such as Wenger (1998) describe CoPs in terms of the interplay of four fundamental dualities: participation vs reification, designed vs emergent, identification vs negotiability, and local vs global. Although because of its link to knowledge management, the participation vs reification duality has been the focus of most interest.

Knowledge Management. Knowledge management or KM is traditionally defined as an evolving discipline that considers an organization's intellectual capital as a manageable and potentially profitable asset (Leibmann, 1999). It is based upon the assumption that today's global economy is knowledge-based and that knowledge is a primary commodity as well as a valuable resource (Flor, 2001). KM entails digitally capturing documented and tacit knowledge and storing these for sharing and reuse. Thus, knowledge is managed through an intranet system and guided by organizational policies that provide incentives to knowledge sharing.

As stated, the goal of knowledge management is the sharing and reusing of intellectual capital (Leibmann, 1999). Although, distinctions are made between undocumented or tacit knowledge and documented or explicit knowledge, both are captured digitally and stored in a knowledge base. These are also made available digitally in a variety of multimedia formats for sharing and reuse.

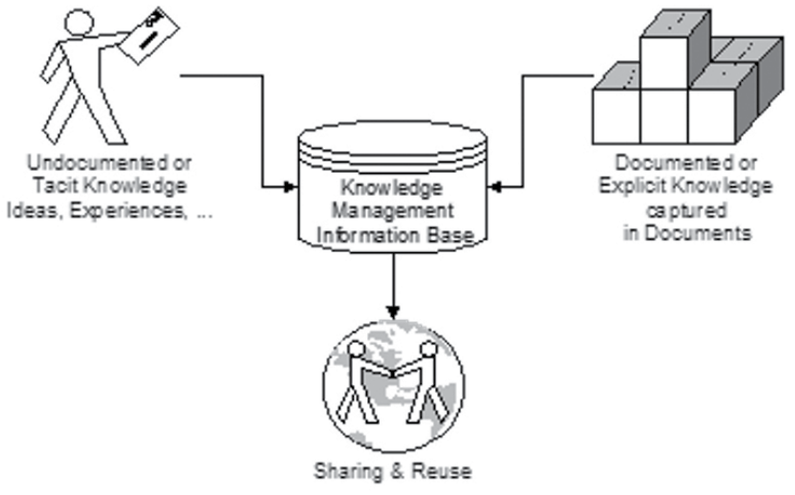

FIGURE 5-1. The Goal of Knowledge Management (Leibmann, 1999)

Conceptual Framework

Much of today's grand academic traditions started out in invisible colleges, well-knit and tightly structured brotherhoods of hooded learned men governed by a culture of hierarchy, exclusivity, ritual, and secrecy. In Paris, Oxford, and Rome, these brotherhoods existed for the purpose of enlightenment. A progressive system of initiation, passing, and raising determined the degrees and the level of knowledge of a scholar. Under this system, disciplines began and areas of studies grew.

Today, the academe has discarded the secret handshake but still adheres to secret codes through the technical jargon inherent in any discipline. The hood and the robe have been retained in academic costumes. The system of seniority, the degrees and the rituals that accompany them have been maintained. Latin and Greek have been replaced with English as the academe's

lingua franca, and invisible colleges are now being transformed into communities of practice. In the past decade, KM principles have been brought to bear upon pressing social and development concerns such as health, education, agriculture and the environment (Flor, 2003).

CoPs have been used as the knowledge management model of choice in other development sectors. In the book *eDevelopment and Knowledge Management* (Flor, 2001), a CoP is defined as a group of professionals informally bound to one another through exposure to a common class of problems, common pursuit of solutions, and thereby themselves embodying a store of knowledge.

Recently, CoPs have been gaining much attention because of the widespread influence that they have generated on several advocacies. With little organizational or logistical support, CoPs are known to have: spearheaded knowledge sharing during the Asian SARS outbreak in 2003; influenced the policy process in 2004 leading to the World Summit for the Information Society; and decisively responded to the avian influenza threat in late 2005 (Flor, 2005). The Asian Development Bank is currently applying KM protocols for an Asian CoP on Management for Development Results in support of the Millennium Development Goals. This same approach may be adopted to address natural resources management constraints in Southeast Asia. However, the KM models employed by these CoPs have not been purposively constructed; and the KM systems have not been systematically documented.

This chapter will attempt to purposively construct and systematically document a KM model/ system for Southeast Asian natural resources management for upscaling, replication and capacity building purposes.

METHODOLOGY

Research Design

This is an applied research study employing the design, development and testing model. It adopted a four-pronged methodology: knowledge management modeling; KM system development; community of practice consensus building; and instructional program design using the constructivist approach.

Methods

KM Modeling. Key informant interviews, analysis of secondary data, and documents analysis were conducted for a preliminary assessment of tacit and explicit NRM knowledge resources. The feasibility of digital capture was evaluated and explored. Infrastructure and bandwidth availability was assessed. The results of these procedures formed the bases for validating the technical feasibility of the CoP as the study's KM model.

KM System. The KM Model was operationalized through a KM system that is co-located and administered at the UP Open University. The system operated as a module of the existing UPOU learning management system (LMS) running on an IVLE (Integrated Virtual Learning Environment) Version 4 platform. It carried the following functionalities: online discussion board; messaging and collaboration; file transfer protocol; scheduling; document management; and others.

CoP. An NRM community of practice involving experts from the Philippines, Thailand, Lao PDR, and Indonesia was activated to capture, upload and share, download, and reuse expert and local knowledge on NRM. Online discussions among the members were facilitated through consensus building.

Curriculum Design. Through face-to-face and online discussions of the CoP, a curriculum for a post-baccalaureate degree on

natural resources knowledge management was designed. The program may be offered in both online and residential modes by Kasetsart University and the UP Open University. NRM professionals in all ten Southeast Asian countries may enroll in the program under sponsorship of development agencies or projects.

Limitations. The project covers only four of the ten Southeast Asian countries. Furthermore, the total number of CoP members was also limited for the pilot testing stage. It was assumed that once the CoP is fully established, there would be no limit to the number of members.

Description of the Project Areas

The study was implemented from Kasetsart University in Bangkok and the UP Open University in Los Baños, with the latter hosting the KM system and administering the online platform. However, it involved a community of practice that came from four countries: Thailand, Philippines, Lao PDR, and Indonesia.

Thailand and Lao PDR were identified for pilot testing because of their proximity, similarity in language, and the strong networking among their scientific communities. However, Lao PDR is landlocked and composed primarily of hilly land ecosystems. Thailand, on the other hand, has extensive marine, coastal, and lowland ecosystems. NRM expertise is very much available in Thailand particularly in Kasetsart University, Mahidol University, and Chang Mai University. Most NRM experts in Lao PDR have trained in Thailand.

The Philippines and Indonesia share parts of the Sulu Celebes (Sulawesi) Sea, a Vavilov center for marine biodiversity. Likewise, both have extensive lowland and upland areas, 70% of which have been deforested. Scientific and local knowledge on NRM management are also extensive in both countries. The documentation, however, is minimal primarily because of language and access issues.

Research Timeline

The project commenced in December 2006 with the mobilization of the research team composed of a Co-Principal Investigator from the University of the Philippines Open University, a Co-Principal Investigator from Kasetsart University, and part-time research assistants. A mobilization meeting was conducted in Bangkok to conduct technical briefings, level-off expectations, finalize schedules, and agree on administrative arrangements.

Online knowledge resource audits were conducted in the Philippines, Indonesia, Thailand, and Lao PDR from December 2006 to January 2007. Workflows for knowledge capture were analyzed through January 2007. The tentative KM model for Southeast Asian natural resources knowledge management was finalized in February 2007. Considering the available resources, steps were taken from March 2007 onwards to operationalize the model using the UPOU learning management system (LMS) running on two separate platforms: the IVLE (Integrated Virtual Learning Environment) Version 4 Platform, www.myportal.upou.org, and the Modular Object Oriented Dynamic Learning Environment (Moodle) Platform, www.myportal.upou.net .

Also in March, a tentative list of members of the NRKM community of practice was compiled. Contacts with these experts were also initiated. It was then decided that the country mobilization workshop in Indonesia be advanced to the last week of March to test the above modules in both platforms.

Country visits were conducted in Indonesia from 26 to 31 March 2007 and to Lao PDR from 21 to 24 May 2007. The researcher from the Philippines conducted the visit to Indonesia while the Thai researcher conducted the visit to Lao PDR. Additionally, the researcher from the Philippines met with the Thai researcher for the Bangkok workshop in the last week of May 2007. Furthermore, CoP members from Thailand felt that an additional workshop was necessary for their active participation. The

Thai researcher organized this second workshop in July and required the inputs of the Philippine researcher. Key informant interviews, analysis of secondary data, and documents analysis were conducted for the assessment of tacit and explicit natural resources management knowledge in the Philippines, Thailand, Indonesia and Lao PDR in May 2007. The feasibility of digital capture was evaluated and explored. Infrastructure and bandwidth availability were likewise reassessed in these countries.

These country visits achieved the following purposes:

1. Identification and finalization of list of members of the NRKM community of practice (CoP);
2. Conduct of briefing sessions and online demonstrations to members of the CoP;
3. Assessment of bandwidth availability, connectivity and access in the localities of the CoP members; and
4. Assessment of availability of resources for digital capture of natural resources knowledge.

Among the participating countries, the best endowed in terms of hardware, software, bandwidth, and connectivity was the Thai group. The least endowed was the Lao PDR group. By the end of May, it was clear that the KM system should be determined by the least common denominator in terms of resources and capacities among the participating NRKM experts.

The CoP was activated in the third week of July. Although it was decided that the discussion forum have a six-week lifespan, it continued up to October 2007. Data gathering ended in November 2007 with the consolidation of the observations of the researchers.

RESULTS AND DISCUSSION

KM Modeling

Knowledge management or KM is traditionally defined as an evolving discipline that considers an organization's intellectual capital as a manageable and potentially profitable asset (Leibmann, 1999). It is based upon the assumption that today's global economy is knowledge-based and that knowledge is a primary commodity as well as a valuable resource (Flor, 2001). KM entails digitally capturing documented and tacit knowledge and storing these for sharing and reuse. Thus, knowledge is managed through an intranet system and guided by organizational policies that provide incentives to knowledge sharing.

As pointed out, the goal of knowledge management is the sharing and reusing of intellectual capital (Leibmann, 1999). Although, distinctions are made between undocumented or tacit knowledge and documented or explicit knowledge, both are captured digitally and stored in a knowledge base. These are also made available digitally in a variety of multimedia formats for sharing and reuse.

In the past decade, KM principles have been brought to bear upon pressing social and development concerns such as health, education, agriculture and the environment (Flor, 2003). The increasing recognition of KM by the international development assistance community is evidenced by the establishment of KM programs in most development agencies and the designation of a Chief Knowledge Officer or a Vice President for Knowledge, as in the case of the Asian Development Bank. In many instances, the levels of application have gone beyond the conventional organizational KM system and have entered sectoral domains cutting across institutions.

Among the most critical in these sectoral domains is natural

resources management or NRM. A KM model for natural resources management would involve three components: content; workflows and procedures; and hardware-software-infrastructure.

Content. This chapter adopts a "body of knowledge" perspective. It forwards that, like other bodies of knowledge, natural resources management is three-dimensional.

As a discipline, on one hand, natural resources management has three aspects: theory, policy, and practice. These three – theory, policy, and practice – do not result from knowledge management per se but are products of knowledge generating activities, particularly research. Theory refers to the product of basic research; policy, the product of policy research; and practice, the product of applied/action research or lessons learned in program implementation.

As an area of study, on the other hand, NRM has several themes, roughly classified as: land resource management (brown issues); water, coastal, and marine resources management (blue issues); biodiversity conservation (green issues); air quality (grey issues); and energy resource management (red issues). Each thematic area would have its sets of theories, policies, and best practice.

Under this framework, it is implied that natural resources management theory, policy, and best practice should first be situated within the body of knowledge, classified and perhaps catalogued before these may be managed, i.e., shared and reused. The first major step would be a knowledge resource audit.

Analysis of secondary data and documents analysis were initially conducted for a preliminary audit of tacit and explicit natural resources management knowledge in each of the four countries. An online search of NRM knowledge yielded resources available in the World Wide Web. Please refer to the Annex.

***Workflows and Procedures*.** The workflows and procedures in knowledge management have been laid down by information science and communication science. Information science or library science covers the workflows for knowledge cataloguing, storage and retrieval. Communication science encompasses knowledge packaging for sharing and reuse. Prior to these stages, however, is the knowledge capture phase, wherein protocols have not yet been established. This is particularly relevant to natural resource management where local or indigenous knowledge plays an important part in community-based NRM. Local or indigenous knowledge are by nature analog.

The feasibility of digital capture was evaluated and explored. Among the workflows considered was the algorithm developed by Amoloza (2006), which the project adopted with modifications.

***Hardware-Software-Infrastructure*.** The project will make use of the Internet protocol as its main knowledge management platform. Since an online community of practice of NRM experts in Southeast Asia will participate in this undertaking, a Web-based platform would be most the appropriate.

The infrastructure for knowledge sharing in all four countries is available (Flor, GMS Study 2005). The policy environment for knowledge sharing is likewise conducive, particularly in Indonesia.

KM System

Testing. The above NRKM Model was operationalized and pilot tested through prototype KM systems hosted and administered by the UP Open University Faculty of Information and Communication Studies. Although the KM system best suited is Web-based, it cannot operate as a complete Intranet because of limited functionalities. It is operationalized through a Southeast Asian NRKM System hosted and administered by the UP Open University Faculty of Information and Communication Studies (FICS).

The KM System was uploaded and tested as a module under the existing UPOU learning management system (LMS) running on two platforms: the IVLE (Integrated Virtual Learning Environment) Version 4 Platform, www.myportal.upou.org, and the Moodle (Modular Object Oriented Dynamic Learning Environment) Platform, www.myportal.upou.net. IVLE was designed and developed by the National University of Singapore. IVLE Version 4 used to be proprietary but its code has been opened when older versions were made available on the market. Moodle, on the other hand, was developed as an open source LMS application by Curtin University. Both sites are secure and password protected. User names and passwords for the CoP members were provided. However, based on tests conducted during the country visits, it was decided to run the CoP on the IVLE workspace and use the Moodle site as an alternate.

www.myportal.upou.org. The IVLE site carries the following functionalities: online discussion board; messaging and collaboration; file transfer protocol; scheduling; document management; and others.

www.myportal.upou.net. The Moodle site has the following functionalities: online discussion board; messaging and collaboration; file transfer protocol; scheduling; document management; and others.

Community of Practice

Establishing the CoP. A total of twenty (20) experts participated in the CoP. Four (20%) come from Indonesia. Another four (20%) come from Lao PDR. Six (30%) come from the Philippines. The remaining six (30%) comes from Thailand.

Forums. The NRKM CoP site had a total of four discussion forums: Introductions; the CoP Process; the Post Baccalaureate Program; and General Comments. The following is a topic outline of the discussions:

A. Introduction (Forum 1)
   1. Meaning of Natural Resources: Leveling Off
   2. Natural Resources as Economically Viable Items or as Ecosystems?
B. Southeast Asian Community of Practice (CoP) on Natural Resources Knowledge Management (Discussion Forum 2)
   1. Definition of Knowledge Management
   2. The Goal of Knowledge Management
   3. Applications of Knowledge Management to Development
   4. Knowledge Management Model and System
   5. Good Practices
C. A Graduate Program on Natural Resources Knowledge Management (Forum 3)
   1. Rationale
   2. Program Description
   3. Institutions to Offer the Program
   4. Faculty
   5. Proposed Courses
D. Comments and Suggestions (Forum 4)
   1. On the Discussion Forum
   2. On the COP
   3. On the IVLE

The discussion threads endeavored to solicit ideas and insights from the participants. Given their expertise on natural resources management, how best can this expertise be shared? How can we build individual and institutional capacities for the sharing and reuse of this expertise through a formal program?

Knowledge Sharing. The exchange of ideas can be exemplified by the discussion threads and selected responses found at the next page:

DISCUSSION THREAD	POSTED RESPONSE
ON KM: KM is traditionally defined as an evolving discipline that considers an organization's intellectual capital as a manageable and potentially profitable asset (Leibmann, 1999). It is based upon the assumption that today's global economy is knowledge-based and that knowledge is a primary commodity as well as a valuable resource. KM entails digitally capturing documented and tacit knowledge and storing these for sharing and reuse. Thus, knowledge is managed through an intranet system and guided by organizational policies that provide incentives to knowledge sharing. Do you think that we can apply knowledge management principles in our work as NRM researchers and educators? Can you cite examples?	I agree with this definition of KM. It is an evolving discipline because it is not a petrified discipline as in all dogmas. Its key idea is "knowledge" or "bits of information integrated together to reflect an improved understanding on the biological, physical and social environment within which man is a part. "Knowledge evolved from sheer memory of human perception of surroundings. Soon it became part of oral tradition of primitive human societies (some survives today as Indigenous Knowledge or IK) and, when writing was invented it first was recorded in scrolls, and then, with the advent of paper invention and printing, in published journals and books. Now, knowledge is stored in both modern libraries as well as electronically in CDs and computers.
ON THE GOAL OF KM: The goal of knowledge management is the sharing and reuse of intellectual capital (Leibmann, 1999). Although, distinctions are made between undocumented or tacit knowledge and documented or explicit knowledge, both are captured digitally and stored in a knowledge base. These are	***Posting 1.*** The need for a knowledge base on NRM is probably beyond argument. It is the feasibility of doing so that requires serious thought. To this end, a COP could be useful in several ways: 1) it can clarify issues and establish boundaries and scope of the putative knowledge base; 2) start a

DISCUSSION THREAD	POSTED RESPONSE
also made available digitally in a variety of multimedia formats for sharing and reuse. Do you agree that Southeast Asian researchers and educators should establish a knowledge base on NRM? Do you think this is feasible?	knowledge pool by putting in their own tacit and explicit knowledge; 3) it can catalyze wider interest; 4) it might be able to present itself and what it has done so far to leverage resources to process materials in the knowledge base or important parts of it into such things as books (in hard copy and electronic form) ***Posting 2.*** Yes, it is feasible. There is a caution however that not all information constitutes what we call knowledge. Much information is generated within the spectacles of dogmatism and retards scientific problem solving, for example the nagging problem of reconciling development with environment. ***Posting 3.*** I think this is the way to go since many of our initiatives are common; hence, one common problem will unite us to come up with a common or collective solution although sometimes solutions have to be on a case-to-case basis as well. ***Posting 4.*** Establishing a knowledge base on natural resources is needed for Southeast Asian researchers and educators. The knowledge

DISCUSSION THREAD	POSTED RESPONSE
ON KM4D: In the past decade, KM principles have been brought to bear upon pressing social and development concerns such as health, education, agriculture and the environment. The increasing recognition of KM by the international development assistance community is evidenced by the establishment of KM programs in most development agencies and the designation of a Chief Knowledge Officer or a Vice President for Knowledge, as in the case of the Asian Development Bank. In many instances, the levels of application have gone beyond the conventional organizational KM system and have entered sectoral domains cutting across institutions. These ad hoc KM systems often operate on a Web-based workgroup platform run by an active community of practice or COP. What is your opinion on these initiatives?	***Posting 1.*** Probably easier to operate a KM activity in an organization or with a group which is homogeneous and have a common binding interest such as professional (engineers or, even more tightly, structural engineers. KM in a sector implies having participants with a common interest in a broader issue (than say, integrity of bridges) such as Natural Resources Management but also of more diffused areas of interests and specializations such as our own COP for this "course". But herein lies the greater challenge. If interests and specializations are widely varied, keeping the discussion points sharply focused might help. ***Posting 2.*** I think it's about time that all knowledge generated have to be captured, stored, and shared in practically all areas or disciplines. In this way, we could learn from one another but at the same time reflect on new ones resulting to new actions or adoption perhaps. The cycle of action-reflection-action prior to adoption of new knowledge is not only empowering but cost-effective and scientifically based as well.

DISCUSSION THREAD	POSTED RESPONSE
	Posting 3. Since CoPs through forums have been recognized as the fastest and perhaps most practical way of information exchange lately, it is but logical to keep tab of those exchanges and unilaterally have a common practice if applicable. The
ON THE NRKM DEGREE PROGRAM: The proposed Rationale of the program reads: The Southeast Asian Region is beset with natural resources management problems. Decades of unhampered resources exploitation I the watersheds of the Philippines and Indonesia by lumber companies are expecting their toll through landslides and flashfloods in the Visayas and Central Java. Land-locked countries in the Greater Mekong Subregion are now suffering the same fate. Coastal resources in the Sulu-Celebes Sea, home of the most biologically diverse marine ecosystems in the world, are being endangered by destructive fishing practices, mangrove destruction, and oil spills. The collective expertise of the region should be brought to bear on these problems through the establishment of a regional knowledge management	***Posting 1.*** Add the "coastal resources of the Gulf of Thailand and the Andaman Sea as among the resources that have been degraded and threatened with further degradation due to unplanned, unregulated and irresponsible practices." ***Posting 2.*** Add "pooling of experiences of practitioners that include managers, policy makers, civil society organizations, and fishers, farmers and foresters. ***Posting 3.*** The rationale is multipartite in nature. ***Posting 4.*** Knowledge sharing should be democratized so that participatory informed-decision making in establishing Marine Protected Areas result in empowerment instead of disenfranchisement.

DISCUSSION THREAD	POSTED RESPONSE
system for natural resources management. Furthermore, the capacities of institutions for natural resources knowledge management should be built and strengthened. A Graduate Certificate in Natural Resources Knowledge Management is hereby proposed. Since the subject matter is focused on natural resources knowledge management, a certificate program is deemed most appropriate. Due to the highly specialized nature of the subject matter, the program should be offered at the post-baccalaureate level.	***Posting 5.*** Add the following sentence after the word 'oil spills': In many areas of the region, natural habitats have been converted to other uses to respond to the needs of the growing population, urbanization and industrial development. These have resulted to the decline of the natural resources. ***Posting 6.*** Add the following before the sentence "The collective expertise..." While there is available expertise in the region and knowledge about the natural resources, access and use of
ON THE PROGRAM DESCRIPTION: The Program Description reads: The proposed Graduate Certificate Program on Natural Resources Knowledge Management will equip professional to apply, share and reuse regionally appropriate information and knowledge to combat problems related to natural resources management. It is a post baccalaureate program with eighteen units of coursework. It will cover instruction on natural resources knowledge science, knowledge management,	***Posting 1.*** Suggestion to re-structure as follows: "... to apply, share and reuse for research, education and management, information and knowledge that are applicable to problems in the region." Another suggestion: "to apply, share and reuse regionally appropriate information and knowledge to plan and execute solutions to cross-cutting problems related to natural resources management in various modes

DISCUSSION THREAD	POSTED RESPONSE
networking, and monitoring and evaluation. It is open to Southeast Asian professional engaged in natural resources, research, instruction and management in the private, government of NGO sectors.	(such as corporate, community-based or agency-based decision-making) in the region."
ON INSTITUTIONAL COMMITMENTS: Although the program will be offered by KU and UPOU, visiting faculty members from SEARCA's University Consortium will be encourage top participate. The core faculty will come from the active members of the COP, who will contribute to the content. A team teaching approach will be employed, fielding several faculty members per course.	For an in-residence course such as envisioned for KU, it would obviously cost more if a team consists of "teachers" from different countries. Couldn't a hybrid approach be developed in which KU and Thailand-based faculty could administer modules/ lessons contributed by faculty from other countries, but with a provision for internet-based support from the "core" faculty?
ON PROPOSED COURSES: Results of key informant interviews and consultations have generated the following tentative listing of courses: NRKM 201. Knowledge Management for Development (KM4D), 3 units. A survey of KM4D concepts, operationalization. NRKM 205. Networking, 3 units. Principles and strategies of	***Posting 1.*** Our students should have background courses on "Biography: Focus in Southeast Asia," "Geography with emphasis on Asian Cultures and Man-Nature Relationships," "East-West Cultural Exchanges that Bridge Development with Environment," and probably a course called by Dr. Malayang as "Political Ecology" and from Jonathan Porritt's "Seeing Green-The Politics of Ecology."

DISCUSSION THREAD	POSTED RESPONSE
institutional, electronic, formal and informal networking. NRKM 210. Natural Resources Knowledge Science I, 3 units. An Introductory course on how natural resources Knowledge is currently structured and systematized by the research and development sector. NRKM 211. Natural Resources Knowledge Science II, 3 units. An advanced course on how natural resources knowledge is applied by decision makers and policy makers. NRKM 220. Monitoring and Evaluation, 3 units. KM4D success indicators and M&E methodologies to gather and analyze data on these indicators. NRKM 250. Special Projects, 3 units. Design, development and testing of NRKM systems.	***Posting 2*** Courses look balanced but I am not sure a whole 3-unit course on KM is needed. Give a thought to a merger of 201 and 205. This would then allow a course that might sequel nicely with 211 (Applications of NRM knowledge in policies and programs), which could be "NRM Policy Tools and Practices." This course could discuss such concepts as environmental or ecological services and their valuation; the worldviews of natural resources management from deep ecology to cornucopian; conservation vs development; tradeoffs and their impacts on welfare; giving voices to the poor aquatic users on policies and programs; and enabling their participation in conservation and development programs. I agree with the merging of 201 and 205 as networking is essential in KM. ***Posting 3.*** Can we have something on participatory communication?

Comments on the CoP. The participants also made comments on the CoP KM Model. The more significant one were as follows:

- The CoP mode of exchanging (academic) views can be effective at the level where no consensus needs to be reached. I am not sure a web-based debate over a principle or theory or an empirical point that supports, reinforces, or rebuts a theory can come up to any useful outcome.

- Maybe an appointment, say adjunct or affiliate faculty for UPOU and/or KU without additional compensation, may be represented to participants so that this document will be proof of having participated in this very relevant project. With an appointment as document, we can include NRKM participation in our respective Curriculum Vitae as addition official service to our University, country and the ASEAN region.

- The initiatives on wider applications of KM to cross sector domains make the knowledge base richer. With the complexity of environmental problems that we are facing, we need multi-disciplined approaches to address them. In order to have an effective natural resources knowledge management, experts from related disciplines who share common concerns and interests are needed.

- KM works under the principle of "unity in diversity" when various views over an issue or concern is ventilated by a heterogeneous group who has down-to-earth experiences on the same issue or concern. Our goal is to see that humanity's "Common Good" is always target. The group should be homogeneous (e.g. all professionals capable of communicating with patience to each other's diverging views) to facilitate putting together our product after one month of on-line forum. While we are homogeneous because we are all professionals, we may

at the same time be heterogeneous because each of us come to the forum as representatives to different interests under the common goal of designing a viable sustainable natural resources knowledge management graduate program. Some of us may represent aquatic environment, others terrestrial, others come to represent respective institutional interests, while some purely academic. Long time ago, I have learned to be patient with diverging views and have experienced collective resolution reconciling diverging views. In UP we promote sharing of ideas but at the same time we are on-guard that the promotion of critical thinking is sustained.

- The CoP model is like a smorgasbord that you do not gulp all dishes on the table. You take only the relevant ones (information or experience from COP) that cater to applications that have heuristic value on case-to-case basis. In CoP model, there should be room for tolerance because it is always possible that participants come from different interests, sectors and philosophies (e.g. anti-globalization versus pro-globalization, pro-GMO versus anti-GMO, pro-centralized governance versus pro-decentralization or devolution, pro-industrialization versus pro-sustainable development). There is a saying that a crowd of mixed experiences can extract the right solutions to a problem better than a monolithic crowd would have done. The latter tends to make solutions that are only variations of the same theme (moving in circles), the former tends to experiment radical solutions that may work (moving in many directions, greater chance of hitting the target!). Solutions that failed are not all bad, because they are recorded in KM as learning experiences so that mistakes will not be repeated and better solutions crafted.

CoP Participation. Participation rates in the CoP were quite disappointing. Participation in face-to-face discussions was quite high. However, online participation was very low. For the

entire duration of the online discussion boards, the total number of posted responses to the twenty-eight discussion threads was fifty-eight (58) replies. This is quite low.

Reasons for Lack of Participation. Perhaps the biggest reason for the lack of participation is the language barrier. English was the medium used by the CoP and a mastery of the language was required. An inability to contribute substantively to the discussion due to language problems prevented active participation.

Furthermore, an unwillingness to make ideas public among some of the experts was observed. Posting an idea for others to assess is considered risky. This is more of a function of Southeast Asian culture. Then there is also an element of intellectual intimidation considering the novelty of the subject matter. However, the most common factor is the schedules kept by the experts. The majority of the participants had very busy schedules. Participation in the CoP requires commitment and quality time. And yet, a very big factor that affected participation was the connectivity of the participants at the institutional level and individual level. Connectivity was an issue, particularly in Lao PDR.

Incentives for Participation. Non-material incentives for participation in the online community should be provided to sustain the active engagement and interest of the CoP members. Thus, it was decided that active CoP members will be given the first option to serve as faculty members in the proposed Graduate Program on Natural Resources Knowledge Management.

Curriculum and Instructional Design: Graduate Program on NRKM

The participants agreed on the need for a Graduate Program on NRKM with the following features:

Description. The proposed Graduate Program on Natural Resources Knowledge Management will equip professionals to

apply, share, and reuse regionally appropriate information and knowledge to combat problems related to natural resources management. It is a post baccalaureate program with eighteen units of coursework. It will cover instruction on natural resources knowledge science, knowledge management, networking, and monitoring and evaluation. It is open to Southeast Asian professionals engaged in natural resources, research, instruction and management in the private government of NGO sectors.

Institutions. It is proposed that the program be offered by Kasetsart University in the residential mode. The University of the Philippines Open University may offer the program in the distance mode. The program will initially use English as the medium of instruction. Thai and Bahasa Indonesian media of instruction may be considered in the future.

Faculty. Although Kasetsart and UPOU will offer the program, visiting faculty members from SEARCA's University Consortium will be encouraged to participate. However, the core faculty will come from the active members of the CoP, who will contribute to the content. A team teaching approach will be employed, fielding several faculty members per course.

Tentative Courses. **R**esults of key informant interviews and consultations have generated the following tentative listing of courses.

1. NRKM 201. Knowledge Management for Development (KM4D).
2. NRKM 210. Natural Resources Knowledge Science I.
3. NRKM 211. Natural Resources Knowledge Science II.
4. NRKM 205. Networking.
5. NRKM 220. Monitoring and Evaluation.
6. NRKM 250. Special Projects.

CONCLUSIONS AND RECOMMENDATIONS

The study concludes that the community of practice model may be used for natural resources knowledge management. Furthermore, Web-based learning management systems such as IVLE and Moodle can adequately serve as the knowledge management system for such a CoP.

However, it is recommended that the following factors should be borne in mind in the conduct of online discussion forums: the language barrier; the schedule and availability of expert participants; the cultural sensitivities of Southeast Asian participants; connectivity; and non-material incentives for participants

Furthermore, the researchers recommend that the Graduate Program on Natural Resources Knowledge Management be developed and implement by a Consortium of universities in the Southeast Asian Region.

CHAPTER 6
KM FOR CLIMATE CHANGE

INTRODUCTION

Background

In support of the Climate Change Act of 2009 (RA 9729) and the Philippine Strategy on Climate Change, the DENR-GIZ ACCBio Project initiated the development of a knowledge management for climate change (KM4C2) framework that would provide the basis for an overall Strategic Plan and a Monitoring and Evaluation (M&E) Plan. As a parallel initiative, DENR issued Special Order 2011- 446 creating a Working Group on KM4C2 composed of one permanent representative and one alternative representative from the sixteen DENR offices.

This document presents the KM4C2 Strategic Plan and M&E Plan, based on the discussions and deliberations of the Working Group. It begins with a review of the Strategic Framework and its underlying assumptions.

Review of KM4C2 Assumptions

The following assumptions guided the drafting of the KM4C2 Strategic Framework and consequently the KM4C2 Strategic and M&E Plans:

Purpose. The purpose of DENR's KM4C2 is to initiate a *program* that would establish and maintain an operational and functional climate change knowledge management system. By definition, this system will be a sectoral and thematic KM system (climate change) instead of an organizational and enterprise KM system for DENR. In other words, it will be a system that will have for its users, all the stakeholders involved in climate change (i.e., DENR, LGUs, NGOs, civil society and the private sector) not merely serving the organizational requirements of DENR and its staff.

Components. The KM4C2 Program has several components:

1. a knowledge capture component;
2. a Web-based content management system (CMS) that integrates multimedia content, geographic/geospatial information, a metadata search engine, messaging and collaboration, and networking;
3. a capacity development component;
4. a knowledge products design and development component;
5. a research/ M&E component; and
6. a resource center and repository.

The CMS may manage and integrate the following components or modules: metadata; multimedia knowledge products (audio, still images, animation, video); hazard maps; research results; best practice from projects; lessons learned from projects; climate change documents (laws, policies, regulations, agreements); and learning modules.

Program Requirements. In order to achieve its goal, the KM4C2 Program requires: financial resource inputs from DENR and other donors; activities identified in a work and financial plan; which is guided by a Strategic Plan and an M&E Plan; and in turn are based on a Strategic Framework.

Revisiting the SOA-Metadata Argument

When designing a KM system for a complex multi-tiered networked organization, the most common approach employed is enterprise architecture (EA). Enterprise architecture is a comprehensive documentation of the structure of a complex organization. The organization's *enterprise* is made up of components of semi-autonomous entities, their properties and their relationships. EA provides the hardware, software and network specifications of information nodes and links within this enterprise through a detailed description of enterprise

components and their relationships with one another and the external environment, as well as a rigorous analysis of their requirements, design, and evolution. The description and analysis are provided in documents called EA artifacts.

This approach is traditionally employed by the private sector and is recommended if an organization is starting its KM system from scratch. However, knowledge management initiatives within DENR did not begin with KM4C2. There were several precedents that were office based or project based, developing independently from one another. Since climate change covers almost every aspect of DENR's technical mandate, it is highly possible that these office-based or project-based systems can be associated with the KM4C2 initiative. Obviously, scrapping these systems in favor of a newly designed integrated system would not be an option considering the expense that was put into these so-called legacy systems. Imposing an altogether new KM system would undermine these earlier initiatives and investments.

Furthermore, the choice of an ideal KM platform should be determined by de facto standards for interoperability purposes and not by industry standards.[6] It would be unadvisable to identify and invest on an industry-standard KM platform that is isolated from communities of practice and may eventually become an electronic white elephant.

Additionally, DENR office-based or project-based legacy systems are still being utilized. In KM, system utilization is self-perpetuating. Hence, several KM systems are actively functioning albeit utilizing differing, non-interoperable platforms and standards that discourage integration or even data migration. The possibility for the integration of these platforms without the option of dismantling and supplanting them should be explored. The situation requires a solution that would interface these fragmented systems without disrupting them.

[6] *For instance, the industry standard for GIS is ArcInfo or ArcView. But the de facto standard has shifted to Manifold, a less expensive alternative, and may eventually become Quantum GIS, an open source alternative.*

In other words, we are proposing service-oriented architecture (SOA) instead of enterprise architecture as a design and development strategy. This strategy would provide for the auto-capture of specific data fields found in legacy systems. It would enable the search and retrieval of knowledge products housed in other servers through metadata. It would make knowledge harvesting from other websites possible. More importantly, it would allow for the evolutionary prototyping of the KM system in itself.

KM4C2 Strategic Framework

The KM4C2 Strategic Framework contains the following elements: a Preamble that presents the statement of commitment (SOC) of the KM4C2 members; a Vision Statement for KM4C2; a Mission Statement for KM4C2 implementers; a Goal Statement for the KM4C2 Program; and a set of Strategic Thrusts that has a one-to-one correspondence to the components of the KM4C2 Program.

The KM4C2 Strategic Framework may be summarized in the following matrix.

Table 6-1. Stratframe Matrix

VISION STATEMENT	We envision a comprehensive knowledge management system that leverages all existing knowledge resources on climate change adaptation and mitigation
MISSION STATEMENT	Our mission is to initiate and consummate a program that would establish, maintain and provide support services for an operational and functional climate change knowledge management system.
GOAL STATEMENT	Our goal is to contribute to the attainment of *climate change resiliency* by 2016 through nationwide access to and sharing of knowledge resources

STRATEGIC THRUSTS	STRATEGIES	PROGRAM COMPONENTS
Systems Development	Adoption of a service oriented architecture (SOA) Employing a Web Content Management System (WCMS)	Content Management System
Content Development	Adoption of the Dublin Core Metadata Standard and participation in the DCMI Adoption of auto-capture strategies Adoption of knowledge harvesting	Metadata System Knowledge Capture Component Knowledge Products Design, Development and Production
Capacity Development	Increase national ownership and partnership building on KM4C2 Strengthen institutional capacity for KM4C2 Improve organizational capacity for KM4C2 Improve quality of KM4C2 systems and products Accelerate knowledge generation on KM4C2	Capacity Development Component Long term degree programs Short Term training Benchmarking visits
Resource Center Development	Documents management Environmental Interpretation	Resource Center and Repository Climate Change Interpretive Facility
Operations Research	Adoption of results-based management paradigm and theories of change	Monitoring and Evaluation

The KM4C2 Working Group as a Core Community of Champions

Tasks of the Working Group. Based on SO 2011- 446, the tasks of the KM4C2 working group are: to review and evaluate outputs of KM Consultant; to conduct environmental and existing knowledge resources scanning; to conceptualize the DENR Climate Change Resource Center; to prepare a KM Strategic Plan and M&E Plan; to draft a 2012 Work and Financial Plan; and to undertake capacity development. Nevertheless, the role of the KM4C2 working group member may eventually be: to serve as KM focal persons within their units; to become the KM trailblazers and eventually the organic KM Officers within their offices; to become KM resource persons in DENR; to serve as the de facto KM implementers, monitors and assessors; and lastly, to become the KM champions within DENR.

Community of Practice. A concept closely associated with KM is that of the CoP or *communities of practice*. The CoP concept was a progression from the CoIs or *communities of interest* that characterized the early Internet workgroups, which essentially shared notes, information and insights on areas of common interest, beginning with CERN theoretical, experimental and applied physics and eventually progressing to Internet protocols. When CoIs ventured into collaborative solutions of common problems, they transformed into so-called workgroups evolving to the next level, the CoP. However, many of today's CoPs offer solutions to problems but stop short of implementing these solutions, preferring to adopt the KM business protocol of sharing and reuse.

C5. The problems that confront us nowadays, such as climate change, are to a scale that often requires policy interventions, not merely technological solutions. CoPs must now delve into the policy process and progress into *communities of champions* or CoCs. From CoIs that share information and CoPs that share solutions, we must move into CoCs that mobilize sectors through

information, knowledge and advocacy. Thus, the KM4C2 strategic framework provides for the members of the working group to become the Core Community of Champions for Climate Change (C5).

Working Group Clusters. For strategic planning purposes, the members of the KM4C2 working group who attended the second workshop were clustered according to interest, practice and advocacy. The current working group make up is that of librarians or information science practitioners, information systems and technology practitioners, communication practitioners and content experts. Using the strategic thrusts as a basis, the KM4C2 clusters identified were: the systems development cluster; the content development cluster; and the capacity development cluster. Hence, apart from serving as KM focal persons in their respective units, the members of the working group had the option of choosing a strategic, advocacy and operational focus.

Under these clusters, the members of the KM4C2 working group contributed to the drafting of the strategic plan and the M&E plan. Prior to the actual drafting of the plans, however, a discussion on the physical and virtual dimensions of KM4C2 was conducted by the group.

THE PHYSICAL AND VIRTUAL DIMENSIONS OF KM4C2

Knowledge management operates both on the physical and virtual planes. Digitized documents and knowledge products have hardcopy and softcopy versions. Both are managed manually and electronically, within physical space and cyberspace.

Similarly, the KM4C2 initiative has both a physical and a virtual dimension. The physical dimension is the KM4C2 Resources Center. The virtual dimension is the KM4C2 Content Management System.

The KM4C2 Resource Center

As a Facility within the DENR Library. The KM4C2 Resource Center is an organized physical space that will house hard copies of published multimedia materials and other knowledge products on climate change. These materials will be: acquired by DENR from commercial establishments or other agencies, national or international, involved in climate change; contributed by specialized bureaus, offices and units; and solicited from LGUs and the academe. Examples of these are books, manuals, reports, policy documents, agreements, hazard maps, posters, and other reference materials. These will be catalogued and indexed for easy retrieval and circulation.

The KM4C2 will be a physical repository of climate change knowledge products organized into a library. It will provide library services to DENR and the general public on climate change acquisitions. It will occupy a wing in one of the three floors of the new DENR Library and will be administered by the Public Affairs Office.

As an Interpretive Center. The KM4C2 Resource Center may also contain a live exhibit area or a semi-permanent climate change interpretive center. An environmental interpretive or interpretation center is a facility for the dissemination of knowledge of nature. Examples of such facilities are Rice World found at the International Rice Research Institute in Los Baños and the Coastal Resources Interpretive Center built by USAID at the SU Marine Laboratory in Silliman beach.

Sometimes called Eco museums, interpretation centers use different media to enhance the understanding of nature. To aid and stimulate the discovery process and the visitor's intellectual and emotional connection to nature, the main presentation strategy tends to be user-friendly and interactive, and often use exhibits and multimedia programs (www.wikipedia.com). The KM4C2 interpretation centers may contain temporary exhibit

modules. Unlike traditional museums, it will not aim to collect, conserve and study objects. The KM4C2 interpretation center will be a specialized fixture for communicating the significance and meaning of climate change ` to educate and raise awareness.

The KM4C2 Content Management System

The strategic framework recommends a service-oriented architecture for its systems design strategy. We will employ a *content management system* (CMS) that provides a bundle of modules and procedures to manage the collaborative workflows required by KM4C2. It should be a Web content management system (WCMS) designed to simplify the publication of web content to a KM4C2 website and mobile devices possibly utilizing a Joomlah or Plone (Zope) platform.

The KM4C2 WCMS will provide the following functionalities: website authoring, messaging and collaboration (e.g., email, chat, discussion boards, workgroups), and administration tools (e.g., security management, version control) to create and manage website content, inclusive of data, documents, images, audio-video, contact details. It may integrate the following modules:

Metadata Search Engine. An online database of the climate change content found in other database systems within DENR, local government units, the academe, and relevant international agencies will be developed. Although the actual content (documents and other knowledge products) will not be contained in the database, it can be accessed and possibly downloaded directly through a link. KM4C2's metadata system should adhere closely to Dubiin Core Metadata standards.

Documents Management. For documents, maps and rich media that are actually housed in the KM4C2 server, a documents management module will be developed as part of the WCMS. This may contain documents explorer, photo galleries, audio-video tagging protocols, etc.

Learning Management System. Another proposed module for the WCMS is online eLearning platform that provides open and distance training programs on climate change for DENR personnel and other stakeholders.

Links to Social Media. The WCMS should incorporate social networking into its services by linking users to KM4C2 Facebook, Twitter and YouTube accounts. For instance, KM4C2 may register a YouTube account on indigenous knowledge and practices to adapt to or mitigate climate change. A Twitter account on climate proofing tips may be initiated, harvesting best practice and lessons learned from the World Wide Web. KM4C2 CoCs can actively engage in Facebook group discussion forums.

Suite of Mobile Apps The content management system may incorporate a service for mobile devices.

Environmental advocacy has achieved much in the past two decades. For instance, there is a greater awareness today that global warming is indeed occurring and that adjuncts to this are extreme weather patterns. The challenge that face now is translating this awareness to action, i.e., climate change adaptation and mitigation, as well as, sustaining the gains made in climate change campaigns particularly among the next generation who will become future leaders, decisions makers and policy makers. KM4C2 should tap the so-called new media: and mobile devices such as hand phones, netbooks, tablets and pods. The spread of new media has been viral. In Philippines alone, Nokia, BlackBerry and iPhone users have achieved a critical mass. A message carried by applications on the BB platform and iPhone platforms has the potential of reaching millions considering that the country has a population of 90 million. Furthermore, the mobile device is now the medium of choice among Filipino youth and young professionals. It has become the universally accepted medium for knowledge sharing and reuse. A suite of mobile phone applications including wikis, games, social networking, messaging, and music can become a viral medium for the climate change message.

Scanning of Knowledge and Expert Resources

To populate the content of both physical and virtual KM4C2, the working group members were asked to scan then list existing knowledge resources that may be contributed by their respective agencies. Similarly, possible service contributions to the KM4C2 initiative were elicited.

DENR Units/Offices. The DENR offices represented in this resource scanning are: the National Water Resources Board; the Management Information Systems Division; the Mines and Geosciences Bureau; the Ecosystems Research Development Bureau; the Protected Areas and Wildlife Bureau; the Foreign Assisted and Special Projects Office; the River Basin Control Office; the Planning Division; the Land Management Bureau; the National Mapping and Resource Information Authority; the Laguna Lake Development Authority; the Center for Land Administration and Management, Philippines; Field Operations; the Central Office; and the Public Affairs Office.

Resource Contributions. The members of the KM4C2 working group were asked to individually identify their agency's possible contributions to the KM4C2 initiative in terms of: CMS modules and content (virtual); KM4C2 Resource Center (physical); and the KM4C2 Program (services).

Potential CMS Module contributions include a library system, the ERDIS and the ETGIS. Virtual content contributions range from digitized documents, publications, hazard maps, proceedings, newsbriefs, abstracts, and expertise for CoPs. Physical content contributions encompass library acquisitions, publications, maps, and compilation of policies, laws, implementing rules and regulations, lists, equipment for the interpretive center, exhibits and others. Lastly, service contributions include security management, data warehousing, CMS development, library services, and metadata/ content provision.

Table 6-2 gives a matrix of virtual, physical and service contributions from the offices and units represented.

Table 6-2. Content and Service Contributions

UNIT/ OFFICE	VIRTUAL MODULES AND CONTENT CONTRIBUTIONS	PHYSICAL CONTENT CONTRIBUTIONS	SERVICE CONTRIBUTIONS
DENR Central Office	Library System	Library Acquisitions - Laws compilation - Journals - Pamphlets - Books	Library Services: Cataloging, indexing (Virtual/ Physical)
ERDB	program wherein documents could be classified and entered	Publications (Canopy, RISE, Manuals, Annual Reports)	
FASPO	Publications (Canopy, RISE, Manuals, Sylvatrop Annual Reports, Compendia)		Data/Content provider on FAPs matters (Virtual) Projects outputs/ knowledge products (Virtual)
LLDA	Proceedings	GHG emissions Inventory Maps (LdBR) Lessons learned from methane avoidance (sub-project: LISCOP Project) GHG emissions inventory for LdBR Laguna de	Research and Writing (Physical) Research skills (Physical) Photo and Video documentation (Virtual)

UNIT/ OFFICE	VIRTUAL MODULES AND CONTENT CONTRIBUTIONS	PHYSICAL CONTENT CONTRIBUTIONS	SERVICE CONTRIBUTIONS
		Bay Community Carbon Finance Project (Climate Change doc) Thematic Maps of LdBR Laguna de Bay Atlas	
LMB	Newsbriefs	Compilation/ Lists of Policies for Land Administration and Management Lists of titled and untitled lots in the Philippines LMB Key Services Manual/ Publications on different kinds of land acquisition IRR for issuance of Free Patents to residential lands	Data Provider (Virtual/Physical) - Reference copy of Technical Description Plan - Status of Lots - Status of Friar/ Public Land Application
MGB	Abstracts of Research Results	Geohazard maps on rain-induced landslides and flood assessment, 1: 50,000 scale (available – 1: 10,000 ongoing) (Lands Geology)	Digitization of maps in ArcGIS format; other formats may follow (Virtual)

UNIT/ OFFICE	VIRTUAL MODULES AND CONTENT CONTRIBUTIONS	PHYSICAL CONTENT CONTRIBUTIONS	SERVICE CONTRIBUTIONS
		Coastal geohazard assessment - ongoing (Marine Geology)	
MISD	Information Systems: ERDIS, ETGIS		Provide Data Security (Virtual/ Physical) Creation of website using CMS such as Joomlah (Physical) Provide CMS webhosting (Physical) Data warehousing (Physical) Provide FTP accounts for warehousing (Virtual)
-NAMRIA	ENR research specialists: forest, coastal zone/ freshwater, grasslands, degraded areas, uplands		
NWRB	Project Completion Reports	Publications/ Manuals Existing water and related laws, rules and	GIS services (Virtual/Physical)

UNIT/ OFFICE	VIRTUAL MODULES AND CONTENT CONTRIBUTIONS	PHYSICAL CONTENT CONTRIBUTIONS	SERVICE CONTRIBUTIONS
		regulations Water resources maps	
PAWB	Lessons learned from implementing projects	Publications	Content Provider (Virtual)
	Coastal Resources Management		Data Provider
RBCO	MPAs (status)	Integrated River Basin Master Plan IEC materials and exhibit materials River Basin/ Watershed thematic maps River Rehabilitation Technology Application Manual	Technical assistance - Facilitation for stakeholder

The potential modular, content and service contributions given above are substantive contributions that would jump start the Km4C2 initiative.

STRATEGIC PLAN

KM4C2 Strategic Thrusts

Based on the previous sections, the activities and tasks under the strategic plan may be categorized under the following strategic thrusts.

Systems Development. The KM4C2 Program will design, develop and test an integrated system, a Web content management system (WCMS) and its modules, for the timely capture, indexing, storage, sharing and reuse of climate change knowledge adopting open access and multi-level/multi-tiered networking strategies. The system will employ a service-oriented architecture (SOA).

Content Development. The next strategic thrust of the KM4C2 Program is content development. Knowledge resources for understanding, adapting, and mitigating climate change will be captured, harvested or developed. A substantial content component is metadata on documents, databases and other knowledge products currently housed in legacy systems within and beyond DENR. Along this line, the adoption of the Dublin Core Metadata Standard and participation in the Dublin Core Metadata Initiative (DCMI) will become a primary strategy. The DCMI is an open organization engaged in the development of interoperable metadata standards that support a broad range of purposes.

Other strategies to be employed are the adoption of auto-capture strategies and climate change knowledge harvesting from the World Wide Web.

Capacity Development. Along with increased tasks and responsibilities brought on by this initiative, institutional, organization and individual capacities on KM4C2 should be developed. The following strategies will be employed:

- Increase national ownership and partnership building on KM4C2
- Strengthen institutional capacity for KM4C2
- Improve organizational capacity for KM4C2
- Improve quality of KM4C2 systems and products
- Accelerate knowledge generation on KM4C2

Capacity development on KM4C2 should include long-term degree scholarships, short-term training courses, benchmarking visits and study tours.

Resource Center Development. A KM4C2 Resource Center is being planned to become the physical repository of available knowledge products on climate change and a library. The Center may also assume the form of a permanent exhibit or "interpretation center" on climate change. Thus, under this thrust, the strategies to be employed are: documents management and environmental Interpretation.

Operations Research. A built-in operations research component should be incorporated into the KM4C2 Program. Specifically, the focus of this strategic thrust is monitoring and evaluation. The strategy to be employed under this thrust is the adoption of results-based management paradigm and theories of change.

Components

Based on the above discussion, the components of the KM4C2 Program will include:

1. Content Management System
2. Metadata System
3. Knowledge Capture Component
4. Knowledge Products Design, Development and Production
5. Capacity Development Component
   5.1. Long term degree programs
   5.2. Short Term training programs
   5.3. Benchmarking visits

6. Resource Center and Repository
7. Climate Change Interpretive Facility
8. Monitoring and Evaluation

Activities and Milestones

The major activities of the Strategic Plan may be categorized under the following clusters: program start-up activities; systems development; content development; capacity development; resource center development; and monitoring and evaluation.

The milestones under program start-up activities are: the beginning of the KM4C2 Program scheduled 1 January 2012; and the issuance of the Departmental Memorandum Order on the KM4C2 scheduled on 30 March 2012. Under this cluster fall the following activities:

1. Preparatory activities
2. Initiate institutional arrangements
3. Administrative preparations
4. Grants and proposal packaging
5. Internal Advocacy

Systems development involves the following major activities:

1. Analysis and core prototyping
2. CMS Design
3. CMS Testing and evaluation
4. Implementation & modules development

The major activities under the content development cluster are:

1. Knowledge products design and development
2. Knowledge harvest
3. Metadata population

Capacity development involves the following major activities:

1. Short term training
2. Benchmarking
3. Degree programs

The resource center development cluster is composed of the following major activities:

1. Procurement of Services
2. CC Interpretive Center Design
3. Collection and production
4. Construction and transfer

A milestone under this cluster is the launching of the KM4C2 Resource Center scheduled on 28 September 2011.

Lastly, the monitoring and evaluation cluster includes the conduct of baseline studies, a Midterm Program Evaluation and a Final Program Evaluation. The KM4C2 Program ends on 30 December 2016.

MONITORING AND EVALUATION PLAN

Approach and Methodology

KM4C2 M&E will be guided by Theories of Change (ToC) and Results Based Management (RBM). RBM provides for adjustments, recalibration and fine-tuning of project plans and designs given the contingencies of implementation that most projects encounter.

On the other hand, ToC defines all building blocks required to bring about a given long-term goal. It originated from the program planning and evaluation community of practice. Built around the pathway of change, Theories of Change describes the types of interventions or inputs that would result in certain outputs that bring about the outcomes desired.

Outcomes and Indicators

KM4C2 Program. The desired outcome of the KM4C2 program is increased climate change resiliency among Filipinos through nationwide access to and sharing of knowledge resources.

Systems Development. The outcome of systems development is an operational and functional KM4C2 CMS and Resource Center. The indicators for this outcome are: system accessibility; system and resource center utilization; and frequency of updates. A primary source for these indicators is Google Analytics.

Content Development. The outcome for content development is increased sharing and reuse of climate change knowledge resources. The indicators for this outcome are similar to those of systems development: system accessibility; system and resource center utilization; and frequency of updates. As in the case of systems development, a primary source for the indicators is Google Analytics.

Capacity Development. As stated in Deliverable 1, the outcomes for capacity development are: increased national ownership and partnership building on KM4C2; strengthened institutional capacity for KM4C2; improved organizational capacity for KM4C2; improved quality of KM4C2 systems and products; and accelerated knowledge generation on KM4C2. Its indicators are: participation rates in capacity development programs; completion rates in capacity development programs; degree of project ownership among DENR staff; efficiency of KM4C2 Program; effectiveness of CMS and Resource Center; quality of content and knowledge products; and utilization of the KM4C2 CMS and Resource Center.

CHAPTER 7
KM for BIODIVERSITY CONSERVATION AND ENHANCING ECOSYSTEM FLOWS

INTRODUCTION

Background

The Global Environment Fund (GEF) proposed a project titled *Enhancing biodiversity, maintaining ecosystem flows, enhancing carbon stocks through sustainable land management and the restoration of degraded forestlands* to be implemented by the Food and Agriculture Organization (FAO) in collaboration with the Government of the Philippines (GoP). It aims to deliver multiple and integrated environmental, livelihood and development benefits through the promotion of the cost-effective and sustainable restoration of biological and productive capacities of degraded forest land ecosystems.

Project interventions come under three components. Component 1 will ensure that enabling conditions are created to support the forms of restoration that are proposed and to scale them up to national level. Component 2 will generate concrete site-level experiences of carrying out ecosystem restoration in such a way as to generate multiple and integrated environmental and social benefits, while at the same time providing for cost-effectiveness and sustainability. Component 3 will ensure that project efforts are science-based and supported by information on experiences generated to date, and also that the experiences generated through the project are effectively communicated to policy formulators, decision-makers and technicians.

Rationale

Knowledge management (KM) and capacity development concerns are under the third component. It is expected that KM

and capacity development would generate increased awareness within a critical mass (at least 2000) of key stakeholders in government, civil society organizations (CSOs) and beneficiary communities on the potentials of forest restoration. This document proposes KM and capacity building interventions of the project.

SITUATION ANALYSIS

Analysis of Existing Knowledge on Land Restoration

Existing knowledge and knowledge gaps on landscape restoration at regional, national, and international levels were assessed through documents analysis and key informant interviews. The main findings are as follows:

Knowledge on restoration approaches is quite extensive. Given current assisted natural regeneration (ANR) initiatives in Africa, Asia, and Latin America there is a diversity and volume of lessons learned and best practice. Many of these have been traditionally categorized under sustainable land management (SLM). The diversity and volume of restoration is expected to increase dramatically with the implementation of The Restoration Initiative (TRI), a program to help countries restore degraded landscapes at scale. With support from the GEF, TRI unites ten countries (Cameroon, Central African Republic, China, Democratic Republic of Congo, Guinea-Bissau, Kenya, Myanmar, Pakistan, Sao Tome and Principe, and Tanzania) and three GEF agencies (IUCN, FAO, and the UNEP) in working to overcome existing barriers to restoration. TRI is being implemented in support of the Bonn Challenge, a global effort to bring 150 million hectares of degraded and deforested land into restoration by 2020 and 350 million by 2030. Among its key implementation areas is knowledge sharing and partnerships. This key area will provide support for the capture and sharing of innovative experiences and best practices, raising awareness of forest land restoration (FLR) needs and benefits, and developing and strengthening critical partnerships. However, TRI is still being implemented and the knowledge generated from the program will still undergo capture and systematization.

In the Asia-Pacific Region, countries such as China, Thailand, Indonesia and Vietnam have implemented sustainable forest management through the ***model forest approach***. A Southeast Asian REDD+ initiative is still ongoing in Lao PDR and other countries in the Mekong sub-region. In the Philippines, significant experiences have been generated with restoration projects. The National Greening Program, which by 2014 had reforested more than 1 million hectares, as well as the FAO TCP Project "Advancing the application of ANR for effective low-cost forest restoration" and the B+WISER project are prime examples.

Current SLM and restoration knowledge generally focus on conservation technologies, ecosystem restoration and neglects other factors central to forest communities. Landscape restoration knowledge, particularly in the Philippines, should incorporate: climate change *adaptation considerations*; *economic realities* faced by the forest dwelling family that determine its relationship with the forest; and recognition of forest community's *traditional and local knowledge*. In other words, the *adaptive* nature of restoration should be highlighted. The GEF-UNDP SLM Project is tentatively referring to this as Adaptive Land Management or ALM, an approach to managing land resources that enhances a farmer's/forest dweller's ability to maintain/restore land productivity by adapting to his environmental, economic and social circumstances with the welfare of his family foremost in mind. In ALM, sustainability is measured by the farm family's ability to adapt (Concepcion, 2017). ALM is pragmatic, it is guided by a sense of responsibility towards the forest as an intergenerational resource, not entirely on conservation or restoration technology.

The adaptive land management approach will enhance knowledge on restoration of degraded forest lands. ALM is transformative since it defines the dynamic relationship of the community with the forest. Ordinarily, SLM focuses exclusively on the science of land, water and air while restoration focuses on biodiversity. ALM, on the other hand, incorporates local, indigenous and traditional knowledge and practices for combating forest degradation. While SLM highlights land/

forest management *technologies*, ALM emphasizes land/forest management *processes* and its temporal and spatial dimensions.

Table 7-1. SLM-ALM Typology (*Source: GEF-UNDP SLM Project*)

	CONVENTIONAL SLM	ADAPTIVE LAND MANAGEMENT
Goal	Check land degradation Rehabilitate degraded land	Maintaining long-term land productivity for the farm family
Approach	Sustainable agriculture	Responsible agriculture
Basis	Science of land, water and air	Functional relationship between land degradation, crop yield and income
	Research-based technologies	Technologies contextualized within farm family circumstances; adaptation strategies
	Government extension agencies	Localized sharing of traditional knowledge
Economics	Farm	Off-farm and Non-farm
Parameters	Natural and human induced degradation	Environmental, economic, social factors that determine degradation
Dimensions	Physical	Temporal, Spatial
Success Indicator	Increased/ sustained fertility of soil	Ability of the farm family to adapt
Land degradation	Linear process	Both seasonal and historical
Monitoring Data	Physico-chemical properties	Geospatial, physical and bioindicators
Index Used	Land Degradation Index (LDI)	Adaptive Land Degradation Index
Main Monitoring Actors	Technicians Researchers	Community Monitors Technicians Analyze

Adopting the long-term perspective of responsible agriculture, ALM recognizes that land management considerations are not

confined merely to the production of raw material. Compared to conventional SLM, ALM includes the management of externalities such as off-agroforest and non-agroforest economic opportunities. It is not exclusively concerned with degradation and restoration but considers the functional relationships of degradation/restoration, crop yield and income that makes the farmer adopt the three-tiered strategy of plot-field-landscape. ALM considers seasonal variations in degradation. It considers natural forest degradation as landscape specific benchmarks. Cabrido, Concepcion and Flor (2018) forward the following prototypology of conventional SLM and ALM:[7]

Analysis of Existing Knowledge Management Platforms

Existing knowledge management platforms on landscape restoration were also assessed at the regional, national and international levels. The major findings of this desk study are as follows:

At the international level, land restoration knowledge is generally found in SLM KM platforms. Since much of restoration knowledge has been traditionally categorized under sustainable land management, they are being made available in online SLM knowledge platforms such as WOCAT (World Overview of Conservation Approaches and Technologies). In the case of TRI, FAO leads its global knowledge component, which would eventually include this Project's KM system.

Regionally and locally, experiences on multiple benefits approaches to restoration are neither well documented nor easily accessible. Related regional KM platforms on natural resources management exist such as SEARCA's Knowledge Center for Climate Change (KC3) and the ASEAN Center for Biodiversity (ACB). However, there are no KM systems dedicated exclusively to forest restoration. It does not account substantively

[7] *Conception, R.N., Cabrido, C.A. and Flor, A.G. 2018.* ***Competency Development Program Guide and SLM Training Manual****. GEF-UNDP SLM Project, Quezon City: DA-BSWM.*

in their current content. WOCAT has its national counterpart, PHILCAT (Philippine Conservation Approaches and Technologies) maintained by the BSWM (Department of Agriculture Bureau of Soils and Water Management). Currently, the BSWM is implementing the GEF-UNDP Implementation of Sustainable Land Management Practices to Address Land Degradation and Mitigate Effects of Drought. The possibility of plugging in a GEF-FAO project module into PHILCAT is currently being considered by the GEF-UNDP project.

Several agencies maintain legacy systems that are related but are not dedicated to forest restoration. There are several other legacy systems in the Philippine environment and natural resources sector, focusing on biodiversity, ecosystem flows and carbon sequestration respectively maintained by Biodiversity Management Bureau, the Climate Change Commission and the Forest Management Bureau. However, the most relevant to the project is PHILCAT.

These legacy systems are more of databases and information systems rather than knowledge management systems. Generally, their content has metadata links that allow for sharing and reuse of quantitative, nominal and descriptive content. Others accommodate online discussions and file sharing among communities of practice (CoP). However, none exist that make use of semantic links and tags that are necessary for KM systems. Furthermore, these legacy systems are purely electronic and are not linked to non-digital networks which are part and parcel of KM systems.

A system devoted to traditional, indigenous or local knowledge on land restoration does not yet exist. However, at the local level, KM networks need not be digital networks. These may consist of project initiated informal social networking groups, i.e., communities of practice, active on the Facebook platform. The existence of such CoPs may be validated in the social development baseline studies conducted by the project.

Opportunities exist to establish local knowledge networks. Additionally, formal and informal channels for indigenous/ local knowledge sharing and reuse may be tapped with the participation of local CSOs such as the *Kababaihang Masigla ng Nueva Ecija* (KMNE) and the academe such as the Central Luzon State University (CLSU) for the Region III Project site. Private sector support may also come from corporate social responsibility (CSR) funding for the Eastern Mindanao project site. Companies that are about to embark in mining operations in the area may provide this support as part of the mitigating measures required for them to obtain an ECC.

Analysis of Systematization and Dissemination

An analysis of systematization and dissemination capacities and efforts for restoration knowledge has also been conducted. The major findings are as follows:

Globally, systematization has been adopted extensively in generating knowledge on natural resources management. Systematization of experience is a method aimed at improving practice based on a critical reflection and interpretation of lessons learned from that practice. Within the context of Philippine forest restoration this involves a facilitated process of capturing, analyzing and structuring tacit knowledge, specifically, best practice and lessons learned, from the perspective of the major stakeholders, i.e., the forest community, the local government, the CENRO/ PENRO and the FMB. The methodology encompasses the identification, documentation, and transfer of experiences and key lessons extracted from a project or an initiative, or group of projects or initiatives for the purpose of advocacy, learning and replication/scaling up.

The systematization methodology was introduced to the natural resources management sector by Jorge Chavez-Tafur (2007, 2013) and adopted in Latin America, Asia and Africa. Systematization has been endorsed by the FAO Knowledge

and Capacity Development Office (OEKC) as part of content provision for KM systems. In 2011, with funding from IFAD, the KM and Capacity Building Expert of this PPG collaborated with Chavez-Tafur and Denise Melvin of FAO OEKC in piloting the systematization approach among CSOs, NGOs and people's organizations involved in forest conservation projects in South Asia (Kathmandu) and in natural resources management undertakings in Southeast Asia (Los Baños).

In the Philippines, the systematization method of forest restoration knowledge is not being applied. Although Philippine agencies participated in the IFAD-FAO systematization workshops conducted for Southeast Asia conducted in 2011, the practice has not prospered nor even picked up by the government, private and NGO sectors. When asked why systematization was not applied in their natural resources management undertakings, some of the participants explained that with the preponderance of NRM research and development agencies and the presence of state colleges of agriculture and forestry in almost every province, they thought it best to leave the systematization of knowledge to these institutions instead. Recommended restoration and conservation technology come from these institutions anyway, they said. This, of course, defeats the purpose of systematization since the exclusion of other stakeholders from the knowledge generation process leads to restoration recommendations which may eventually be ignored by forest communities.

The academic community is eager to facilitate the systematization process of forest restoration knowledge. Key informants from the University of the Philippines Los Baños - some retired, others in active service - were interviewed for this desk study, many of them coming from the Department of Social Forestry. They are familiar with the limits of technical knowledge coming from the academe and see the value of indigenous and local knowledge. Most of all, they recognize the need to involve stakeholders in what was referred to as the "social construction of forest restoration knowledge."

The systematization method may be expanded by introducing levels to the systematization process and ontologies for forest restoration knowledge. The systematization method as outlined by Chavez-Tafur occurs at the community level. The full size project may opt to expand systematization to include regional, national and global levels. This would require the development of ontologies for forest restoration encompassing the entire spectrum of practices and technologies from assisted natural regeneration to accelerated reforestation and biodiversity spread. However, this will necessitate a global dialogue leading towards standards and a substantive interface with a global knowledge management system.

The Philippine natural resources management sector is actively disseminating forest restoration knowledge. Although the dissemination of forest restoration knowledge is the responsibility of DENR, several sectors assist in this undertaking. These include NGOs, CSOs, and local governments. Conventional media (print, radio, audio-visual) is often employed. However, the most extensively used is interpersonal communication or word of mouth. Community field training, workshops and farmers' field schools are among the more popular forms since these enable the cross-fertilization of ideas among forest communities.

Summary of Findings

An analysis of current land restoration knowledge, knowledge management platforms, systematization and dissemination revealed the following:

1. Knowledge on restoration approaches is quite extensive.
2. However, current SLM and restoration knowledge generally focus on conservation technologies, ecosystem restoration and neglects other factors central to forest communities.
3. The adaptive land management approach will enhance knowledge on restoration of degraded forest lands.

4. At the international level, land restoration knowledge is generally found in SLM KM platforms.
5. Regionally and locally, experiences on multiple benefits approaches to restoration are neither well documented nor easily accessible.
6. Several agencies maintain legacy systems that are related but are not dedicated to forest restoration.
7. A system devoted to traditional, indigenous or local knowledge on land restoration does not yet exist.
8. Opportunities exist to establish local knowledge networks.
9. Globally, systematization has been adopted extensively in generating knowledge on natural resources management.
10. In the Philippines, the systematization method of forest restoration knowledge is not being applied.
11. The academic community is eager to facilitate the systematization process of forest restoration knowledge.
12. The systematization method may be expanded by introducing levels to the systematization process and ontologies for forest restoration knowledge.
13. The Philippine natural resources management sector is actively disseminating forest restoration knowledge.

These findings will guide the proposed KM framework and design as well as the systematization and dissemination strategies.

FRAMEWORK, DESIGN AND STRATEGIES

Knowledge Management, Systematization & Dissemination Framework

This section presents a knowledge management, systematization and dissemination framework that provides the bases for systems design, network specifications, strategies and activities for the full-size project. The framework introduces a KM model based on Kim's science of delivery (SOD).

Kim (2014) contends that a deep understanding of delivery is essential in development work including restoration and conservation undertakings. Elaborating on this view, *demand-driven* knowledge products and services are not enough to bring about a desired result among upland farmers and forest dwellers. First of all, upland farmers and forest dwellers may not know exactly what they need and cannot be in a position to seek it or demand for it. Secondly, there must also be effective delivery to be useful at the local level where development results are produced. Kim believes that inconsistencies in development results, which in the case of the full-size project is forest restoration, may be attributable to *lapses in delivery*.

Thus, our KM, systematization, and dissemination framework includes the four dimensions of SOD (Kim, 2014):

1. Support for frontline implementation by capturing *local and indigenous knowledge* and feeding that knowledge back into practice through *systematization and dissemination*;
2. Increased capacities for *dissemination* and knowledge delivery skills based on the tacit knowledge of stakeholders;
3. Involvement of research stakeholders to spur innovation and evaluate new interventions; and
4. Construction of an ontology-based *systematization* model that can help explain and adapt successful approaches to solving forest restoration problems.

This KM model can serve as the basis for an innovative knowledge sharing protocol where local knowledge and operational knowledge supplement technical knowledge on forest restoration.

Translating the four dimensions of SOD into four elements that may be situated within the model, we arrive at the following: Local Knowledge; Research-Based Innovation; Delivery Skills

and Knowledge Sharing; and Delivery Systems Framework. Local knowledge refers to indigenous or homegrown knowledge on forest restoration. Research-based innovation refers to technology that conventionally functions as the content of knowledge management systems. Delivery skills and knowledge sharing refer to the sharing of tacit knowledge among stakeholders on how restoration knowledge is best disseminated given forest community conditions that they are fully exposed to but may not be generally known by other stakeholders. Finally, delivery systems framework refers to the specific KM model that informs, explains and operationalizes delivery. To reiterate, these four elements roughly correspond to the four dimensions of SOD (Kim, 2014).

We can juxtapose these four elements into a KM model framed into quadrants. The quadrants on the left hand side deal with *knowledge on restoration*. In KM terms, this would be the content of the system. The quadrants on the right hand side refer to the *KM system* or the delivery system.

The quadrants on top are *conceptual* constructs. The quadrants on the bottom are constructs dealing with *practice*.

We may situate the delivery systems framework element in Quadrant I, which treats the concept of delivery systems at the conceptual level. The forest restoration knowledge element is logically situated in Quadrant II since it deals with innovation or advice at the conceptual level. The local knowledge element may be situated in Quadrant III since it deals with innovation or advice at the practical level. The delivery systems sharing element is situated in Quadrant IV since it treats delivery systems at the practical level.

Conceptual-Operational Model. Found below is the knowledge management, systematization and dissemination model that we are proposing for the full-size project. The model submits that effective delivery of forest restoration knowledge requires that:

1. R&D-based innovation or technology should be informed by local or indigenous knowledge, thus the plus sign that combines both vertically;
2. The model that informs and explains the delivery strategy adopted by the project should be studied and shared among its stakeholders, particularly the tacit knowledge gained by the more experienced, thus the plus sign that adds the two vertically; and
3. Restoration knowledge should be combined with the delivery system, thus the plus sign that adds the two constructs horizontally.

Delivery will not be effective if any one of these elements is missing. A delivery system not guided by a framework is tentative, fluid and ineffectual. The absence of tacit knowledge shared on the delivery system robs the deliverer of any conviction on his/her strategy. Furthermore, if local knowledge is taken out of the model then the restoration practice may not be adopted as recommended since it may not be appropriate under local conditions. It goes without saying that the innovation/ technology should be research-based.

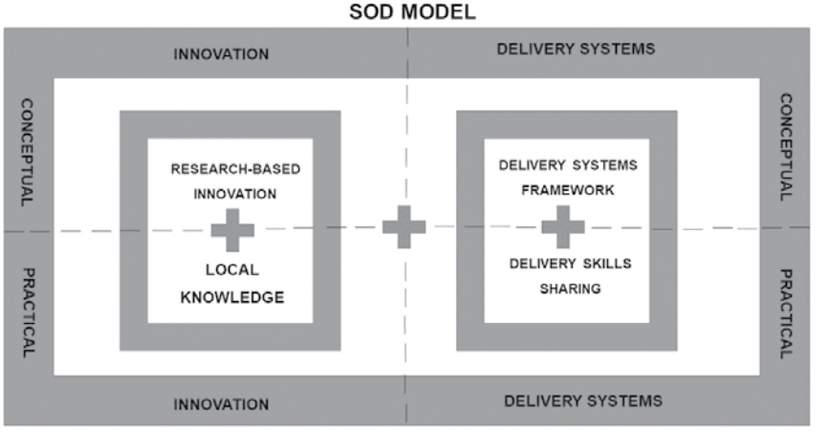

FIGURE 7-1. KM, Systematization, and Dissemination Model

In short, our KM, systematization, and dissemination framework proposes a deliberate and calculated strategy of providing forest restoration services wherein research-based innovation and/or technology is combined with local/homegrown knowledge employing a delivery mechanism guided by a systems framework and informed by tacit knowledge sharing within the extension service.

KM System Design

To capitalize and share existing knowledge on restoration approaches applied to date, the full-size project should deploy a knowledge management system. Its purpose is the sharing and reusing of project results, and best practice and lessons learned internally and externally at the local, national, and global levels. Its users will be: project staff; project beneficiaries; decision makers; policy makers; the international TRI community of practice; and the general public (for success and human interest stories).

The proposed KM system will be made up of electronic and non-electronic knowledge networks.

Electronic Knowledge Network. The KM System will be linked with the global TRI system for documentation and sharing of best practices relative to sustainable land management and forest land restoration. It will deploy an electronic network with messaging and collaboration as well as content management functionalities.

Internal KM and External KM. The proposed electronic KM System will have two components: internal KM and external KM. The internal KM system will be maintained and administered by the full-size project. It will possess database, messaging and collaboration functionalities. The external KM system will be hosted externally and will assume content management system functionalities. We propose the latter to be a forest restoration plug-in within PHILCAT.

PHILCAT Plug-In. With the concurrence of the DA Bureau of Soils and Water Management, a forest-restoration plug in for the full-size project will be deployed. PHILCAT is the Philippine node of WOCAT, the global repository of conservation technologies. Although basically a content management system (CMS), it may accommodate additional functionalities that would enable it to serve as a knowledge management system for external (client) use.

PHILCAT possesses geotagging and metadata management capability but it cannot manage qualitative data. The nature of knowledge is qualitative and contextual (e.g., audio-visual data; narratives, etc.). Although it may be electronically captured, it cannot be efficiently and effectively managed without the appropriate handles/attributes. Additional attributes that characterize best practices, lessons learned, success stories, project insights, local solutions and indigenous knowledge should be incorporated into the system via refined ontologies and semantic links. These attributes serve as semantic metadata that allows for the management/manipulation of the qualitative data mentioned above.

Non-electronic Knowledge Network. The full-size project should also maintain knowledge networks among stakeholders. It should include the following nodes: academe; local media (radio and cable stations); LGU workers; NGOs; and community leaders.

In summary, the proposed KM system will be multi-level, multi-modal, and multi-dimensional:

Table 7-2. KM System Design

KNOWLEDGE NETWORKS	RESPONSIBILITY	INTERNAL KM CONTENT	EXTERNAL KM CONTENT	USER LEVELS
Electronic Network (Messaging & collaboration, KM content management system) *Platforms: Google Suite and PHILCAT*	*KM & Systematization Specialist* administers KM electronic network. *CMS Developer* designs and programs PHILCAT plug-in. CMS will be maintained by BSWM.	Project activities and output Lessons learned M&E information	Best practice Success stories Infographics Electronic knowledge products	Global, National, Local: project staff; project
Community Media Network *Platforms: Community Cable, Local Radio Stations and others*	*Knowledge Networking Expert* taps and liaise with local media and venues.	-	Knowledge products	Local: pilot
Stakeholders Network *Platform: Social Media*	*Knowledge Networking Expert* forms social media groups	Project activities and output	Technical knowledge Local knowledge	National, Local
Interpersonal Networks *Platform: Messaging and Interpersonal*	*Knowledge Networking Expert* establishes texting messaging protocol and captures local/ indigenous knowledge	-	Local knowledge Indigenous knowledge	Local: pilot

Proposed Activities. The project will develop, test and roll out multi-level, multi-modal and multi-dimensional project KM System. The following activities constitute the development and deployment of a multi-level, multi-modal and multi-dimensional knowledge management system:

1. Validate and further identify/analyze existing knowledge resources and KM systems at the global, national and local levels pertinent to landscape level conservation;
2. Develop PHILCAT plug-in on forest restoration;
3. Tap other legacy systems focusing on biodiversity, ecosystem flows and carbon sequestration respectively maintained by BMB, ERDB, SEARCA, ACB, CCC and FMB;
4. Organize knowledge networks at community level w/links to community media;
5. Implement internal and external knowledge sharing and reuse actions; and
6. Initiate and facilitate electronic, community and interpersonal networks.

Strategy for Systematization

For the full-size project, the systematization of forest restoration knowledge should be conducted at the local, national and international levels. Existing knowledge on restoration, best practice, project results, and lessons learned will be subjected to systematization and dissemination.

Definition. As described earlier, systematization of experience is a method aimed at improving practice based on a critical reflection and interpretation of lessons learned from that practice. Within the context of the full-size project this involves a facilitated process of capturing, analyzing and structuring tacit knowledge on forest restoration, specifically, best practice and lessons learned, from the perspective of the major stakeholders, i.e., the forest community, the local government, the CENRO/PENRO

and the FMB. The methodology encompasses the identification, documentation and transfer of experiences and key lessons extracted from a project or an initiative, or group of projects or initiatives for the purpose of advocacy, learning, and replication/ scaling up.

For the past decade, the systematization methodology has been championed by the global CSO movement and the international development assistance community including IFAD and FAO OEKC because of its inclusive knowledge generation process. However, systematization as prescribed, would only occur at the local level.

Multi-level Systematization Strategy. The full-size project should not only adopt the systematization methodology but expand it to national, regional and global levels. The systematization method as outlined by Chavez-Tafur mainly occurs at the community level. The full size project may opt to expand systematization to include regional, national and global levels. This would require the development of ontologies for forest restoration encompassing the entire spectrum of practices and technologies from assisted natural regeneration to accelerated reforestation and biodiversity spread. This, however, will necessitate a global dialogue leading towards standards and a substantive interface with a global knowledge management system.

Local Systematization and Dissemination. Local level systematization workshops will be conducted semi-annually in the project sites to capture, process and codify/organize project generated forest restoration best practice and lessons learned. Social forestry department of state colleges and universities active in the pilot areas should be involved as workshop facilitators while project staff will serve as documenters and rapporteurs.

National Systematization and Dissemination. National level systematization workshops will be conducted annually by FMB to capture, review, process and codify/organize forest restoration knowledge generated by the full-size project and other similar undertakings in the Philippines. The UPLB College of Forestry social forestry department should be involved as workshop facilitators while national project and FMB staff will serve as documenters and rapporteurs.

International Systematization and Dissemination. In its lifetime, the full-size project should organize and conduct two bi-annual international conferences on forest restoration knowledge systematization. This may be done in collaboration with the TRI program and other advocates of the Bonn challenge. In these conferences, ontologies for forest restoration encompassing the entire spectrum of practices and technologies from assisted natural regeneration to accelerated reforestation and biodiversity spread will be agreed upon. A global dialogue leading towards standards and the project KM system's substantive interface with a global knowledge management system on forest restoration will be pursued.

Proposed Activities. The project will conduct systematization workshops at local, national and global levels. The following are the major activities attendant to systematization:

1. Conduct knowledge audit of knowledge resources in Output 3.2.
2. Develop systematization framework incorporating community, national and global forest restoration knowledge systematization.
3. Capture and make available indigenous and local knowledge on restoration innovation.
4. Conduct community level systematization workshops.
5. Conduct national level systematization workshops.
6. Collaborate with TRI for global level systematization and ontology framing workshop.
7. Mainstream systematization framework.

Dissemination

Multi-modal, Multimedia, and Multi-level Dissemination Strategy. The dissemination activities described above at the local, national and international levels will make use of different modes and media. The following matrix defines the project dissemination strategy:

TARGET AUDIENCE	MODE	MEDIA
Project Staff	Electronic network	Internal Messaging and Collaboration system; Knowledge products in CMS
Beneficiary Communities	Non-electronic network	Community media Social media networks Interpersonal networks Local level workshops Field visits (FFS), Study Tours
CSO/ NGO Workers	Electronic network Non-electronic network	Social media networks Interpersonal networks Local level workshops Knowledge products in CMS
Local Government Extension Workers	Electronic network Non-electronic network	Social media networks Interpersonal networks Local level workshops Knowledge products in CMS

TARGET AUDIENCE	MODE	MEDIA
Technical Staff Of Relevant National Government Agencies	Electronic network Non-electronic network	Social media networks National workshops Knowledge products in CMS
National Decision Makers Policy Makers	Electronic network Non-electronic network	National workshops Knowledge products in CMS
Global TRI Communities Of Practice	Electronic network Non-electronic network	International Conferences Knowledge products in CMS
General Public	Electronic network Non-electronic network	Knowledge products in CMS

Local Level Dissemination. Local and project knowledge will be disseminated through the project KM system utilizing electronic (content management system) and non-electronic (CoPs, community media, stakeholders) networks.

National Level Dissemination. Nationally generated forest restoration knowledge will be disseminated through the project KM system utilizing its electronic (content management system) network. Field visits between Region III and Eastern Mindanao will be organized and conducted to encourage the cross-fertilization of ideas. A forest restoration module will be prepared for inclusion into the Farmers' Field School curriculum for upland farmers.

International Dissemination. Best practice and lessons learned will be shared through PHILCAT. The project will organize a study tour among project beneficiaries to other TRI sites in Africa and Asia.

Proposed Activities. The project will implement the sharing of knowledge products and dissemination of project results and lessons learned locally, nationally and internationally.

The following are the major activities attendant to dissemination:

1. Populate and publish internal and external KM system content.
2. Produce and publish knowledge products on best practice, success stories.
3. Link up with other national and global KM systems for content sharing.
4. Incorporate restoration modules in upland farmers' field schools.
5. Initiate local study tours for cross-fertilization among upland farmers.
6. Initiate international study tour for LGU and community stakeholders to TRI sites.

PART C.
KM4D and Marginalized Groups

CHAPTER 8
KM FOR INDIGENOUS PEOPLES[8]

INTRODUCTION

Background

Many observers are of the opinion that the future of information and communication technology for development rests upon mobile phones and other mobile devices. In Chapter 3, we forwarded the following trends:

- Mobile devices will spell the death of the telecenter movement and will drive the final nail in the coffin of the 100-dollar laptop initiative.
- Mobile service providers will solve the first mile/ last mile linkage challenge that have plagued the ICT4D community for the past decade.
- Mobile phone users in agricultural communities will reach a critical mass before 2010.
- Mobile phone functionalities will force the networking and collaboration issue, thereby rendering intermediaries unnecessary.
- Mobile phone content will efficiently address issues such as a universally acceptable language medium, auto-translations, relevance and the lack of local knowledge.

8 *The author gratefully acknowledges the inputs of Ms. Emely Amoloza and Mr. Alexander Benjamin Flor Jr, research assistant and CMS developer, respectively.*

- Mobile phone handsets will make ICT services affordable to agricultural communities.
- Mobile phone applications will provide the eAgriculture community with an effective Web 2.0 platform.

This chapter focuses on the last forecast. Web 2.0 has revolutionized how people think of the World Wide Web from a collection of individually owned static websites with published content into a body of collectively owned dynamic websites with user generated content. The 3G mobile phone may provide ICT4D community in particular, a much-needed platform for Web 2.0.

From December 2008 to July 2009, an exploratory study was conducted by the Principal Investigator on the potentials of mobile devices for participatory content development.[9] In the course of the study, a number of factors surfaced that were clustered according to the following: technological factors; content-related factors; user-related factors; incentives; and cost-related factors. The study forwarded the following recommendations:

Firstly, the use of mobile devices as a Web 2.0 platform among rural communities should be tested through an action research study with due consideration given to the factors enumerated above. Secondly, a protocol for online participation and content provision for rural communities using mobile Internet and rich media should be developed again with due consideration given to the factors enumerated above. Thirdly, capability building programs should be designed to upgrade the skills and confidence of the rural user. Lastly, learning modules on Mobile Videography for Rural Users should be designed, developed and packaged. This current study was conducted in response to the above recommendations with a focus on indigenous knowledge systems.

[9] *Flor, 2009. Factors Associated with the Use of Mobile Phones as a Web 2.0 Platform for Philippine Rural Families. Diliman: PhilICT Research-International Development Research Centre of Canada.*

The Research Problem

The study attempted to answer the following research questions:

1. How can mobile devices be used by rural communities to document indigenous and local knowledge?

2. How can Web 2.0 protocols be employed in an indigenous/local knowledge management system?

3. How will indigenous peoples (IPs) respond to the use of mobile technology in the documentation of their local knowledge?

Objectives

The study has the following objectives:

1. To test mobile telephony and data services as a Web 2.0 platform for the capture, sharing and reuse of indigenous and local knowledge among rural communities;

2. To design a rich media based indigenous knowledge management (KM) system;

3. To develop a protocol for online participation and content provision for rural online communities using mobile Internet and rich media; and

4. To identify and validate factors that related to participation in Web content provision across Philippine indigenous peoples.

THEORETICAL FRAMEWORK

Constituent Concepts

The theoretical construct that mobile devices may lead to the active participation of rural communities and indigenous peoples as ICT4D Web content providers is founded on the relationships of three concepts: social capital; the network effect; and critical mass theory.

Social Capital. In recent years, economists and sociologists alike have been closely studying a factor that has been deemed as a necessary element in the development equation. This factor is called social capital as distinguished from financial, physical, human and natural capital.

Social capital has been defined as the capacity of groups to work together for the common good, or as the ability to draw on relationships with others especially on the basis of trust and reciprocity. The sociological definition of social capital is trust, reciprocity and mutuality that are inherent in social relationships. An economic definition describes social capital as the institutional dimension of transactions, markets, and contracts.
To the above definitions, we venture to add another meaning, which may be considered as communicational in nature. Simply put, social capital is the economic value obtained in institutional or individual networking. Note that reciprocity and mutuality, two concepts contained in the sociological definition, are variables central to networks and network analysis. Hence, this framework posits that social capital is a function of networking and communication, two features of mobile devices.

The Network Effect. Perhaps the most popular IT adage is found in Moore's Law, which states that, technology-wise, computing power doubles every eighteen months. A lesser-known IT principle is the Network Effect. Otherwise known as Metcalf's Law, after the head of the Ethernet development team, the

Network Effect states that the total value of a network where each node can reach every other node grows with the square of the number of nodes. Presumably, this exponential increase in value is due to the synergy produced by the interconnectivity of the nodes. More so, the potential value reflects access to computing resources in the Internet. This framework likewise proposes that synergies inherent in social networking will encourage the capture, sharing and reuse of indigenous knowledge and practices among IP communities.

Reed's Law. David Reed, a sociologist and community development expert, applied Metcalf's Law to social networks and arrived at similar conclusions. Social capital may increase exponentially through Intra and Internet connectivity. How may social capital increase in a networked environment? The following reasons are given: superimposing electronic networks on social networks allow individuals to cross easily between these networks; electronic networks provide "doors" between online community infrastructures; access to the World Wide Web increases the potential social capital of a community through the augmentation of its knowledge capital. Due to: the synergy produced in working together as a virtual community; the use of a common platform provided by an indigenous knowledge management system; and the knowledge resources in the World Wide Web available to them individually and as a collective, the *potential* social capital of any community, even IP groups, may increase exponentially.

***Critical Mass Theory*.** In physics, critical mass is that amount of radioactive material necessary to produce nuclear fission. Since the 80s, social scientists have been applying this term to refer to the number of early adopters necessary to steer the rest of the population into collective action. The Critical Mass Theory by Oliver, Marwell, & Texeira provides answers to the following questions: What are the conditions for sustained collective action? When does a development intervention assume a life of its own?

The theory was tested through empirical research on, among others, early adopters of rice production technology. In 1987 Markus applied the Critical Mass Theory to interactive media. In general, these studies found that sustained collective action is achieved when a core of members (10 -15 percent) within a group or community engages in mutually reinforcing reciprocal behavior. When such conditions within a critical mass are achieved, then one is assured of a practice spreading throughout the population. In the late 90s, SMS technology reached a critical mass of users in the Philippines. The sharing and reuse of indigenous knowledge captured as rich media via mobile devices may likewise go the same route.

Sustainable Livelihoods Framework

Finally, the study also adopted the sustainable livelihoods approach. It identifies five forms of capital (human, social, natural, physical, and financial) shown below as five corners of a pentagon representing their inter-linked nature.

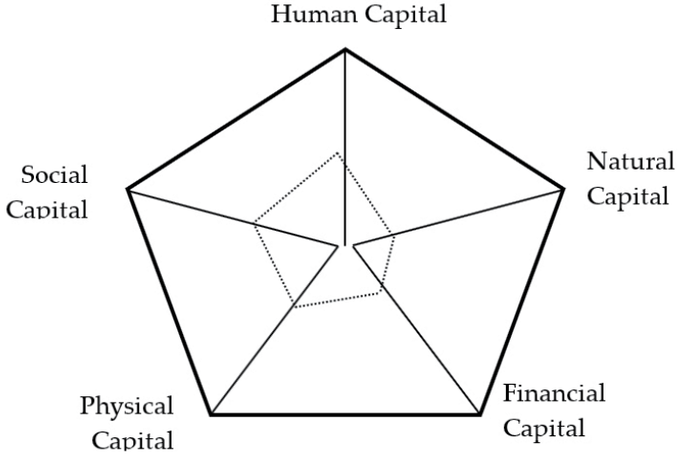

FIGURE 8-1. Sustainable Livelihoods Framework

Based on this framework, one may argue that social capital as a sustainable livelihood asset may increase through active ICT intervention, specifically mobile devices employing participatory content development. Assets can potentially be increased with activities undertaken by indigenous peoples through transforming structures and processes represented herein by the application of mobile technologies.

Conceptual Framework

Thus, this chapter suggests that: ICT4D utilization and content generation among marginalized communities can bring about increased social capital among these communities; and that increased social capital would result in increased utilization and content generation leading to a critical mass of users and content providers.

Conceptually, the study's empirical referent for ICT4D is an indigenous knowledge management system using mobile device video capture and web 2.0 protocols. Its empirical referent for increased social capital is increased sharing and reuse of indigenous knowledge among IP communities. The relationship between these two variables is not merely reciprocal but reinforcing leading into a reiterative loop. Figure 8-2 gives the study's conceptual model.

METHODOLOGY

Design

This is a quasi-experimental cum action research study utilizing a treatment then observation design. The following interventions constitute the study's treatment: capacity development through training and equipment provision; systems development; and pilot testing.

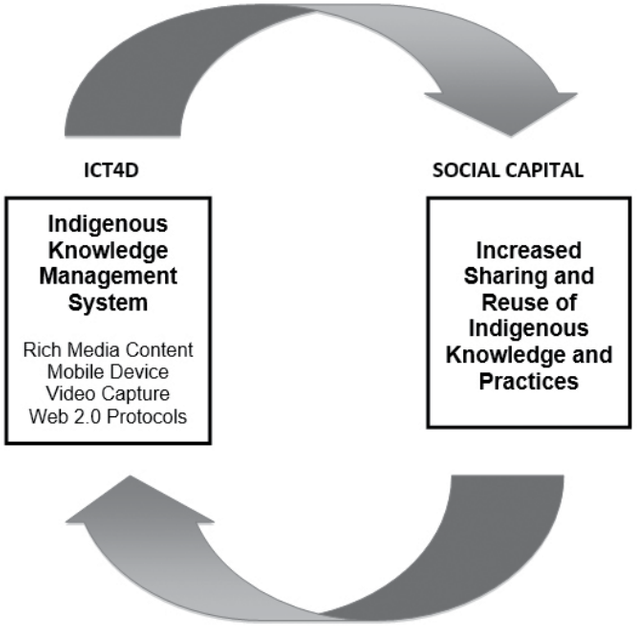

FIGURE 8-2. Conceptual Model

Locale and subjects

With the assistance of the National Commission on Indigenous Peoples (NCIP) and the Southeast Asian Regional Center for Graduate Study and Research in Agriculture (SEARCA), six indigenous communities were identified in the provinces of Mindoro Oriental, Mindoro Occidental, Camarines Norte, Camarines Sur, Misamis Oriental, and Misamis Occidental. Twelve focal persons from NCIP and the IP communities were identified for capacity development.

Treatment

Each was provided with a GPRS enabled mobile phone that had audio-video capture and internet browsing functionalities, through the sponsorship of the European Union focused-food production assistance to vulnerable sectors project. An appropriate use agreement for the unit was signed by the focal persons. Ideally, mobile data services should be accessible in the identified areas. Otherwise, internet browsing and rich media uploading-downloading can be done via conventional ISPs, non-mobile devices and public facilities such as internet cafes and telecenters. The author developed training modules on mobile videography and trained the focal persons on the video capture of indigenous or local knowledge.

Data Gathering

Content development and utilization by the participants was monitored by the Principal Investigator. Factors contributing to the levels of content provision (knowledge sharing), utilization (knowledge reuse) and online participation were observed and discussed at length in key informant interviews.

RESULTS AND DISCUSSION

Capacity Development: Equipment Provision

***Mobile device*.** Through the sponsorship of the EU, each of the twelve participants was provided with a NOKIA 5230. Although the model of choice among ethnovideographers is still the N93I (now phased out), the NOKIA 5230 is cheap, user-friendly and employs touch screen technology. Among users, it is recognized as a simple “entry-level touch screen smart phone.” It can video record at up to 640 x 480 pixels and up to 30 frames per second on television high quality, widescreen quality, email high quality, and sharing quality. It possesses up to 4x digital zoom.

An even more convenient feature is the unit's ability to overcome codec issues. Its video recording formats are the standard mp4 and 3gp. It also supports WMV formats, download and streaming video content as well as video feeds. Audio recording formats are likewise standard: WAV, AMR, ACC and MP4. The unit comes with RealPlayer software for landscape mode playback, editing and assembly.

Image wise, the unit provides four white-balance settings apart from automatic. It has automatic and night scene modes as well as normal, sepia, black and white, vivid and negative color modes for effects. The maximum clip length is one hour and thirty minutes.

The appropriateness of the Nokia 5230 for this experiment cum action research can be illustrated by way of an anecdote. The oldest focal person in the group was a sixty-year old female chieftain of the Agta tribe, Felicitas Alano from Itbog, Sta Cruz, Buhi, Camarines Sur. When her Nokia unit was handed over to her, she was not sure what to do with it since she never owned a mobile phone before. Part of the training design was the participants to coach and assist one another on the

proper operation, handling and care of their mobile device. After just a few minutes with her NCIP colleague, Felicitas was already listening to Rihanna's Umbrella on her Nokia.

Capacity Development: Training

As mentioned earlier, IP focal persons were trained by the project on mobile video capture and assembly (shoot-edit). Hence, video clips of local and indigenous knowledge and practices are expected to populate the CMS captured and assembled using mobile devices such as mobile phones or digicams.

This section describes the course design on video capture of local and indigenous knowledge and practices for indigenous communities in the FPAVAS focus areas.

***Objective of Training Course*.** At the end of the training course, participants from the IP communities and provincial project management units should be able to capture local and indigenous knowledge and practices on sustainable agriculture through mobile video devices.

Mechanics. The Training Course on Video Capture of Local and Indigenous Knowledge and practices for indigenous communities within FPAVAS focus areas was conducted from 15 to 17 November 2010. The venue of the training course was the SEARCA Training Hall and its Residence Hotel located within the UPLB Campus.

The course had twelve (12) participants broken down as follows: 6 representatives from IP communities within FPAVAS focus areas · and six (6) staff members of the National Council of Indigenous Peoples. The course was learner-centered and employed experiential, participatory, mentoring and coaching procedures.

Training Materials. The following training materials were provided by FPAVAS to the participants:

1. Mobile video capture devices: digicams; and mobile phones
2. Book: *Ethnovideography: Video-based Indigenous Knowledge System* published by SEARCA

Training Curriculum. The course was divided into four major sessions: Elements of Video; Ethnovideography; Mobile Video Capture; and the NCIP Draft IKSP Documentation Protocol. Much of the training content is found in the volume, ***Ethnovideography*** (Flor, 2003).

Training Plan. The course adopted the following schedule:

Table 8-1. Training Schedule of Video Capture Course

DAY/TIME	ACTIVITY
Day 0. Sunday, 14 Nov 2010	ARRIVAL OF PARTICIPANTS
Day 1. Monday, 15 Nov 2010. Morning Session	**Opening Program:** Welcome Remarks, Keynote, Course Overview, ***Presentation.*** NCIP Draft IKSP Documentation Protocol Handing over of Mobile Phones/Digicams ***Mentoring Session 1.*** The Mobile Device ***Lecture/Discussion/Open Forum 1***. Elements of Video
Day 1. Monday, 15 Nov 2010. Afternoon Session	***Exercise 1.*** Outdoor and Indoor Practice Shots ***Mentoring Session 2.*** Viewing of Rushes/ Critiquing ***Lecture/ Discussion/Open Forum 2.*** The Basic Shots ***Exercise 2.*** The Basic Shots
Day 2 Tuesday, 16 Nov 2010. Morning Session	***Mentoring Session 3.*** Viewing of Rushes of Basic Shots/ Critiquing ***Lecture/Discussion/Open Forum 3***. Mobile Video Capture ***Exercise 3.*** The Process Shot
Day 2. Tuesday, 16 Nov 2010. Afternoon Session	***Mentoring Session 4.*** Viewing of Rushes of Process Shots/ Critiquing ***Lecture/ Discussion/Open Forum 4.*** Ethnovideography ***Exercise 3.*** Documenting Indigenous Knowledge and Practices (Part 1)
Day 3. Wednesday, 17 Nov 2010. Morning Session	***Mentoring Session 5.*** Viewing of Rushes/ Critiquing ***Exercise 5.*** Documenting Indigenous Knowledge and Practices (Part 2)
Day 3. Wednesday, 17 Nov 2010. Afternoon Session	***Mentoring Session 6.*** Viewing of Rushes/ Critiquing ***Presentation:*** The Way Forward Closing Program: Closing Remarks, Awarding of Certificates
Day 4. Thursday 18 Nov 2010	DEPARTURE OF PARTICIPANTS

Modules Development

Three modules were developed by the Principal Investigator for the study.

Module 1, titled Introduction to Video, contains the following lessons:

1. Essentials
   1.1. subject
   1.2. light
   1.3. sound
   1.4. time and space
   1.5. motion and movement

2. Elements
   2.1. Footage
   2.2. Graphics
   2.3. Titles/Characters
   2.4. Special Effects
   2.5. Voice
   2.6. Music
   2.7. Actualities

3. Properties
   3.1. Continuity
   3.2. Point of View
   3.3. Dynamic Composition

4. Shots
   4.1. Fixed Shot
   4.2. Long Shot/ Medium Shot/ Close Up
   4.3. Wide Angle Shot/ Telephoto Shot
   4.4. Low Angle/ High Angle
   4.5. Zoom In/ Zoom Out
   4.6. Pan Left/ Pan Right
   4.7. Tilt Up/ Tilt Down
   4.8. Dolly In/ Dolly Out
   4.9. Track Left/ Track Right
   4.10. Crane Up/ Crane Down

Module 2, titled *Ethnovideography* has five lessons:

1. Ethnovideography
   1.1. A procedure that evolved at Los Baños in the 80s and 90s inspired by Cinema Direct, visual anthropology and the development of the camcorder
   1.2. initially employed small format video in the study of peoples, communities and groups (EV1)
   1.3. now uses digital video to capture, share and reuse indigenous and local knowledge (EV2)

2. Related Developments
   2.1. Cinema *Verite* or Cinema Direct: French filmmakers before and after the Second World War felt that film should record reality not fantasy
   2.2. Visual Anthropology
   2.3. USC Center for Visual Anthropology: Made use of short film (16mm, 8 mm) & small format video (Beta, VHS, V8/ Hi8)
   2.4. Reality TV: Made possible by digital video

3. Characteristics of Digital Video
   3.1. Group medium
   3.2. Both visual and aural
   3.3. Electronic
   3.4. Portable and unobtrusive
   3.5. Provides high resolution images and high fidelity sound
   3.6. Can be stored, edited and assembled in your PC

4. Operationalizing Digital Video Documentation
   4.1. Scripts, narration as well as aural and visual effects are not employed in cinema direct productions
   4.2. The use of lightweight, portable equipment is prescribed.

4.3. Camera techniques are unassuming and unobtrusive.
4.4. “Sound is half your film.”

5. Ethnovideography 2.0
   5.1. Uses mobile devices (Mobile Videography): Addresses issue of documentation difficulty
   5.2. Uses participatory documentation: Addresses issues of ownership & validation
   5.3. Uses a Content Management System: Addresses issues of secrecy, repository, community registry system and IPR
   5.4. Uses tagged and annotated video clips: Addresses issues of context & validation

Module 3, titled *Mobile Video Capture, h*as the following lessons:

1. The Mobile Device
   1.1. The great equalizer
   1.2. Mobile phone users in rural communities will eventually reach a critical mass
   1.3. Mobile phone handsets will make ICT services affordable to rural communities
   1.4. Mobile device content will efficiently address ICT4D issues such as the language medium, auto-translations, relevance and the lack of local knowledge.
   1.5. Mobile device applications will provide rural online communities with an effective Web 2.0 platform.

2. Execution
   2.1. Use the telephoto sparingly.
   2.2. Visualize your shots.
   2.3. Establish your settings.
   2.4. Avoid zoom cuts right after zoom ins;
   2.5. Avoid pan lefts right after pan rights;
   2.6. Avoid tilt downs right after tilt ups;
   2.7. Position yourself properly vis a vis light source.
   2.8. Advise subjects to wear pastel colors.

2.9. Remember the “magic hour.”
2.10. Observe the rule of thirds.
2.11. Strive to achieve depth thru composition.
2.12. Avoid mutilating your subjects.
2.13. Check your shooting environment.
2.14. Aim at the horizon.
2.15. Match your shots in terms of action and POV.
2.16. Vary your shots according to your subject.
2.17. Master the fixed shot.

Systems Development

The YouTube Option. Initially, the *de facto* KM platform that was identified for use in the study was YouTube. Each community was to register a YouTube site to “broadcast themselves.” They were then expected to monitor the content uploaded by the others on a regular basis.

As mentioned earlier, the planned KM system content constitute rich media: audio-video clips on indigenous or local knowledge in agriculture, health, livelihood, and culture in the form of rituals, practices, products, choices and others. The content itself is visual in nature and would lend well to rich media. Furthermore, rich media overcomes written documentation capacity and language barriers. Additionally, they capture “slices of reality” instead of becoming *interpretations* of reality that written records or text documents are.

However, in the course of the study, it became obvious that video documentation of indigenous knowledge from Philippine indigenous peoples cannot be openly shared on the Web from the point of view of the NCIP. The concluding section of the results and discussion chapter outline the arguments for this view.

In deference to the above, the study limited its option to the development of a Web Content Management System (WCMS) for Indigenous Knowledge and Practices that will be security enabled

and turned over to the NCIP once completed and operational. A CMS is a collection of procedures used to manage work flow in a collaborative environment to do any or a combination of the following: allow for a large number of people to contribute to and share stored data; control access to data, based on user roles (defining which information users or user groups can view, edit, publish, etc.); aid in easy storage and retrieval of data; reduce repetitive duplicate input; improve the ease of report writing; and improve communication between users. The first three uses are most appropriate to this undertaking.

Video clips of indigenous knowledge and practices will populate the CMS. It will run on a client server located in SEARCA. Eventually, however, the system and the client server will be handed over to the National Council of Indigenous Peoples after testing and may eventually be adopted nationally by all IP groups.

Content Management System. The WCMS is a web-based audio-video file sharing website intended for sharing and reuse of indigenous knowledge and practices through audio-video recordings uploaded by its users and then viewed online.

System Requirements. The content is tagable audio-video clips. Each clip should run no longer than three (3) minutes. System features are: Web-based streaming/uploading; audio-video search content function (by source community, IP group, topic, and language); security enabled (log-in splash screen); user rating, tags and comments for audio-video; and backend database maintenance by a web administrator.

Solution Strategy. The hardware used for the WCMS is an HP Proliant ML150G6 E5520. It is a SAS/SATA 1 Terabyte HPM AP Server with AEON Processor 2.26 GHz, 8 Megabyte L3 Cache, 80 W.

Like the Nokia 5230, this unit is a moderately priced, entry level model. For sustainable development applications such as an

indigenous knowledge and practices WCMS, the choice of hardware should be guided by replicability and scalability considerations and hence should approximate *least common denominator* technology and exclude high end, high priced options.

Insofar as software solutions are concerned, the use of the *Joomla!* open source portal engine and CMS app was initially considered. However, once again considering scalability and replicability issues, the software solution has been limited to PHP Script and MySQL database. All software used are open source.

Conceptual Website Design. The website is designed as follows:

- Login page: Members can only access the system
- Home page: Display links to different pages of the website, newly uploaded videos, etc.
- Upload page: Upload 3-minute videos
- Profile page: Edit username, password, email address, etc.
- Search video page: Search videos by entering video name, topic, tribe, etc.
- View video page: Load video and stream, also add comments and ratings
- Backend page: Maintain and edit backend database

Figure 8-3 gives the high level data flow diagram.

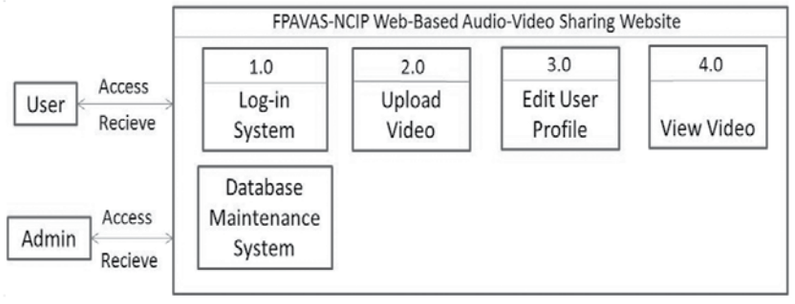

FIGURE 8-3. High Level Data Algorithm

As for low level data flows, algorithms for log-in, upload, edit user profile and view video sub routines are found below.

The Log-In System ensures security management and would limit users to those authorized by NCIP.

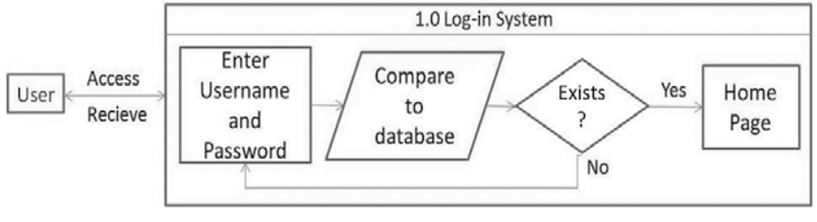

FIGURE 8-4. Log-In System Subroutine

The Upload Video subroutine enables IP communities to participate in content generation.

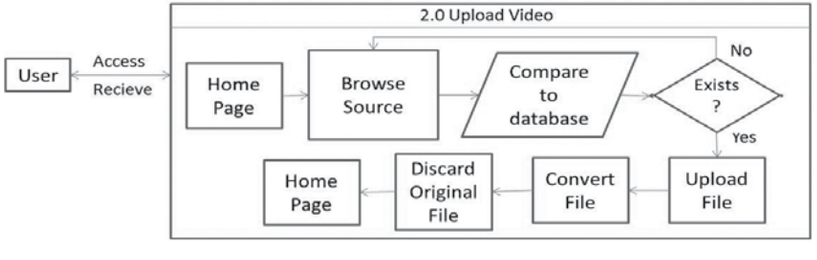

FIGURE 8-5. Upload Video Subroutine

The Edit User Profile subroutine allows privacy options.

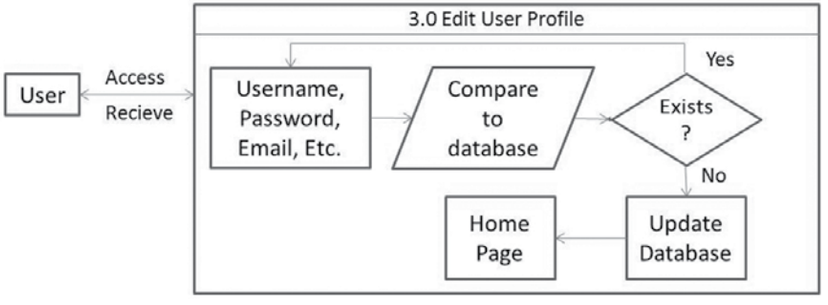

FIGURE 8-6. Edit User Profile Subroutine

Finally, the View Video subroutine enables sharing and reuse.

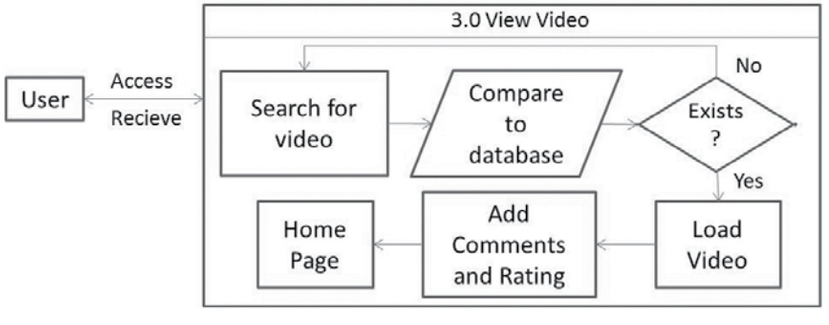

FIGURE 8-7. View Video Subroutine

Field Testing

For six months, from 20 November 2010 through 19 June 2011, the video capture protocols were tested by the participants. Since the CMS was developed later than expected, the participants were asked to submit three video clips each of an indigenous practice on sustainable agriculture via email that would populate

the MySQL database for purposes of testing and debugging the subroutines. As of 31 July 2011, only one third of the participants have complied.

The video clips submitted followed most of the execution guidelines contained in the Mobile Videography module. Such reflects the technical proficiency of the trained IP focal persons. However, the limited participation rate had to be analyzed and reflected upon by the Principal Investigator. Clearly, the study encountered major challenges - intervening variables - that have shaken its basic assumptions.

Intervening Variables

The inhibiting factors observed and reflected upon by the Principal Investigator were as follows:

Honoring Indigenous Belief Systems. Indigenous belief systems closely follow traditional knowledge transfer protocols and epistemologies. As members of the academe, we have all been subjected at one time or another to this tradition that traces its beginnings in the so-called “invisible college.”[10]

In earlier times, when knowledge was thought to be the purview of the privileged, the term was applied to secret societies and even to occult brotherhoods. Many of today's grand academic traditions started out in invisible colleges, well-knit and tightly

[10] ***NOTE:*** *Young (1998) describes the invisible college as a precursor to the Royal Society of the United Kingdom. It consisted of a group of scientists including Robert Boyle, John Wilkins, John Wallis, John Evelyn, Robert Hooke, Christopher Wren and William Petty. In letters written in 1646 and 1647, Boyle refers to "our invisible college" or "our philosophical college." The concept of an invisible college made up of a brotherhood of scholars exchanging ideas in restricted gatherings and correspondences spread throughout Europe and was exemplified by networks of astronomers, professors, mathematicians, and natural philosophers including Johannes Kepler, John Dee and Nicolas Copernicus. These societies adopted a common theme, to acquire knowledge through experimental investigation (Owen, 2004).*

structured brotherhoods of hooded learned men governed by a culture of hierarchy, exclusivity, ritual and secrecy. In Paris, Oxford, and Rome, these brotherhoods existed for the purpose of enlightenment. A progressive system of initiation, passing, and raising determined the degrees and the level of knowledge of a scholar. Under this system, disciplines began and areas of studies grew. Today, the academe has discarded the secret handshake but still adheres to secret codes through the technical jargon inherent in any discipline. The hood and the robe have been retained in academic costumes. The system of seniority, the degrees and the rituals that accompany them have been maintained. Latin and Greek have been replaced with English as the academe's *lingua franca*.

Indigenous belief systems covering knowledge transfer, sharing and reuse is likewise guided by this exact same tradition of hierarchy, exclusivity, ritual, and secrecy. Indigenous communities, as a rule, have invisible collages composed of tribal elders, chieftains, and healers who regard themselves as custodians of knowledge, which may only be shared with prudence, responsibility and, on occasion, sanctity. Like the invisible college of the past, tribal elders regard knowledge as power. Thus, the prevailing belief system dictates that indigenous knowledge on feeding (agriculture) and healing (medicine) cannot just be made openly available to any person who may misuse it or irresponsibly wield the power attendant to it. It is incumbent upon mainstream cultures to honor and respect such belief systems.

Respect of Privacy. Twenty years ago, while developing and testing the ethnovideographic methodology, I conducted fieldwork among the indigenous peoples of Central Mindanao and local upland communities of Southern Luzon (Flor, 2003). With a grant from the Lima-based International Potato Center, I video documented the indigenous agricultural practices of the Talaandig-Higaonon tribe residing in Mt. Kitanglad in Bukidnon. One practice in particular is the planting of sweet potato, which is one of their staple crops, during fool moon, naked. Like many of their counterparts from all over the world, the members of the

tribe plant the crop during fool moon, naked. [11] For purposes of academic research, the video capture of such an event may be acceptable and may even be repackaged into a rich media knowledge product. However, uploading this knowledge product to You Tube would be ethically indefensible. The privacy of IP communities should be respected.

Significance of Context. The nature of the video medium is such that the capture of phenomena may be considered as slices of reality within specific points in time. To be considered a bite-sized knowledge product, a video clip is often edited and assembled. In many occasions, the content for the phenomenon observed is edited out.

It must be noted that knowledge cannot be complete without a context. If an indigenous practice captured in a video clip is removed from its context then the knowledge gained can be considered incomplete, inaccurate and may lead to misunderstanding.

Prejudice and Value Judgments among non-IP users. In the early 90s, I supervised an Indonesian graduate student who employed ethnovideographic procedures in the documentation and analysis of indigenous agricultural practices of the Naga tribe in Tasik Malaya, West Java. The documentation included sequences of recycling wastes as fish feed, the use of palm leaves as roofing material, the non-adoption of high yielding varieties of rice, and rituals in the nearby forests. These practices are actually based on sound environmental wisdom handed over from one generation to another for hundreds of years (Flor, 2003). However, the initial viewing of the footage by colleagues only highlighted an impression of backwardness among the tribe members.

[11] *NOTE: This author later found that indigenous peoples from other parts of the world adhered to a seasonal calendar dictated by the phases of the moon when planting, harvesting and even fishing. Certain rituals associated with these practices likewise required the shedding of clothes. Thus, this practice may be embedded in the collective unconscious of indigenous peoples.*

Mainstream cultures have often prejudged indigenous peoples as uncivilized, lazy, unlearned, superstitious, primitive and dirty. Thus, there is a tendency among non-IP Web users to judge indigenous knowledge and practices in this light ignoring for innate wisdom in these practices.

Misrepresentation of IKSP. Mainstream and popular culture have often misrepresented and abused indigenous knowledge and practices. Buasen (2010) provides the following examples: the public mimicry of traditional music with no benefit or due regard on the cultural meaning of the expressions and adaptations; the commercialization of textile designs being copied, mass produced as tourist merchandize; covert intentions on the conduct of research on folklore; and the abuse of cultural beliefs. Cases of representation have prompted IP groups to become suspicious of the intentions of researchers and documentors.

Indigenous Knowledge System and Practices (IKSP) Protocols. French, Japanese, and American bioprospecting expeditions in the Philippines have resulted in the patenting of *ilang-ilang, banaba, nata de coco,* and snails at the expense of Filipino IP communities (Bengwayan, 2003). To address this form of exploitation, the National Council of Indigenous Peoples (NCIP) are putting together a comprehensive set of legal protocols at the community, provincial and national levels that determine the transfer, sharing and reuse of IKSP from IP communities. Under these protocols, clearances from the community up to the national agency (NCIP) are required for the capture, digitization, publication and distribution of IKSP. Thus, they cannot be openly transferred and shared.

Alternative Conceptual Framework

Obviously, the original conceptual framework o0f the study failed to consider the intervening variables listed above. These inhibiting factors should be juxtaposed within the conceptual model to reflect the findings of the study and to serve as a framework for future studies along this line.

Figure 8-8 gives an alternative to the study's conceptual model.

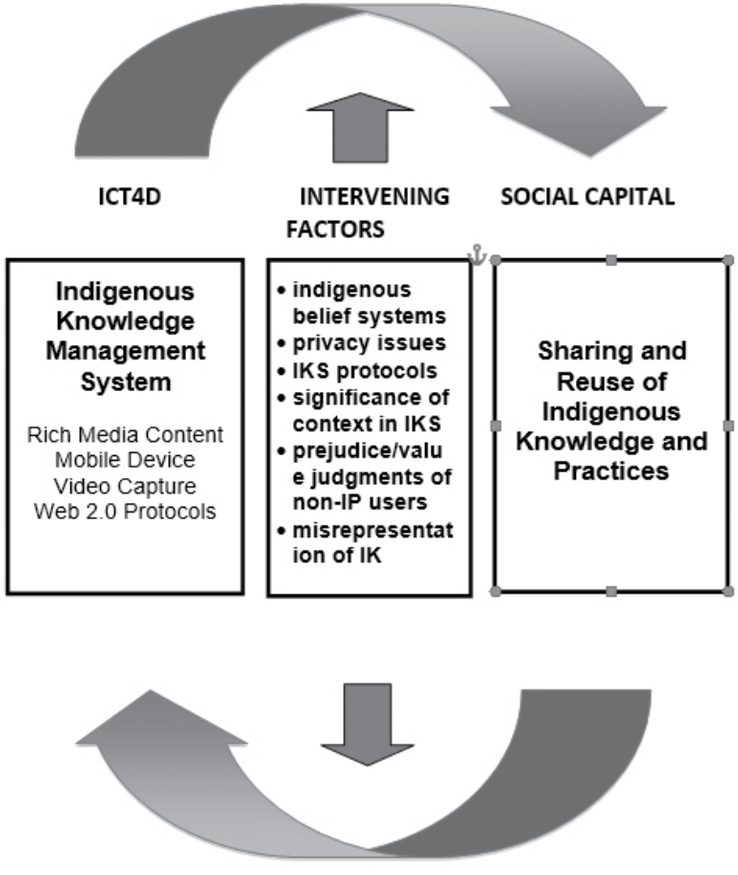

FIGURE 8-8. Alternative Conceptual Model

SUMMARY, CONCLUSIONS AND RECOMMENDATION

Indigenous peoples are among the most marginalized communities in Asia due primarily to access, equity, and quality issues. Developing their capacities to download and share among themselves content from/on the World Wide Web may resolve these issues without much investment in physical infrastructure.

The theoretical basis for proposing that mobile devices may lead to the active participation of indigenous peoples as ICT4D Web content providers is founded on the relationships of three concepts: social capital (Cox, 1995; Montgomery, 1998); the network effect (Reed, 2002; Flor, 2004); and critical mass theory (Oliver et al, 1985). The primary technological intervention was the mobile device - GPRS enabled mobile phones, with audio-video capture and Internet browsing functionalities.

The following are the answers to the research questions forwarded by the study:

How can mobile devices be used by rural communities to document indigenous and local knowledge? The provision of entry level, low cost, user friendly mobile devices will allow members of indigenous groups to capture their knowledge and practices on sustainable agriculture. Furthermore, the Principal Investigator developed a set of modules that may capacitate rural communities to document indigenous and local knowledge.

How can Web 2.0 protocols be employed in an indigenous/ local knowledge management system? The design and development of a Web Content Management System utilizing entry level, relatively low cost hardware and low level open source software will accommodate Web 2.0 protocols in an indigenous knowledge management system.

How did indigenous peoples (IPs) respond to the use of mobile technology in the documentation of their local knowledge? The concept of open knowledge resources may not be appropriately applied to indigenous knowledge and practices due to a number of inhibiting factors. These factors were encountered during the researcher's study on the use of mobile videography and Web 2.0 protocols for the capture and sharing of indigenous knowledge. The discussion of these factors presented in this paper resulted from casual observation and a cursory review of literature.

As part of the continuing inquiry into open access issues, open knowledge resources and the significance of indigenous and local knowledge in the development effort, the researcher recommends the conduct of a more exhaustive analysis of these issues from the lens of critical theory.

At this juncture, it would only be appropriate to conclude that there are indeed valid exceptions against open access and knowledge commons that require further study and articulation.

CHAPTER 9
KM CAPDEV FOR AGRICULTURAL RESEARCH

INTRODUCTION

Rationale

The state of agricultural research in the Philippines has greatly improved in the past two decades. This improvement is due to revitalized programs, increased government investments in R&D, networking and consortium building at the local, national, and regional levels, and research capacity development at provincial state universities and colleges. Strengthened capacities for agriculture and fisheries research have generated new knowledge and technologies across commodities. However, these newly generated knowledge assets have not been adequately managed in terms of knowledge capture, sharing and reuse. Research findings have not been fully promoted, adequately packaged and thus, remain underutilized. The agricultural and fisheries' information and knowledge management (IKM) system has not kept up with its research counterpart.

Improved capacities in knowledge generation must be accompanied by strengthened capabilities in knowledge capture, sharing and reuse. The situation reveals a pressing need for a capacity development program on IKM for the agriculture and fisheries sector.

This document presents a capacity building program on agriculture and fisheries information and knowledge management for the Philippine agricultural and fisheries research and development system. The capacity development program covers DA BAR and the National Research and Development System in Agriculture and Fisheries (NARDSAF), comprising the DA Regional Integrated Agricultural Research Centers (RIARCs) and the National Fisheries Research and Development Center (NFRDC).

Objectives

The capacity development program aims:

1. To articulate a strategic framework for Philippine agriculture and fisheries information and knowledge management;

2. To identify milestones and activities that would capacitate the national agriculture and fisheries research and development sector on information and knowledge management; and

3. To provide details of the capacity development components, which includes, among other things, staff retooling, long-term training (graduate studies on KM) and short term training (professional courses on knowledge sharing; study tours; internships with IKM programs in national and international agricultural development organizations)

Potential Impact

Generally, it is expected that the program will contribute to the realization of DA-BAR's vision of a better life for Filipinos through excellence in agriculture and fisheries research and development.

Specifically, however, it should lead to the efficient and effective utilization, sharing and reuse of new agricultural and fisheries knowledge and technologies. It may result in the following impact:

1. Maximized popularization, dissemination and adoption of agricultural research results.
2. Increased sharing and reuse of knowledge among communities of practice (agricultural researchers and R&D knowledge workers) within the country.
3. Intensified synergies among national and regional agricultural and fisheries research and development institutions.
4. Strengthened knowledge management capacities within DA BAR and NARDSAF.

5. Reinforced multi-level agriculture and fisheries research networking among academic institutions, the R&D sector and the private sector.
6. Amplified visibility of agriculture and fisheries research products within the international agricultural research network.
7. Heightened presence of Philippine agricultural and fisheries knowledge products in the World Wide Web.

Beneficiaries

Generally, the capacity development program when implemented will benefit agricultural and fisheries information and knowledge management stakeholders, otherwise known as the IKM community of practice (CoP). They include: agricultural and fisheries researchers from the public and private sectors; specialists involved in the scientist-extension worker-farmer interfaces; academics from agricultural and fisheries state universities and colleges (SUCs); agricultural and fisheries public information officers; and knowledge products services coordinators.

Specific beneficiaries of the project are:

1. DA BAR technical (research management, communication, information science and information technology) staff
2. Agricultural Librarians
3. Public Information Officers/ knowledge products and services staff
4. NARDSAF member agencies or institutions
   4.1. Technical (research management, communication, information science and information technology) staff of agricultural colleges and universities
   4.2. Technical (research management, communication, information science and information technology) staff of agricultural research and development agencies

METHODOLOGY

Design

The capacity development program resulted from a two pronged methodology: strategic planning; and training needs analysis.

Strategic planning employed for this undertaking may be summarized with the following flowchart:

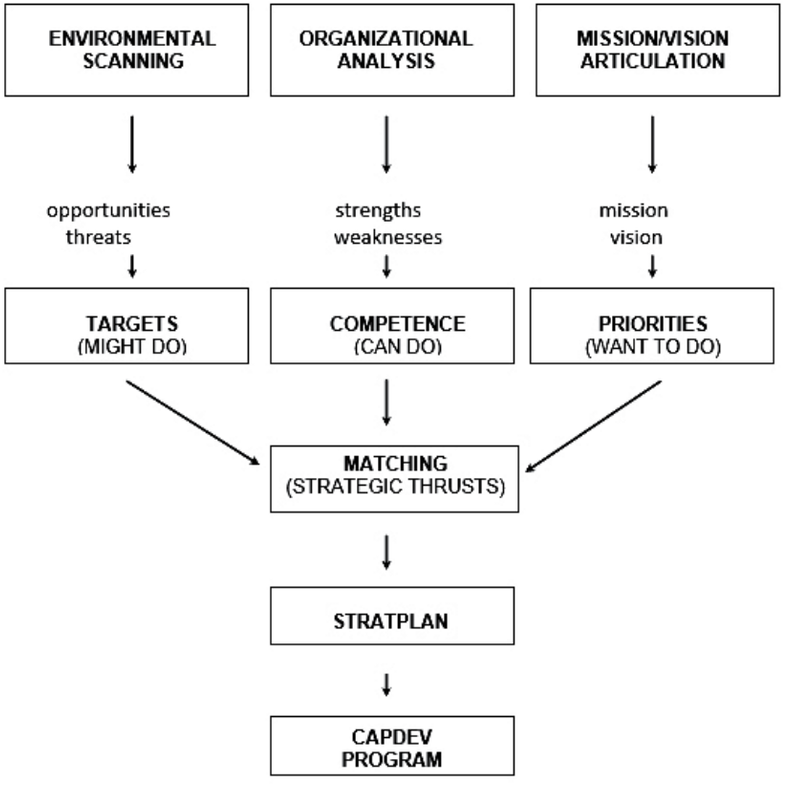

FIGURE 9-1. Strategic Planning Flowchart

An environmental scanning served as the rationale for this strategic planning exercise. Opportunities and threats of the national agriculture and fisheries R&D system or subsector were identified. These served as bases for what the subsector *might* do, i.e., possible planning targets.

An organizational analysis was also conducted to determine the subsector's strengths and weaknesses along the line of information and knowledge management. This was supplemented by training needs analysis (TNA). The findings pointed towards what the subsector *can* do outlining its current IKM competence.

Lastly, an analysis of the subsector's vision and mission statements as these pertain to information and knowledge management was conducted in order to articulate what the subsector *wants* to do IKM-wise and affirm its IKM priorities.

What the subsector might do, can do and want to do along the lines of IKM were matched to identify strategic thrusts. These thrusts formed the basis of the five-year strategic plan. Eventually, the five-year strategic plan was employed to design the IKM Capacity Development Program for DA BAR-NARDSAF.

Data Gathering

Data was gathered through key informant interviews, focus group discussions and a TNA survey conducted during two training workshops for public information officers, knowledge products and services staff as well as other technical staff of DA BAR-NARDSAF.

Online and Group Validation or Vetting Process

An online validation or vetting process was conducted from June to October 2012 via the KC3 Platform of the SEAMEO Regional Center for Graduate Study and Research in Agriculture. Participants of the two training workshops participated in this online vetting and validation.

A National Conference on IKM Capacity Building for DA BAR-NARDSAF was conducted in February 2013, wherein the IKM Capacity Building Program designed and developed on the basis of the five-year strategic plan was discussed, revised and finalized.

FINDINGS

Environmental Scanning

The Environment for Agricultural and Fisheries Research and Development. The current policy environment for agricultural and fisheries sector is dictated by: Republic Act 8435 otherwise known as the Agriculture and Fisheries Modernization Act of 1997 or AFMA; Republic Act 8550 otherwise known as the Fisheries Code of 1998; and the Philippine Development Plan 2011-2016. The two republic acts documents underscore the importance of research and development to fight hunger, ensure food security, and maximize the contribution of agriculture and fisheries to the country's economy. This is adequately supported by Chapter 4 of the Philippine Development Plan 2011-2016 which gives the first of the three development goals as *food security improved and incomes increased.* All three documents recognize the advances made in agricultural and fisheries research as drivers of economic growth.

Opportunities in the R&D Subsector. However, the state of agricultural research in the Philippines has greatly improved since 1997 when AFMA was passed. As stated earlier, this improvement is due to revitalized programs, increased government investments in R&D, networking and consortium building at the local, national and regional levels, and research capacity development at provincial state universities and colleges. Strengthened capacities for agriculture and fisheries research have generated new knowledge and technologies across commodities.

Threats in the R&D Subsector. However, these newly generated knowledge assets have not been adequately managed in terms of knowledge capture, sharing and reuse. Research findings have not been fully promoted, adequately packaged and thus, remain underutilized. The agricultural and fisheries knowledge management (KM) system has not kept up with its research counterpart.

KM Solution. Traditionally, knowledge management has been recognized as an evolving discipline that considers an organization's intellectual capital as a manageable and potentially profitable asset (Leibmann, 1999). It is based upon the assumption that today's global economy is knowledge-based and that knowledge is a primary commodity as well as a valuable resource (Flor, 2001). KM entails digitally capturing documented and tacit knowledge and storing or packaging these into knowledge products for sharing and reuse.

We can apply KM within the context of agricultural and fisheries research and development as the area of focus that succeeds agricultural research or knowledge generation.

The goal of knowledge management is the sharing and reuse of knowledge assets or intellectual capital (Leibmann, 1999). These assets, generated through agricultural and fisheries R&D must be captured, stored, and packaged as knowledge products. Although, distinctions are made between undocumented or tacit knowledge and documented or explicit knowledge, both are captured digitally and stored in a knowledge base. These are also made available digitally in a variety of multimedia formats for sharing and reuse.

Improved capacities in knowledge generation must be accompanied by strengthened capabilities in knowledge capture, sharing and reuse. Relevant staff members should be retooled and retrained on information and knowledge management. The situation reveals a pressing need for a capacity development program on IKM for the agriculture and fisheries sector.

Organizational Analysis

Strength: Information and Knowledge Staff. A *de facto* knowledge management system is currently in place within the agricultural and fisheries research and development sector. The National Research and Development System for Agriculture and Fisheries is made up of Regional Integrated Agricultural Research Centers and Regional Fisheries Research and Development Centers under program supervision of DA BAR. Each of these centers, including DA BAR have public information officers and knowledge products and services staff, who perform knowledge capture, documentation, storage and retrieval, and packaging and promotions functions. However, there appears to be problems on hiring, staff turnover and work load.

Weakness: Staffing. Like many of the line agencies, the Department of Agriculture is currently designing a Rationalization Plan to address structural, organizational, personnel and staffing issues. The Plan is yet to be completed and finalized. In the meantime, there is a freeze in the hiring of new personnel who should occupy regular items including public information officers and knowledge products and service staff.

The current modality in hiring information officers and KPS staff is outsourcing or so-called job-orders. Information officers hired under this modality have no security of tenure. Occasionally, they are tasked to perform functions that are generally delegated to a team rather than an individual. Hence, multitasking is not uncommon among regional and provincial information and knowledge staff. Furthermore, hiring qualified information officers and knowledge products developers and service providers become difficult because of the lack of security of tenure. In many cases, the difficulty in job contracting leaves no choice to the regional or provincial information officer but to assume responsibility for all tasks and perform all the requirements himself/herself.

Weakness: Lack of Articulation of Functions. The functions of information and knowledge managers are the least understood among middle to top management within the agriculture and fisheries research and development sub-sector. There are three prevailing erroneous impressions:

1. Firstly, information and knowledge management work do not require expertise.
2. Secondly, information and knowledge sharing and reuse do not require too much financial inputs.
3. Thirdly, information and knowledge capture, documentation and packaging is a one man/woman job.

Hence, we see information officers who use their own equipment and resources in documentation, writing, production, and dissemination. One person is expected to be the photographer, videographer, documentor, writer, media liaison, announcer, voice talent, emcee, sound man, musical scorer, librarian, graphic artist, web designer, web manager, etc.

Both the quality and quantity of tasks performed suffer because of these impressions and the lack of articulation of the exact coverage of responsibilities and functions of an information officer cum knowledge products and services provider.

Training Needs Assessment

As part of the organizational analysis, a training needs assessment was conducted to determine the IKM competence of the agriculture and fisheries research and development sector. Data gathering was conducted through a training needs analysis survey conducted during two training workshops for public information officers, knowledge products and services staff as well as other technical staff of DA BAR-NARDSAF.

Respondents' Characteristics. The following profile was obtained from the TNA respondents:

Designations. Table 9-1 shows the positions or designations of the participants grouped into five categories. There were 11 Information Officers/Staff, 16 Agriculturists/Agricultural Technologists/Aquaculturists/ Aqua Tech, six Directors, Deputy Chiefs/Heads/Assistant Heads/Project Leaders/Managers, 11 Science Research Specialists/Research Assistants/Researchers/ Technical Staff, and three AV Technician/Engineer/ Writer. This is illustrated further in Figure 9-2.

Table 9-1. Position/designation of participants

POSITION/DESIGNATION	COUNT	PERCENTAGE
Information Officer/ staff	11	23.40
Agriculturist/ Agricultural Technologist/ Aquaculturist/ Aqua Tech	16	34.04
Director, Deputy Chief/ Head/ Assistant Head/ Project Leader/ Manager	6	12.77
Science Research Specialist/ Research Assistant/ Researcher/Technical Staff	11	23.40
AV Tech/ Engineer/ Writer	3	6.38
TOTAL	**47**	**100.00**

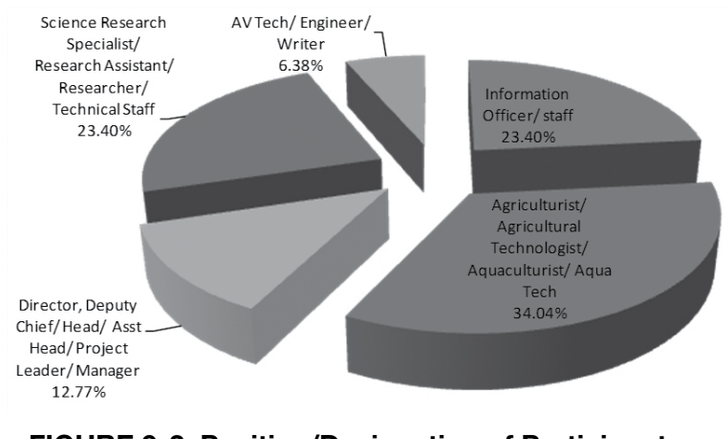

FIGURE 9-2. Position/Designation of Participants

Length of Service. As for the length of their service, the responses were grouped into six categories. Table 9-2 shows the following results: seven has been working for less than a year; 17 has been working for one to five years; 12 has been working for 6 to 10 years; four has been working for 11 to 15 years; two has been working for 16 to 20 years; four has been working for 21 to 25 years; and one has been working for 26 to 30 years. These values are further illustrated in Figure 9-3.

Table 9-2. Length of service of participants

LENGTH OF SERVICE	COUNT	PERCENTAGE (%)
Less than 1 year	7	14.89
1 – 5 years	17	36.17
6 – 10 years	12	25.53
11 – 15 years	4	8.51
16 – 20 years	2	4.26
21 – 25 years	4	8.51
26 – 30 years	1	2.13
TOTAL	**47**	**100.00**

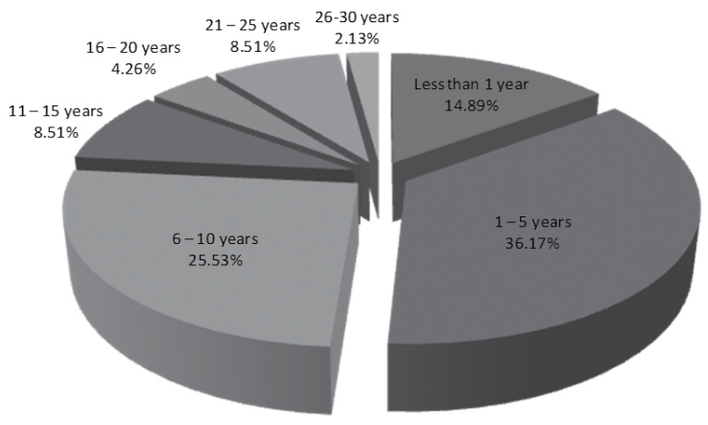

FIGURE 9-3. Length of service of participants

Degrees Earned. Table 9-3 shows the breakdown of the participants depending on the degrees they have earned: Undergraduate, Masteral, or Doctorate. As presented, majority or 59.57 percent of the participants has earned an Undergraduate degree. Moreover, 31.91 percent has earned a Masteral degree, while 8.51 percent has earned a Doctorate degree. Figure 9-4 illustrates these results.

Table 9-3. Degrees earned by the participants

DEGREES EARNED	COUNT	PERCENTAGE (%)
Undergrad	28	59.57
Masteral	15	31.91
Doctorate	4	8.51
TOTAL	**47**	**100**

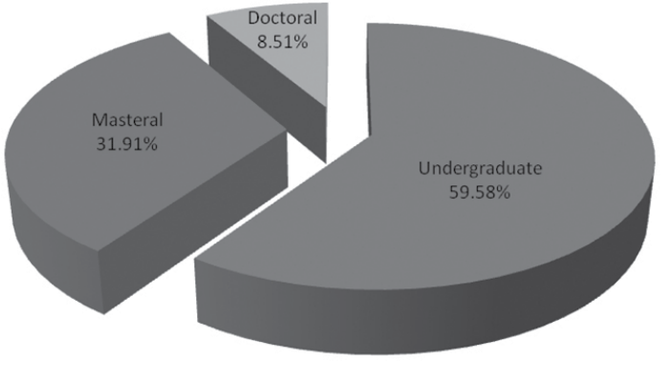

FIGURE 9-4. Degrees earned by the participants

***KM Skills and Practice*.** The respondents were then asked if they considered themselves as KM practitioners and about their KM skills.

Perception of Role as KM Practitioners. Table 9-4 presents the classifications of the participants based on their practice of Knowledge Management (KM). As shown, majority or 55.32% of the respondents were KM practitioners. On the other hand, 25.53% were not KM practitioners; while 19.15% did not respond to the question. These results are further illustrated in Figure 9-5.

Table 9-4. Respondents' perception of their KM role

CLASSIFICATION	COUNT	PERCENTAGE (%)
KM practitioners	26	55.32
Not KM practitioners	12	25.53
No reply	9	19.15
TOTAL	**47**	**100**

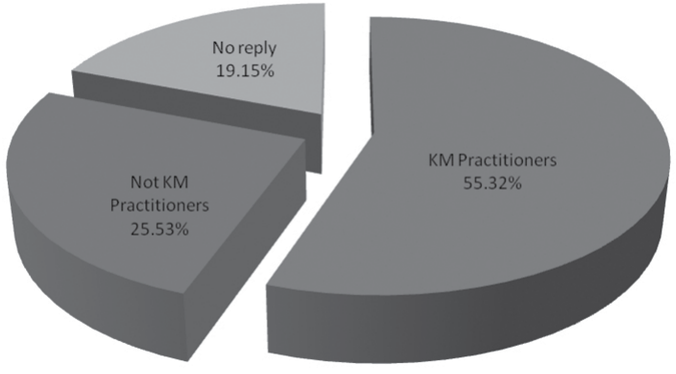

FIGURE 9-5. Respondents' perception of their KM role

KM Skills. Furthermore, the participants were asked to indicate the KM skills they have practiced. A total of 12 KM skills were included in the questionnaire: Referencing/Content Management; Documentation/Digital Capture; Content Analysis; Network Analysis; Documents Management; Writing and Presentation; Multimedia Packaging; Web Design and Writing; Messaging and Collaboration; Portals and Search Engines; Networking; and Materials Development. Table 9-5 and Figure 9-6 present the responses of the participants.

Majority of the participants have practiced the following KM skills: Referencing/Content Management (53.19%); Documentation/ Digital Capture (80.85%); Documents Management (68.09%); Writing and Presentation (89.36%); Messaging and Collaboration (51.06%); Networking (57.45%); and Materials Development (59.57%). However, majority of the participants have not practiced Network Analysis (78.72%); Multimedia Packaging (55.32%); Web Design and Writing (70.21%); and Portals and Search Engines (55.32%). Lastly, results show relatively close values for the KM skill Content Analysis: 46.81% (22 respondents) have practiced; 42.55% (20 respondents) have not yet practiced; while 10.64% (5 respondents) did not reply.

Among all the KM skills listed, Writing and Presentation was the most practiced KM skill with an 89.36% value; while Network Analysis was the least practiced KM skill with only 8.51%. Table 9-6 and Figure 9-7 present the responses of the participants regarding their training needs on the KM skills.

Table 9-5. KM skills practiced by the participants

KM SKILLS	PRACTICED		NOT PRACTICED		NO REPLY	
	Count	Percentage	Count	Percentage	Count	Percentage
Referencing/ Content Management	25	53.19	18	38.30	4	8.51
Documentation/ Digital Capture	38	80.85	7	14.89	2	4.26
Content Analysis	22	46.81	20	42.55	5	10.64
Network Analysis	4	8.51	37	78.72	6	12.77
Documents Management	32	68.09	11	23.40	4	8.51
Writing and Presentation	42	89.36	4	8.51	1	2.13
Multimedia Packaging	19	40.43	26	55.32	2	4.26
Web Design and Writing	9	19.15	33	70.21	5	10.64
Messaging and Collaboration	24	51.06	20	42.55	3	6.38
Portals and Search Engines	15	31.91	26	55.32	6	12.77
Networking	27	57.45	17	36.17	3	6.38
Materials Development	28	59.57	17	36.17	2	4.26

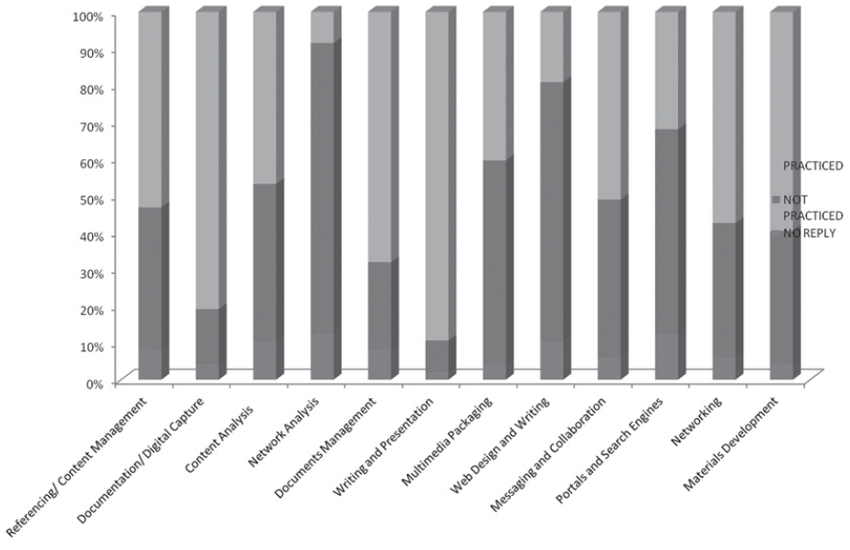

FIGURE 9-6. KM skills practiced by the participants

As shown in Table 9-6 and Figure 9-7, majority of the participants needed training for all the KM skills: Referencing/Content Management (87.23%); Documentation/Digital Capture (82.98%); Content Analysis (91.49%); Network Analysis (93.62%); Documents Management (91.49%); Writing and Presentation (85.11%); Multimedia Packaging (89.36%); Web Design and Writing (95.74%); Messaging and Collaboration (85.11%); Portals and Search Engines (74.47%); Networking (78.72%); and Materials Development (91.49%).

Among all the KM skills listed, a training on Web Design and Writing was relatively more needed with a 95.74% value; while training on Portals and Search Engines was relatively less needed with 74.47% values.

Table 9-6. Training needs of participants regarding the KM skills

KM SKILLS	NEEDS TRAINING		DOES NOT NEED TRAINING		NO REPLY	
	Count	Percentage	Count	Percentage	Count	Percentage
Referencing/ Content Management	41	87.23	4	8.51	2	4.26
Documentation/ Digital Capture	39	82.98	5	10.64	3	6.38
Content Analysis	43	91.49	1	2.13	3	6.38
Network Analysis	44	93.62	1	2.13	2	4.26
Documents Management	43	91.49	2	4.26	2	4.26
Writing and Presentation	40	85.11	2	4.26	5	10.64
Multimedia Packaging	42	89.36	2	4.26	3	6.38
Web Design and Writing	45	95.74	1	2.13	1	2.13
Messaging and Collaboration	40	85.11	4	8.51	3	6.38
Portals and Search Engines	35	74.47	8	17.02	4	8.51
Networking	37	78.72	4	8.51	6	12.77
Materials Development	43	91.49	1	2.13	3	6.38

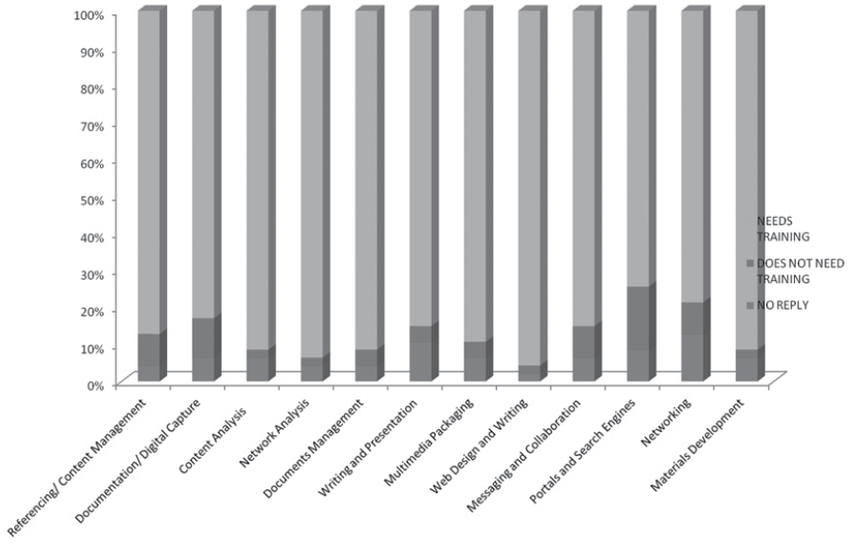

FIGURE 9-7. Training needs of participants regarding the KM skills

Knowledge Sharing Methods. Furthermore, the participants were asked to indicate the knowledge sharing methods they were familiar with. A total of 16 knowledge sharing methods were included in the questionnaire: Storytelling; After actions review; World Café; Knowledge fairs; Chat shows; Open space meetings; Communities of practice; Peer assists; Blogs; Wikis; Tagging; Social bookmarking; Digital videos; Photo sharing (e.g. Flickr); YouTube; and Collaborative websites. Table 9-7 and Figure 9-8 present the responses of the participants. As presented, majority of the participants were familiar with the following knowledge sharing methods: Storytelling (59.57%); Blogs (61.70%); Wikis (55.32%); Tagging (72.34%); Digital videos (70.21%); Photo sharing (72.34%); and YouTube (85.11%). On the other hand, majority of the participants were not familiar with the following knowledge sharing methods: After Actions Review (53.19%); World Café (85.11%); Knowledge fairs (59.57%); Chat shows (65.96%); Open space Meetings (57.45%); Communities of practice (61.70%); Peer assists (61.70%); social bookmarking (57.45%); and Collaborative websites (51.06%).

Among the knowledge sharing methods, the participants were most familiar with YouTube with an 85.11% value; on the other hand, they were least familiar with World Café with a 12.77% value.

Table 9-7. Familiarity of participants with knowledge sharing methods

KNOWLEDGE SHARING METHODS	FAMILIAR		NOT FAMILIAR		NO REPLY	
	Count	Percentage	Count	Percentage	Count	Percentage
Storytelling	38	59.57	8	17.02	1	2.13
After actions review	19	40.43	25	53.19	3	6.38
World café	6	12.77	40	85.11	1	2.13
Knowledge fairs	17	36.17	28	59.57	2	4.26
Chat shows	14	29.79	31	65.96	2	4.26
Open space meetings	15	31.91	27	57.45	5	10.64
Communities of practice	15	31.91	29	61.70	3	6.38
Peer assists	16	34.04	29	61.70	2	4.26
Blogs	29	61.70	17	36.17	1	2.13
Wikis	26	55.32	19	40.43	2	4.26
Tagging	34	72.34	13	27.66	0	0.00
Social bookmarking	16	34.04	27	57.45	4	8.51
Digital videos	33	70.21	14	29.79	0	0.00
Photo Sharing (e.g. Flickr)	34	72.34	12	25.53	1	2.13
YouTube	40	85.11	7	14.89	0	0.00
Collaborative websites	19	40.43	24	51.06	4	8.51

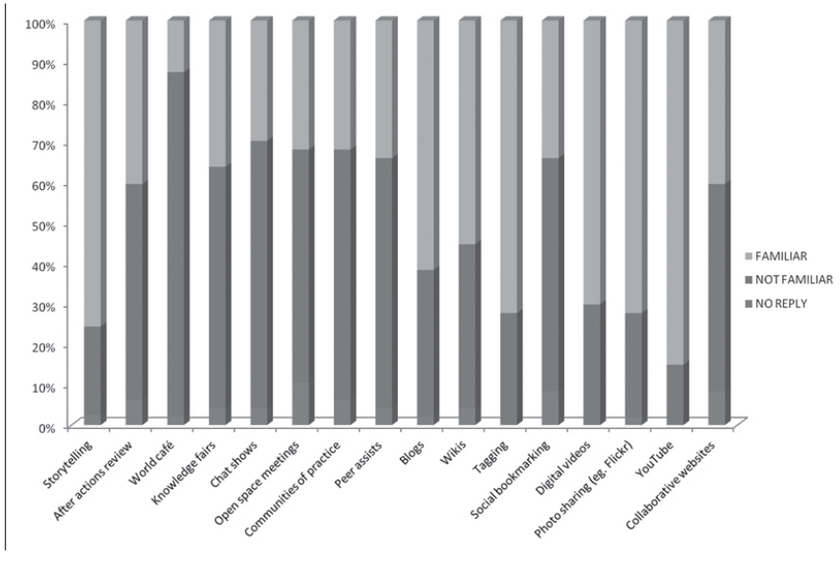

FIGURE 9-8. Familiarity of participants with knowledge sharing methods

***Short Term Training Needs*.** On the other hand, Table 9-8 and Figure 9-9 present the training needs of the participants regarding the knowledge sharing methods. As shown, majority of the respondents needed training on all the knowledge sharing methods: Storytelling (74.47%); After actions review (82.98%); World Café (80.85%); Knowledge fairs (80.85%); Chat shows (74.47%); Open space meetings (78.72%); Communities of practice (85.11%); Peer assists (74.47%); Blogs (70.21%); Wikis (72.34%); Tagging (65.96%); Social bookmarking (68.09%); Digital videos (85.11%); Photo sharing (63.83%); YouTube (55.32%); and Collaborative websites (76.60%).

Among these knowledge sharing methods, trainings on the methods of Communities of Practice and Digital Videos were the most needed both with 85.11%; while a training on utilizing YouTube was relatively less needed with 55.32 percent.

Table 9-8. Training needs of participants regarding knowledge sharing methods

KNOWLEDGE SHARING METHODS	NEEDS TRAINING		DOES NOT NEED TRAINING		NO REPLY	
	Count	Percentage	Count	Percentage	Count	Percentage
Storytelling	35	74.47	7	14.89	5	10.64
After actions review	39	82.98	5	10.64	3	6.38
World café	38	80.85	7	14.89	2	4.26
Knowledge fairs	38	80.85	6	12.77	3	6.38
Chat shows	35	74.47	8	17.02	4	8.51
Open space meetings	37	78.72	7	14.89	3	6.38
Communities of practice	40	85.11	4	8.51	3	6.38
Peer assists	35	74.47	9	19.15	3	6.38
Blogs	33	70.21	12	25.53	2	4.26
Wikis	34	72.34	11	23.40	2	4.26
Tagging	31	65.96	13	27.66	3	6.38
Social bookmarking	32	68.09	12	25.53	3	6.38
Digital videos	40	85.11	4	8.51	3	6.38
Photo Sharing (e.g. Flickr)	30	63.83	12	25.53	5	10.64
YouTube	26	55.32	16	34.04	5	10.64
Collaborative websites	36	76.60	9	19.15	2	4.26

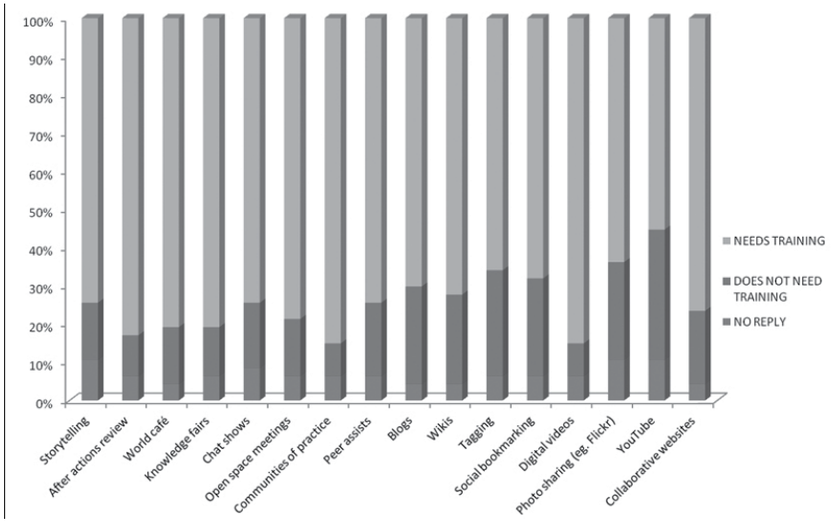

FIGURE 9-9. Training needs of participants regarding knowledge sharing method

Vision Mission Articulation

This strategic planning exercise assumes that DA BAR vision-mission statements are representative of the vision-mission statements of the entire agriculture and fisheries research and development subsector.

The current vision statement of DA BAR is: *A better life for Filipinos through excellence in agriculture and fisheries research and development.*

This vision statement can be articulated into the following to reflect information and knowledge management: *We envision a better life for Filipinos through excellence in agriculture and fisheries research and development, the results of which are shared and reused extensively.*

On the other hand, DA BAR's current mission statement reads: *To attain food security and reduce poverty through technology-based agriculture and fisheries sector*

An articulation of the mission statement to reflect information and knowledge management would read: *Our mission is to attain food security and reduce poverty through technology-driven, knowledge-based agriculture and fisheries sector.*

These vision and mission statements re-articulated towards information and knowledge management will be used as elements in the strategic framework that will be discussed in the succeeding section.

STRATEGIC FRAMEWORK

Elements of the Strategic Framework.

Based on the findings discussed above, the elements of the IKM Capacity Development Strategic Framework were crafted. The elements are as follows: a Preamble; the IKM Vision Statement; the IKM Mission Statement; the IKM Goal Statement; and the IKM Capacity Development Strategic Thrusts.

***Preamble*.** We, constituents of the agriculture and fisheries research and development subsector, believe that the country can attain food security and reduce poverty through excellence in research and development supplemented by knowledge sharing and reuse.

We shall take it upon ourselves to: faithfully capture and document explicit and tacit knowledge generated by our sector; store and make available these knowledge assets to agriculture and fisheries users; develop and disseminate knowledge products; and package and promote advanced and appropriate agriculture and fisheries technologies.

We shall serve as agriculture and fisheries information and knowledge advocates. We shall constitute ourselves into a community of champions for agriculture and fisheries information and knowledge management. We shall serve as the instruments that will bring to bear our collective knowledge resources in the service of food security and poverty reduction.

***Vision Statement*.** We envision a better life for Filipinos through excellence in agriculture and fisheries research and development, the results of which are shared and reused extensively.

Mission Statement. Our mission is to attain food security and reduce poverty through technology-driven, knowledge-based agriculture and fisheries sector.

***Goal Statement*.** Our goal is to contribute to the attainment of *food security and poverty reduction* through extensive, effective and efficient sharing and reuse of agriculture and fisheries information and knowledge resources by 2017.

***Strategic Thrusts*.** To achieve this goal, we shall have three strategic thrusts: adequate staffing; articulation of our roles as information and knowledge managers; and the retooling of public information officers and knowledge products and services staff into information and knowledge managers.

1. *Adequate Staffing.* The information offices and knowledge products and service units of the RIARCS, RFRDC, and DA BAR should be adequately staffed. Information and knowledge management should not be considered as one-man/woman set-ups manned by a jack-of-all-trades but by a team of information, communication and knowledge specialists.

2. *Articulation of Roles*. The roles and functions of information offices and knowledge products and services units should be clearly articulated. Information officers and KPS staff should not be considered as public relations agents of the provincial or regional offices but as information and knowledge managers tasked to capture, share and reuse information and knowledge generated by agriculture and fisheries research to users in the government and private sectors, in the academe, development agencies and nongovernment organizations.

3. *Retooling*. Information offices and knowledge products and services units should be retooled in terms of: equipment; training; and toolkit development. Training should be at the formal (degree programs), nonformal (short term training and internships) and informal (attendance to conferences, agency visits and others).

These three thrusts shall employ five *capacity development* strategies outlined in a five-year strategic plan and operationalized in a capacity development program presented in the next chapter:

Increase national ownership and partnership building on agriculture and fisheries IKM. Agriculture and fisheries information and knowledge management benefits not only the R&D sector but the complete list of actors involved in the agricultural value chain. Each and every node in this chain increases in value with every input of information or knowledge. Thus, it is to everyone's benefit to strengthen the capacity of information and knowledge workers within the bureaucracy. Ownership of the capacity development program must be assumed not only by the IKM staff but by management as well, not merely by DA BAR and NARDSAF but by the entire Department of Agriculture as well.

Strengthen institutional capacity for agriculture and fisheries IKM. Institutional capacities should be strengthened through retooling: equipment procurement, formal, nonformal and informal training.

Improve organizational capacity for agriculture and fisheries IKM. On the other hand, organizational capabilities must be improved through adequate staffing and staffing policies.

Improve quality of IKM systems and products. Institutional strengthening and capability building will subsequently increase the quality of information and knowledge systems as well as their products.

Accelerate knowledge generation on agriculture and fisheries IKM. Improvement of IKM systems and knowledge products will in turn generate best practices on IKM and accelerate knowledge generation on the subject.

StratFrame Matrix

The following matrix summarizes the elements of the agriculture and fisheries information and knowledge management strategic framework.

Table 9-9. Stratframe Matrix

VISION STATEMENT	We envision a better life for Filipinos through excellence in agriculture and fisheries research and development, the results of which are shared and reused extensively.
MISSION STATEMENT	Our mission is to attain food security and reduce poverty through technology-driven, knowledge-based agriculture and fisheries sector.
GOAL STATEMENT	Our goal is to contribute to the attainment of *food security and poverty reduction* through extensive, effective and efficient sharing and reuse of agriculture and fisheries information and knowledge resources by 2017.

STRATEGIC IKM THRUSTS	STRATEGIES	PROGRAM COMPONENTS
Articulation of Roles	• Increase national ownership and partnership building on agriculture and fisheries IKM • Accelerate knowledge generation on agriculture and fisheries IKM	Crafting the IKM Terms of Reference
Adequate Staffing	• Increase national ownership and partnership building on agriculture and fisheries IKM • Strengthen institutional capacity for agriculture and fisheries IKM • Improve organizational capacity for agriculture and fisheries IKM	Staffing Policy Design and Development
Retooling	• Strengthen institutional capacity for agriculture and fisheries IKM • Improve organizational capacity for agriculture and fisheries IKM • Improve quality of IKM systems and products • Accelerate knowledge generation on agriculture and fisheries IKM	Formal, Nonformal and Informal Training Toolkit Development Equipment Provision

IKM CAPACITY DEVELOPMENT PROGRAM

CapDev Strategies

As discussed in the previous chapter, the capacity development program shall employ five strategies to address its three strategic thrusts (articulation of roles, adequate staffing, and retooling). These strategies are to:

1. Increase national ownership and partnership building on agriculture and fisheries IKM;
2. Strengthen institutional capacity for agriculture and fisheries IKM;
3. Improve organizational capacity for agriculture and fisheries IKM;
4. Improve quality of IKM systems and products; and
5. Accelerate knowledge generation on agriculture and fisheries IKM.

Components

The strategies will be operationalized with the capacity development program's five components (crafting the IKM TOR, staffing policy, formal/non-formal/informal training, toolkit development, and equipment provision):

Component 1: Crafting the IKM Terms of Reference. As part of the strategic thrust for adequate staffing, the capacity development program will include a component that would craft the appropriate terms of reference for the information and knowledge officer. Technically, terms of reference or TORs are made up of the specific and detailed tasks expected of the incumbent, the duration of employment, his/her required credentials, and his/her qualifications. TORs are drafted for specific posts with identified requirements. However, the capacity development program can only realistically address the generic requirements for an IK Officer.

The first step in crafting the TOR for the agriculture and fisheries information and knowledge officer is to identify and agree on the tasks that he/she should perform. These tasks should be clear and specific. They should not be open to interpretation nor should they be subject to wide latitudes of discretion by management. Hence, these tasks should be identified by the information officers and knowledge services and products staff who have been on the job for quite some time.

Once the tasks are identified and agreed upon, the next step is to prepare a position paper on the role of the IK Officer and his/her proper utilization by the agriculture and fisheries R&D sector. The position paper will present the information and knowledge contexts wherein agriculture and fisheries R&D is situated. It will provide arguments on the centrality and critical nature of the IKO's role as well as the need for committed, qualified and competent personnel to man this position. The position paper will end with a call for regularization and the design and development of appropriate staffing policies.

Component 2. Staffing Policy Design and Development. Policies on the hiring, regularization, staffing and competencies of the IK officers who will man the RIARCS and the attached agencies of NaRDSAF should be incorporated into a Department Administrative Order (DAO) on the Role, Functions and Qualifications of the agriculture and fisheries Information and Knowledge Officer. The DAO should be drafted and subjected to consultative meetings among IK stakeholders. After several iterations, it will be finalized for approval by the Secretary.

Component 3. Formal, Nonformal and Informal Training. Component 3 holds the substance of the IKM capacity development program. It has three sub-components: formal education; nonformal education; and informal education.

Formal. The formal education or long-term training sub-component pertains to the provision of post-baccalaureate degree opportunities to permanent IK officers within the agriculture and fisheries R&D sector. These opportunities include fulltime and part-time scholarships for graduate certificate, masters and doctoral degrees on information science and knowledge management. Considering that, as of this writing, there are no residential post-baccalaureate degree programs on KM, most of these degrees will have to be pursued abroad – in Australia, Singapore or the US. Since Philippine government scholarships exclusively fund local study only, other scholarship facilities will have to be pursued.

The most promising funding facility is the Philippines Australia Human Resource Development Facility (PHRDF) funded by AUSAid. PHRDF works closely with Australian university service providers such as the Queensland University of Technology that offers post baccalaureate degrees on knowledge management.

Furthermore, we propose the design and development of a ladderized online post baccalaureate degree program on agricultural information and knowledge management to be offered by the University of the Philippines-Open University with multiple entry and exit points. By ladderized, we refer to a full program that offers: (1) a graduate certificate on agricultural IKM; (2) a master's degree on IKM; and (3) a professional doctorate on agricultural IKM. These three degrees also correspond to entry and exit points that the online student might avail themselves of. The program(s) will be offered online, but a summer internship may be arranged with the program's co-sponsor, the Food and Agriculture Organization of the United Nations. The internship can be conducted in any FAO office globally.

A sample curriculum of thirty (30) units leading to a Master of Agricultural Information & Knowledge Management (MAIKM) may include the following:

AIKM 201. Information & Knowledge for Development (IK4D) A (3 units)
AIKM 202. Information & Knowledge for Development (IK4D) B (3 units)
AIKM 211. Digitization and Digital Libraries (3 units)
AIKM 212. Management of Electronic Documents (3 units)
AIKM 221. Knowledge Products Design (3 units)
AIKM 222. Knowledge Products Production (3 units)
AIKM 231. Networks and Electronic Communities (3 units)
AIKM 232. Social Networking (3 units)
AIKM 290. FAO Internship (6 units)

Additionally, a scholarship facility for IK officers within the agriculture and fisheries R&D sector may be established for the funding of matriculation and a modest allowance for instructional materials. The scholarship facility will be administered by the SEARCA Graduate Scholarships Division and will be open to permanent IK officers on a competitive basis. It will fund part time study. The IK officer need not relocate nor go on leave from his post in DA BAR, the RIARC or the attached agency.

Nonformal. The nonformal or short-term training subcomponent comprises non-degree training courses offered on a regular basis for information and knowledge officers. These courses will run from three days to two weeks and will include the following:

Training Course on Demystifying KM for R&D Managers/ Heads of Agencies
Training Course on KM Project Design
Training Course on Knowledge Sharing Tools
Training Course on Mobile Videography
Training Course on Knowledge Audit
Training Course on Geospatial IKM
Training Course on IKSP
Training Course on Content Management System

These courses will have face-to-face and online delivery platforms.

Informal. By informal education, we refer to learning platforms that are established not to lead to a formal degree nor to structured, organized learning activities. Nevertheless, these offer a wide range of learning opportunities to the IK officer. Primarily, an Agriculture and Fisheries Knowledge Management System should be established to serve as the IK community's learning platform. The system would include:

- A Content Management System (Video, Audio, Text)
- Discussion Forums
- Online Databases
- RSS Feeds

Under this component, cross-fertilization visits among IK officers from agencies of the National Research and Development System for Agriculture and Fisheries may be organized on a regular basis.

Component 4. AIKM Toolkit Development. By definition, a toolkit is a collection of standardized tools that would aid and assist users in performing tasks. An agricultural information and knowledge management toolkit presents KM Tools for the IK officer and appropriate instructions on how to use them.

This toolkit will contain sections on: (1) KM Best Practices; (2) Knowledge Products Design and Development Tools; and (3) Knowledge Sharing Tools. This will be made available in hardcopy, in CD-ROM format and in downloadable versions.

Component 5. Equipment Provision. The retooling of information and knowledge units and officers necessarily entails the provision of appropriate equipment. Given today's information and communication environment, a basic set of equipment for the information and knowledge unit includes:

- Personal computers and laptops
- Servers
- Tablets/drawing tablets
- Digital Single Lens Reflex cameras
- Video cameras, underwater casing for fisheries IK officers
- Non-linear video editing equipment
- Colored laser printers and scanners
- Large-format printers
- Portable PAs
- Software
- LCD Projectors

IK officers should not be forced to use their personal equipment for their professional tasks.

Activities

A five year planning horizon (2013 to 2018) will be adopted for the implementation of the IKM Capacity Development Program.

The major activities are as follows:

1. Crafting the IKM Terms of Reference
   1.1. Draft IKM Terms of Reference
   1.2. Conduct Regional Consultative Workshops on Crafting the IKM TOR
   1.3. Finalize TOR

2. Staffing Policy Design and Development
   2.1. Draft Staffing Policy
   2.2. Conduct Regional Consultative Workshops on IKM Staffing Policy
   2.3. Finalize Staffing Policy

3. Training
   3.1. Source scholarships for IKM staff
   3.2. Develop online degree programs on IKM
   3.3. Send IKM staff on scholarships under available formal programs
   3.4. Conduct nonformal training programs
   3.5. Send staff to conferences and internships in partner agencies

4. Toolkit Development
   4.1. Design agriculture and fisheries IKM toolkit series
   4.2. Develop agriculture and fisheries IKM toolkit series
   4.3. Test and finalize agriculture and fisheries IKM toolkit

5. Equipment Provision
   5.1. Identify equipment requirements
   5.2. Procure and deploy equipment to RIARCs and RFRDCs

Milestones

The following milestones will be indicative of the progress of the IKM Capacity Development Program:

1. Program Start Up
2. Crafting the IKM Terms of Reference: Approval of the TOR
3. Staffing Policy Design and Development: Approval of Staffing Policy
4. Formal, Nonformal and Informal Training
   4.1. MOU Signing with Scholarship Funds
   4.2. Approval of Online Degree Program on IKM

5. Toolkit Development: Roll out of IKM Toolkits
6. Equipment Provision
7. Program End

CHAPTER 10
KM FOR SMALLHOLDER FARMERS IN ASIA AND PACIFIC ISLANDS REGION

INTRODUCTION

Background

The Project. Supporting Smallholder Farmers in Asia and the Pacific Islands Region through Strengthened Agricultural Advisory Services (SAAS) is a three-year collaborative undertaking of the Asia-Pacific Islands Rural Advisory Services (APIRAS) and the Southeast Asian Regional Center for Graduate Study and Research in Agriculture (SEARCA) together with the Global Forum for Rural Advisory Services (GFRAS) and the sub-regional networks, namely, AESA, PIRAS, MELA, SEARAS, and CACFRAS as well as national nodes such as BAEN in Bangladesh and ATI in the Philippines. It is supported by a grant from the International Fund for Agricultural Development (IFAD) and counterpart funding from GFRAS and the European Union (EU).

The goal of the project is *to empower poor smallholder farmers and producer organizations in Asia-Pacific Region (APR) through access to improved, more effective and demand-driven agricultural advisory services (AAS*). Its two-fold objectives are: to strengthen individual and organizational capacities of agricultural advisory services stakeholders in the target countries and at regional and sub-regional levels which will directly benefit poor farmers, indigenous communities, and producer organizations; and to facilitate the availability and accessibility of appropriate and up-to-date knowledge and evidence on innovative advisory services from a range of sources in the Asia Pacific through country, regional and worldwide fora. It is being implemented in three sub-regions with one country per-sub-region: Bangladesh representing SAARC, the Philippines representing ASEAN, and Fiji representing the Pacific Islands.

The provision of agricultural advisory services presupposes the availability and accessibility of sound, appropriate and timely agricultural knowledge for sharing and reuse. Such is a knowledge management (KM) concern, specifically in this context, knowledge management for development (KM4D).

KM4D. Knowledge management for development is an offshoot of knowledge management, an evolving discipline that considers intellectual capital as a manageable asset (Leibmann, 1999). KM was initially conceived from a corporate-organizational context with wealth-generation/profitability as its primary focus. It is based upon the assumption that today's global economy is knowledge-based and that knowledge is both a primary commodity and a valuable resource that can generate or lead to other resources (Flor, 2001).

KM entails digitally capturing documented and tacit knowledge and storing these for sharing and reuse. Knowledge is managed through a complete intranet system and guided by policies that provide incentives for organizational knowledge sharing. The goal of KM is the sharing and reuse of intellectual capital (Leibmann, 1999). Although, distinctions are made between undocumented (or tacit knowledge) and documented (or explicit knowledge), both are digitally captured and stored in a knowledge base, then made available digitally in a variety of multimedia formats through a content management system (CMS) for sharing and reuse.

KM, as a discipline, was borne out of the need to systematically leverage the intellectual assets of an organization to achieve its corporate goals. Soon after its introduction to the corporate world, however, both the government sector and the international development assistance community (owing to the fact that governments and international agencies are, by nature, knowledge organizations) embraced it and reframed it as KM4D. These include United Nations agencies; international financial institutions such as the World Bank and IFAD; regional financial bodies such as the Latin American Development Bank, the Asian

Development Bank and the African Development Bank; and bilateral aid agencies as well, such as USAID, AusAID, CIDA, JICA, AFD, DFID, and others.

KM4D recognizes intellectual capital as a manageable asset as well. The difference is while intellectual capital is leveraged to increase the corporate bottom-line in KM, it is utilized in KM4D to further the development agenda, nowadays consolidated as the Sustainable Development Goals or SDGs. KM4D is similarly anchored upon Davenport and Prussak's KM theory and thus adopts a digital environment. However, it functions within the public sphere, specifically applied within the development context wherein digital resources are not as readily available as in private sector environments. From the point of view of governments and development assistance agencies, KM need not be exclusively applied to organizations. It can very well be employed to non-going concerns such as projects and to larger systems, communities, or even development sectors. For example, knowledge within academia, scientific circles, or communities of practice, can be managed, particularly so with social media and content management systems.

Purpose and Overview

The purpose of this paper is to present a KM4D strategy for Supporting Smallholder Farmers in Asia and Pacific Islands Region through Strengthened Agricultural Advisory Services. It should be encompassing enough to cover the rural advisory services ecosystem and comprehensive enough addressing the following concerns:

- Bringing to bear the knowledge assets of the APR agricultural sector to strengthen rural advisory services networks, institutions, policy and practices;
- Making available technical, local and indigenous knowledge that form the content of advisory services;
- Improving access to advisory services by intermediaries and smallholder farmers;

- Establishing a system that both ensures availability and enables accessibility; and
- Developing capacities to populate, administer and maintain the system.

In other words, the strategy should cover *networks*, *systems, content,* and *capacities* as well as articulate the foundations for these. A KM4D Framework is presented in Section II to provide the bases for networking, systems design, content specifications and capacities required. The framework introduces an agricultural advisory delivery model based on Kim's science of delivery (SOD). Moreover, the components of the KM4D Strategy are detailed in Section III. These include KM4D vision, mission and goal statements as well as identified strategic thrusts. Finally, a KM4D Strategic Plan is proposed in Section IV inclusive of an enumeration of activities.

Entry Points

The following table is an attempt to situate KM4D within Supporting Smallholder Farmers in Asia and Pacific Islands Region through Strengthened Agricultural Advisory Services. Activities 1 to 4 of the SAAS Project all require KM4D input.

KM4D entry points in the SAAS Project are given in the left hand column while proposed counterpart activities are enumerated in the left:

Table 10-1. KM4D SAAS Entry Points

SAAS activity	KM4D activity
Activity 1. Undertake capacity needs assessment and strengthening of country fora and sub-regional networks while strengthening governance of regional and country-level AAS institutions.	
1.1 Situational analysis of AAS in the countries, introduction and discussion of country fora approach	1. Country Level Knowledge Audit 1.1. Identification of Knowledge Hubs 1.2. Network Analysis 1.3. Gap Analysis 2. Regional Knowledge Audit Workshop 3. Finalize Country KM Operational Plans 4. Finalize Regional Operational Plan
1.2 Capacity needs assessment of 2 sub-regional networks and APIRAS	• Regional Knowledge Audit Workshop
Activity 2. Improve individual capacities of AAS to effectively serve poor farmers, indigenous communities, and producers' organizations respond to their demands and ensure sustainability of project gains as well as future geographical scaling-up	
1.1 Undertake AAS capacity needs assessment exercises through the country fora and development of long-term AAS provider capacity development strategy to address the capacity gaps	• Country level knowledge audits
1.2 Address the capacity needs of AAS actors through capacity strengthening events (trainings, learning routes, peer-to-peer coaching, etc.)	• SAAS KM4D Systems development • SAAS KM4D Content development • SAAS KM4D Capacity development (Online learning, toolkit development, continuous knowledge sharing)
Activity 3. Develop a regional portal/hub as repository of information including innovative practices from APIRAS sister networks, along with a knowledge management strategy	

3.1 Development of knowledge management strategy 3.2 Region-wide AAS events (including KM4D workshops) 3.3 Implementation of Knowledge Management strategy 3.4 Elaboration of best-fit approaches (KM4D content development)	
Activity 4. Policy engagement in high level policy dialogues at national and regional levels.	
4.1 Hold policy dialogues and national and regional levels as part of long term process	• Online CoP support

KM4D FRAMEWORK

Basic Construct

This section presents a KM4D Framework that provides the bases for networking, systems design, content specifications and capacities development. The framework introduces an agricultural advisory delivery model based on Kim's science of delivery (SOD).

Kim (2014) contends that a deep understanding of delivery is essential in development work. Elaborating on this view, *demand-driven* knowledge products and services are not enough to bring about a desired result among smallholder farmers in Asia and the Pacific. First of all, smallholder farmers and producers may not know exactly what they need and cannot be in a position to seek it or demand for it. Secondly, there must also be effective delivery to be useful at the local level where development results are produced. Kim believes that inconsistencies in development results may be attributable to *lapses in delivery*.

Thus, our KM4D framework includes the four dimensions of SOD (Kim, 2014):

1. Support for frontline implementation by collecting *local experience* and *feeding that knowledge back* into practice through agricultural advisory services.

2. Increased capacity for advisory delivery skills based on the experience of the most successful practitioners.
3. Built in research to spur innovation and evaluate new interventions as well as agricultural advisory services.
4. Construction of an analytical model that can help explain and adapt successful approaches to solving agricultural advisory delivery problems.

This agricultural advisory delivery model can serve as the basis for an innovative extension or knowledge sharing protocol where local knowledge and operational knowledge supplement technical knowledge. If proved sound, the SAAS agricultural advisory delivery model may be emulated by the agricultural extension community in Asia and the Pacific.

Elements

Translating the four dimensions of SOD into four elements that may be situated within the model, we arrive at the following: Local Knowledge; Research-Based Innovation; Advisory Skills and Technique Sharing; and Delivery Systems Framework. Local knowledge refers to indigenous or homegrown knowledge on the innovation that the agency is introducing. Research-based innovation refers to technology that conventionally functions as the content of agricultural advisory services. Delivery systems sharing refer to the sharing of tacit knowledge among agricultural advisers on how innovation is best shared given field conditions that they are fully exposed to but may not be generally known by their agency colleagues. Finally, delivery systems framework refers to the specific agricultural advisory delivery model that informs, explains and operationalizes the country level approach. To reiterate, these four elements roughly correspond to the four dimensions of SOD (Kim, 2014).

We can juxtapose these four elements into an agricultural advisory delivery model framed into quadrants. The quadrants on the left hand side deal with the *agricultural innovation or advice*.

In KM4D terms, this would be the content. The quadrants on the right hand side refer to the *advisory service*. In KM4D term, this corresponds to the delivery system.

The quadrants on top are *conceptual* constructs. The quadrants on the bottom are constructs dealing with *practice*.

We may situate the delivery systems framework element in Quadrant I, which treats the concept of delivery systems at the conceptual level. The agricultural innovation element is logically situated in Quadrant II since it deals with agricultural innovation or advice at the conceptual level. The local knowledge element may be situated in Quadrant III since it deals with agricultural innovation or advice at the practical level. The delivery systems sharing element is situated in Quadrant IV since it treats delivery systems at the practical level.

Agriculture Advisory Services Delivery Model

Conceptual-Operational Model. Found below is the agricultural advisory services delivery model that we are proposing for the SAAS, in general, and the Asia Pacific Region, in particular. The model submits that effective agricultural advisory services delivery requires that:

1. Research-based innovation or technology should be informed by local or indigenous knowledge, thus the plus sign that combines both vertically;
2. The network model that informs and explains the delivery strategy adopted by the service should be studied and shared within the service, particularly the tacit knowledge gained by the more experienced, thus the plus sign that adds the two vertically; and
3. Innovation should be combined with the delivery system, thus the plus sign that adds the two constructs horizontally.

Delivery will not be effective if any one of these elements is missing. A delivery system not guided by a framework is

tentative, fluid and ineffectual. The absence of tacit knowledge shared on the delivery system robs the deliverer of any conviction on his/her strategy. Furthermore, if local knowledge is taken out of the model then the agricultural advice may not be adopted as recommended since it may not be appropriate under local conditions. It goes without saying that the innovation/ technology should be research-based.

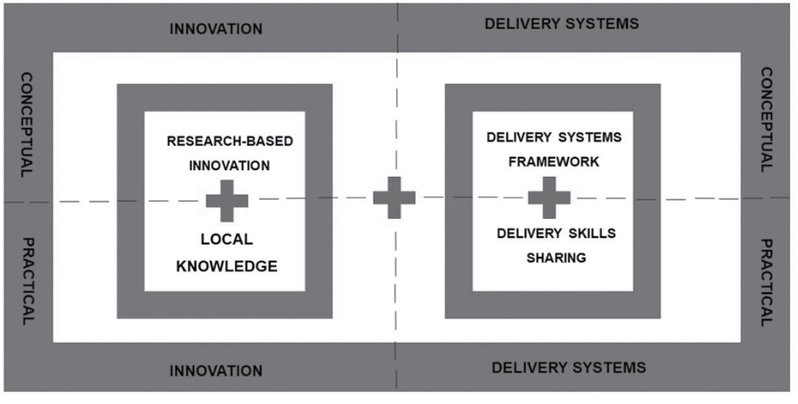

FIGURE 10-1. Agricultural Advisory Services Delivery Model

In short, our KM4D framework proposes a deliberate and calculated strategy of providing agricultural advisory services wherein research based innovation and/or technology is combined with local/homegrown knowledge employing a network-based agricultural advisory services delivery mechanism guided by a systems framework and informed by tacit knowledge sharing within the extension service.

KM4D Instrument. The proposed delivery model may guide the provision of agricultural advisory services using a simple KM4D instrument that resembles a window with four panes. The left hand panes represent the innovation/technology. The right hand panes stand for the delivery system. Neither innovation nor delivery can be neglected in the provision of advisory services.

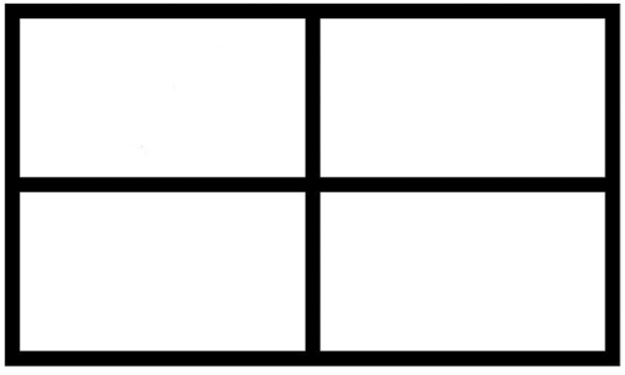

FIGURE 10-2a. KM4D Instrument Frame

The upper left hand pane represents research-based innovation or technology representing the content of the advice. This pane is checked to signify the existence of this innovation or technology.

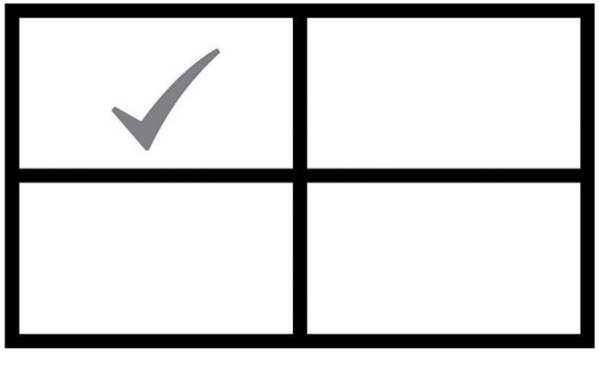

FIGURE 10-2b. KM4D Instrument with Checked Quadrant

The lower left hand pane represents local or indigenous knowledge. A check is placed in the box if the innovation or technology is informed by local or indigenous knowledge.

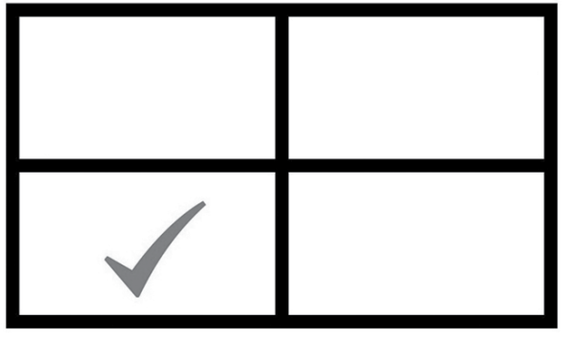

FIGURE 10-2c. KM4D Instrument with Checked Quadrant

The upper right hand pane represents the country-level delivery framework adopted. The deliberate and calculated delivery strategy is determined by this element. If such a framework guides the intervention, then the box is checked.

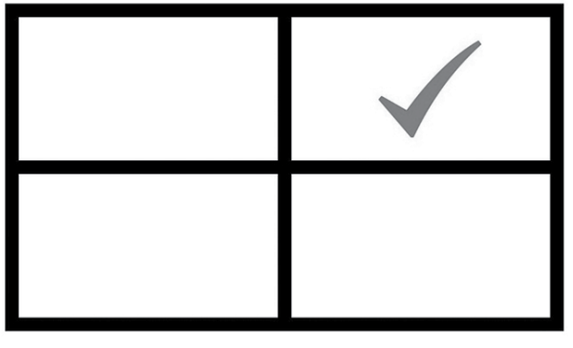

FIGURE 10-2d. KM4D Instrument with Checked Quadrant

Finally, the lower right hand box is where the sharing of tacit advisory services knowledge is situated. If sharing of knowledge on delivery occurs within the development project or agency, then the box is checked.

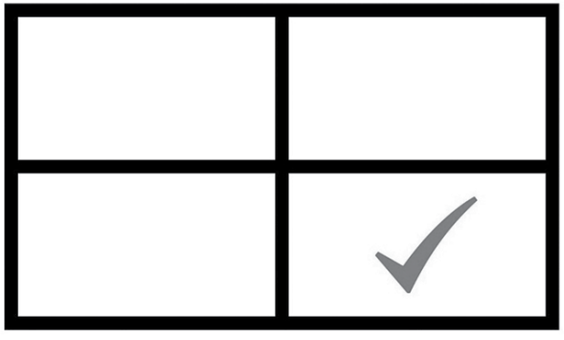

FIGURE 10-2e. KM4D Instrument with Checked Quadrant

Thus, in the agricultural sector, an extension activity should be assessed using this tool or instrument. Once all the panes are checked, there is a high probability that the intervention will succeed and the agricultural advice adopted.

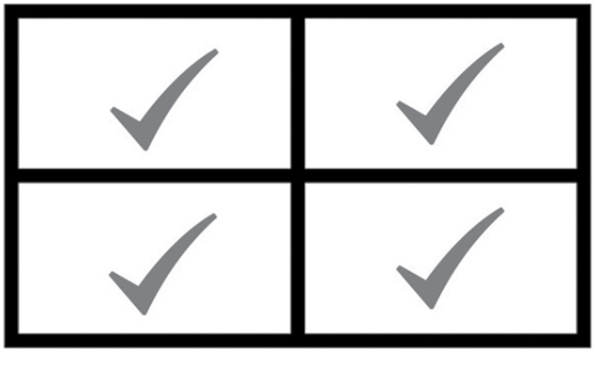

FIGURE 10-2f. KM4D Instrument Compliant with Agricultural Advisory Services Delivery Model

First, it will support adoption by collecting local experience and feeding that knowledge back into practice. Second, it will teach delivery skills based on the experience of the most successful practitioners. Third, it will incorporate prospective research to

spur innovation and evaluate new interventions. Fourth, it will develop theoretical and analytical frameworks that can help explain and adapt successful approaches to solving delivery problems (Kim, 2014).

KM4D STRATEGY COMPONENTS

The components of the proposed strategy are: the SAAS KM4D Vision Statement; the SAAS KM4D Mission Statement; the SAAS KM4D Goal Statement, including internal and external knowledge management objectives; strategic thrusts; and requirements.

Vision Statement

Envisioning improved, effective and demand driven agricultural advisory services for smallholder farmers made possible through technology-enabled delivery, sharing and reuse of agricultural knowledge (innovations, local and indigenous; explicit and tacit) and knowledge products.

Mission Statement

*Empowering poor smallholder farmers and producer organizations in the Asia Pacific Region through improved, effective delivery and technology-enabled access to agricultural advisory service*s.

Goal Statement

Poor smallholder farmers and producer organizations in the Asia Pacific Region will have access to effective and demand driven agricultural advisory services by Year 2022.

Objectives. The KM objectives of the strategy and, to wit, the KM4D system are:

- To strengthen rural advisory services networks, institutions, policy and practices;

- To capture best practice and lessons learned on agricultural advisory services delivery;
- To support policy dialogue and other concerns related to the effective implementation of agricultural advisory services;
- To document related services/events on agricultural advisory services delivery in the Asia and Pacific Islands region for sharing with farmer leaders, policy makers and other stakeholders;
- To address APIRAS capacity development needs through online learning, toolkit provision and internal knowledge sharing and reuse; and
- To produce, collect, further develop and strengthen knowledge products for sharing and reuse by intermediaries, agriculture sector champions, policy makers and other stakeholders.

Strategic Thrusts

The KM4D strategy shall adopt three thrusts: *networking*; *systems development*; *content development*; and *capacity development*.

Networking. The regional, sub-regional, and country networks/nodes will be strengthened through network resources sharing, engagement in policy dialogue and exchanges of best practice and lessons learned.

Systems Development. The proposed system will address both internal and external SAAS knowledge management needs. Its specific strategies are three pronged: *service orientation/evolutionary prototyping*; *knowledge resources auditing*; and *scaling up*.

Considering the availability of operational legacy systems among project partners, stakeholders and service communities, the KM4D infrastructure development strategy shall employ service-oriented architecture (SOA). Legacy resources including possible network hubs will be identified through knowledge audit benchmarking.

Internal to SAAS, the system will employ internal databases for project management purposes. For internal messaging and collaboration, Google Suite is recommended. Since the project is location-specific, a geospatial system may also be availed of. The proprietary de facto standard is ArcView GIS. But the project may opt for the Windows compliant Manifold GIS or the open source Quantum GIS. For capacity development support, the Moodle Learning Management System is recommended.

External KM for SAAS will be agile and robust enough to accommodate legacy systems that go beyond direct project stakeholders. Agricultural advisory service providers that are not yet part to the project, intermediaries, NGOs, smallholder farmers, indigenous communities and producers' organizations are both sources and users of agricultural knowledge and are operating legacy systems that may potentially become nodes in the knowledge network. Cloud subscription will be necessary with client server computing for back-up and archiving. The following platforms are thus recommended: a metadata base compliant with the Dublin Core Metadata Standard (DCMS); a content management system (CMS) for documents, maps and multimedia knowledge products; YouTube for video sharing; and Google Suite for messaging and collaboration. The latter, in particular, may be tapped for CoP discussion boards and AgriWikis for best fit practices.

Content Development. Initially, a knowledge audit among the participating agencies in Bangladesh, Philippines and Fiji will be conducted to arrive at a gap analysis of agricultural advisory services knowledge. This will lead to an inventory of knowledge resources among the participating agencies eventually scaling up to the Region involving other agricultural advisory service providers as well.

A metadata system for knowledge resources already contained in other systems will be introduced in keeping with the service orientation strategy.

Fugitive and future content will be captured. Additional knowledge products will be designed, development and produced.

Capacity Development. To supplement capacity development activities of SAAS, an online learning platform will be built into the KM4D system. An Agricultural Advisory Services Toolkit will be compiled. Continuous engagement of project stakeholders will be operationalized via online CoPs

KM4D StratFrame

The KM4D strategy's components may be consolidated into a coherent whole by the strategic framework (StratFrame) embodied in the following matrix:

Table 10-2. KM4D StratFrame

VISION STATEMENT	Envisioning improved, effective and demand driven agricultural advisory services for smallholder farmers made possible through technology-enabled delivery, sharing and reuse of agricultural knowledge (innovations, local and indigenous; explicit and tacit) and knowledge products
MISSION STATEMENT	Empowering poor smallholder farmers and producer organizations in the Asia Pacific Region through improved, effective delivery and technology-enabled access to agricultural advisory services
GOAL STATEMENT	Poor smallholder farmers and producer organizations in the Asia Pacific Region will have access to effective and demand driven agricultural advisory services by Year 2022

OBJECTIVES	• to strengthen rural advisory services networks, institutions, policy and practices in APR • to capture best practice and lessons learned on agricultural advisory services delivery • to support policy dialogue and other concerns related to the effective implementation of agricultural advisory services • to document related services/events on agricultural advisory services delivery in the Asia and Pacific Islands region for sharing with farmer leaders, policy makers and other stakeholders • to address APIRAS capacity development needs through online learning, toolkit provision and internal knowledge sharing and reuse • to produce, collect, further develop and strengthen knowledge products for sharing and reuse by intermediaries, agriculture sector champions, policy makers and other stakeholders.	
STRATEGIC THRUSTS	**Networking**	Sharing of network resources at the regional, sub-regional and country levels; Engagement in policy dialogue; best practice/ lessons learned exchanges
	Systems Development	Knowledge audit-based benchmarking/ Scaling Up/ Service oriented architecture/ Evolutionary prototyping
	Content Development	Knowledge audit-based benchmarking/ Metadata System/ Knowledge Capture Component/ Knowledge Products Design, Development and Production
	Capacity Development	Online learning; Toolkit provision; Continuous engagement through online CoPs

Requirements

The following are indicative hardware, software and content requirements for the implementation of the proposed KM4D strategy:

Table 10-3. Indicative System Requirements

REQUIREMENTS	INTERNAL KM	EXTERNAL KM
Infrastructure hardware/ services	Internal client server	Cloud subscription External client server (back up/ archiving)
Platforms	Messaging and Collaboration (Google Suite) Learning Management System (MOODLE) GIS (ArcView)	Service Orientation (Visual Studio, SQL-XML) Messaging and Collaboration (Google Suite) Content Management System (Joomla) Video Sharing (YouTube)
Content	Internal databases AgriWiki CoPs	Metadata Multimedia Knowledge Products CoPs

STRATEGIC PLAN

The activities and milestones for the SAAS KM4D strategy are enumerated below.

1. Project Start Up (Milestone)
2. Knowledge Inventory
   2.1. Country Level Knowledge Audit
   2.2. Regional Knowledge Audit Workshop (Milestone)
   2.3. Finalize Country KM Operational Plans
   2.4. Finalize Regional Operational Plan
3. Networking
   3.1. Establish APIRAS KM TWG
   3.2. Configure APIRAS KM Network
   3.3. Identify KM focal person per network node (regional/sub-regional/country)
   3.4. Identify network-wide knowledge resources sharing protocol
   3.5. Engage in regional/sub-regional/country policy dialogues
4. Systems Design and Development
   4.1. Draft Country Service Oriented Architecture Designs
   4.2. Regional Design
   4.3. Hardware/software procurement
   4.4. System Development and Testing
   4.5. System Roll-Out (Milestone)
5. Content Development
   5.1. Multimedia knowledge products
   5.2. Videos/ Learning Modules
   5.3. AgriWikis/ CoPs
6. Capacity Development
   6.1. Training on Knowledge Management
   6.2. Develop online learning programs
7. Toolkit Development
   7.1. Design and Develop KM4SF toolkit
   7.2. Test and finalize toolkit
   7.3. Roll out KM toolkits (Milestone)
8. Monitoring and Evaluation
9. Scaling Up

EPILOGUE:
Towards a Global K-Net

Three trends are aggressively manifesting themselves within the developing world amidst this age of information and communication technology (ICT). Firstly, globalization has become a primary agenda among development agencies. Secondly, networks are becoming the most dominant organizational structure among development institutions. Finally, knowledge is becoming the most critical resource in developing economies. Establishing a *Global Knowledge Network or Global K-Net* is now providing the logical closure for these trends, the long-term goal being the evolution of a so-called "world brain." Such a global network links up the knowledge base of research and development agencies all over the world.

Employing Bill Gates' "digital nervous system" metaphor, a world brain requires an infrastructure in the same manner as an ordinary brain requires a network of neurons to function. The World Wide Web has become the *de facto* backbone of this infrastructure. However, the immense differences in bandwidth and interconnectivity among regions and countries within regions have so far prevented the formation of such a Global K-Net. Interventions should be made to effectively bridge this Digital Divide through the appropriate technology. Furthermore, the interconnectivity of this network should be assured.

National knowledge networks are slowly but surely becoming a reality, with individual nations investing heavily into IT infrastructure development and the identification of common platforms and standards among national research institutions. This is a welcome development on one hand. On the other, some futurists are alarmed by its implications. Based on generally observed network behavior, these systems will link up with one another sooner or later to form systems of a higher level of

complexity. Thus, national knowledge networks will link-up with one another to form sub-regional (e.g., South Asian, East Asian, Central Asian, etc.) knowledge networks. Sub-regional knowledge networks will join together to form regional (e.g., Asian, North American, European, African, etc.) knowledge networks that in turn combine to form the Global K-Net. Due to the lack of *de facto* standards, however, the development of national information systems and knowledge networks independent from other national systems and networks may soon pose problems of compatibility and interconnectivity.

This paper describes a super-project that establishes the infrastructure for Southeast Asian sub-regional knowledge networks. While still employing the World Wide Web backbone, it will make use of broadband and wireless technologies for connecting research and development institutions from the ten Southeast Asian countries, i.e., Brunei Darussalam, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Singapore, Thailand, and Vietnam. Furthermore, it shall identify the most appropriate standards and platforms for knowledge exchange and sharing.

Objectives. The objectives of the super project are:

1. To design and develop the infrastructure for a Southeast Asian Knowledge Network that may serve as a template infrastructure for other sub-regions in Asia and the Pacific;

2. To establish and operationalize this knowledge network by linking research and development institutions in Southeast Asia through a complete intranet system within specified knowledge domains; and

3. To identify appropriate platforms, standards and protocols for the K-Net and to ensure their compliance among the participating nodes.

Mechanics. A template infrastructure for a sub-regional Knowledge Network will be designed and developed. This infrastructure will cover hardware, software and middleware requirements. Although it may be applicable to any specific knowledge domain, this project will concentrate on the highest priority domain in the region, which at the moment is food security. Hence, it will be a knowledge network designed and developed for the Southeast Asian Forum for Agricultural Research (SEAFAR), the sub-regional node for the Global Forum for Agricultural Research (GFAR) based in Rome. It will be an alternative to the exclusive international agricultural research centers network, CGNET. It will establish domain specific agricultural knowledge bases in the national agricultural research centers (NARC) and link these up electronically as complete intranet systems using broadband and wireless technology. The network is tentatively being called the SEAFAR KNet. The Secretariat of SEAFAR, the SEAMEO Regional Center for Graduate Study and Research in Agriculture or SEARCA, will manage it.

Although institutional arrangements are yet to be firmed up between GFAR and SEARCA, it is anticipated that the project will commence in 2005 with a number of feasibility studies and project preparatory designs. This will be followed by the development of the KNet infrastructure, inclusive of its hardware, software, middleware and connectivity specifications. The use of broadband and wireless is expected to enable countries such as Laos, Cambodia, Vietnam, and Myanmar to leapfrog ICT development bypassing cable requirements. The construction of appropriate facilities and the installation of the equipment will follow the design process, which would entail a series of consultative meetings with the NARCs based in the ten countries. Standards, platforms and protocols will have to be identified by consensus.

Additionally, the super project will have a content development component that will likewise be designed through a consultative

process. This will be supplemented by a capacity building component for the NARCs, SEAFAR and SEARCA staff.

Appropriate templates for the content will be designed. A mechanism for the electronic capture, storage, sharing and re-use of lessons learned, best practice, models and methodologies generated by the NARCs will be instituted as an aid to policy formulation for the governments concerned. Employing the knowledge management approach, traditional databases with knowledge bases on specific agricultural research and development domains. These shall contain documented knowledge as well as electronically captured tacit knowledge. Additionally, Southeast Asian experts (known in KM parlance as *communities of practice*) in these knowledge domains may also be tapped through the KNet.

Given the rapid advancements and obsolescence of information and communication technology, the super project should develop a Knowledge Management System that would not be obsolete in a couple of years. It should be a system that is an integral part of the Southeast Asian Agricultural R&D supra system that grows and adapts with it. Hence, this project should adopt a *modular evolutionary prototyping* approach.

DESIGN AND CONSTRUCTION HIGHLIGHTS

The SEAMEO Regional Center for Graduate Study and Research in Agriculture has entered into a Memorandum of Agreement with Sun Microsystems Philippines for the infrastructure design of the SEAFAR KNet. This generic design template may be employed in any knowledge domain covered by national research institutions in the countries within the sub-region.

The infrastructure will cover the entire Southeast Asian sub-region using a broadband and wireless platform. This would entail the construction of appropriate facilities in the ten Southeast Asian countries as well as the installation of the requisite hardware,

software, and middleware. Much of the cost of this super project will go into the infrastructure, which may require the use of transponders in commercial satellites.

MANAGEMENT OR SPONSORING GROUPS

SEAFAR. The Southeast Asian Forum for Agricultural Research (SEAFAR) is the planned sub-regional node for Southeast Asia of the Global Forum (GFAR) for Agricultural Research, an association of international and regional organizations involved in agricultural research and development. GFAR is based in Rome and is closely associated with the United Nations Food and Agriculture Organization (FAO) and the Consultative Group for International Agricultural Research (CGIAR).

SEARCA. The SEAMEO Regional Center for Graduate Study and Research in Agriculture (SEARCA) is first of seven regional centers established by the Southeast Asian Ministers of Education Organization (SEAMEO), an intergovernmental treaty organization formed in 1965 to facilitate informational, educational and cultural exchange programs within Southeast Asia. Ten countries are represented in SEAMEO.

ECONOMIC DEVELOPMENT IMPACT

The sharing and re-use of agricultural knowledge among the ten Southeast Asian nations is expected to:

1. Improve food production and post-production efficiency by US$ 60 million annually;
2. Generate new knowledge assets worth US$ 70 Million annually;
3. Lead to new national and sub-regional economic transactions at the volume of US$ 80 million annually;
4. Result in R&D savings at the tune of US$12 million annually;
5. Produce spillover effects in other sectors (education, information and communication technology) worth US$ 40 million annually;

6. Improve national and local governance through sounder policy formulation;
7. Improve relations within the Southeast Asian sub-region; and
8. Reduce poverty in the Southeast Asian sub-region (as well as other concomitant conditions such as crime, child labor, and corruption) by twenty percent through the improvement of social protection mechanisms.

The higher order impacts of this project are not limited to the above. The development of a sub-regional knowledge network infrastructure may eventually serve as the basis for knowledge networks in other sub-regions. These may link up to form regional KNets and, at a higher level of complexity, a Global KNet. This super project may just serve as the catalyst for the evolution of the world brain.

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APPENDIX A

FREQUENTLY ASKED QUESTIONS ON KM AND KM4D

How does one differentiate data from information and information from knowledge? Data are empirical observations recorded in units. Data may be quantitative, using interval values or qualitative, using nominal, binomial or ordinal values.

Information refers to a signal from a source to a receiver. It is processed data that represents a negative uncertainty. Information is measured in bits (binary digit). One bit is equivalent to one-unit negative uncertainty.

Knowledge is information processed by the human mind. It is generated when information on objects (concrete or abstract) become mental subjects. Knowledge is generated or collectively constructed.

What is knowledge management? Knowledge management is a newly emerging management discipline that treats intellectual capital as an asset (Microsoft, 1999)

What are the types of capital? There are four types of capital: financial capital; physical capital; social capital; and intellectual capital.

Financial capital is wealth in the form of money used/accumulated in a venture. Physical capital is remaining non-monetary assets of an organization after all liabilities. Social capital is the cumulative capacity of social groups to work together to achieve a goal. Intellectual capital is the sum of individual talents, recorded knowledge, tacit knowledge and institutional memory within an organization.

Why KM? Knowledge management has three rationales: economic; technological; and social.

The economic argument for knowledge management states that intellectual capital is an organizational asset that should be managed. One of the so-called fathers of KM, Lawrence Prussak was quoted as saying. “Knowledge Management is expensive, but so is stupidity.”

The technological argument claims that the environment is ripe for knowledge management. Technology has enabled knowledge management solutions.

The social argument for knowledge management forwards that collective knowledge should be purposively and efficiently used to solve societal problems

What are the prerequisites of KM? There are three prerequisites for knowledge management: hardware and software or technology for knowledge capture, storage and retrieval, sharing and reuse; knowledge processes; and a conducive organizational environment for knowledge sharing and reuse.

What is the goal of KM? The goal of KM is knowledge sharing and reuse. Knowledge generation or construction is not the goal of KM but of research.

How did KM come about? There is reason to believe that the current discourse on KM has originated from a group of pre-World War II Austrian-born academics. This school of thought, known as knowledge economics, developed in the 30’s as a branch of Friedman’s liberal economics. Its luminaries were Hayek (1936) and Schumpeter (1912, 1942). The tradition situated knowledge as a major economic variable but was overshadowed by the Keynesian school in the forties. It was resurrected in the seventies by Porat albeit under a new brand, information economics. He argued that information has become the dominant commodity and the most critical resource in contemporary societies. It was Porat and his senior collaborator Fritz Machlup who introduced the Agricultural-Industrial-Information Age(s) trichotomy as

well as the concept of the *information society*.[12] It may be said that information economics theorizing branched out from the traditional labor economics school of thought. However, instead of the conventional agricultural- industrial-services sectors, Machlup and Porat proposed a slightly different classification: the agricultural-industrial-information sectors. Nevertheless, it adopted similar approaches, methods and analyses.

Then in the mid-nineties, Nonaka and Takeuchi (1995) published their seminal work on knowledge creating companies in Japan followed by several papers on knowledge management by Davenport and Prussak (1998). In 1996, the World Bank established its Knowledge Management Program under Stephen Denning. In Asia, research and development organizations such as SEAMEO-SEARCA followed suit. Soon, knowledge management for development (KM4D) programs were being established by regional and international development agencies claiming that knowledge can become the great equalizer among developing societies.

Why KM4D? Knowledge management has always been regarded as a tool for the private sector and the corporate world. This same tool should be applied to the public sector, i.e., governance, international development assistance agencies and development projects as well. As such, it is called knowledge management for development or KM4D.

Development assistance is by nature a knowledge enterprise. This sector is strategic in the global knowledge economy. It sets the directions and the agenda. In the arena of global competition, it occupies the high end. Development assistance accounts for a substantial portion of the global knowledge economy. It is interventionist in approach and, thus, responds proactively to economic forces.

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[12] *Defined as a society whose economy is information based, i.e. the majority of its workforce is made up of information workers or the greater part of its GNP may be attributed to information products, services and labor (Porat, 1978).*

Development is infinitely more complicated than business and, hence, would require more knowledge resources. KM4D globalizes the flattening of the learning curve and makes strategic use of scarce resources allotted to development assistance.

How did KM4D begin in Asia? The SEAMEO Regional Center for Graduate Study and Research in Agriculture or SEARCA was established in Los Baños in 1966. Its first Director harbored a vision to make SEARCA the center for documentation of agricultural sciences in Southeast Asia. This vision eventually came to pass with the Information Resources Development Program (IRDP), which eventually transformed into the SEARCA Knowledge Management Program.

In the case of SEARCA, state of the art knowledge on the thematic areas under agricultural development and natural resources management could be digitally "captured" from within the ranks of its collective organizational expertise. This knowledge base is made available to its knowledge workers and its partners and brought to bear upon the multitude of sustainable agriculture problems that occasionally confront the Southeast Asian region.

What is the significance of KM4D important to the field at large? In spite of global technological advances, people still die of hunger, disease, war, crime, environmental disasters and ignorance every day. Our collective knowledge should be brought to bear on these societal problems.

What are the benefits of KM4D to its community of users? KM4D enables development workers, agencies and governments to harness intellectual capital or knowledge resources to solve the most pressing societal problems.

What are the future directions of KM4D? The Sustainable Development Goals were launched in September 2015. These goals have effectively set the global development targets from 2015 to 2030. KM4D research should be focusing on how knowledge management may contribute to the attainment of these goals.

APPENDIX B

CONCEPT NOTES

WORKSHOP CONCEPT NOTE

TITLE: Consultative Workshop on Agriculture and Fisheries Information and Knowledge Management Sub-Sector Development

PROPONENTS: Department of Agriculture – Bureau of Agricultural Research
SEAMEO Regional Center for Graduate Study and Research in Agriculture

BACKGROUND:

The state of agricultural research in the Philippines has greatly improved in the past two decades. This improvement is due to revitalized programs, increased government investments in R&D, networking and consortium building at the local, national and regional levels, and research capacity development in provincial state universities and colleges. Improved capacities for agriculture and fisheries research have generated new knowledge and technologies across sub-sectors. However, these newly generated knowledge assets have not been adequately managed in terms of knowledge capture, sharing and reuse. In other words, the agricultural and fisheries' information and knowledge management (IKM) sub-sector has not kept up with its research counterpart.

Research findings have not been fully utilized. This may have been a function of packaging and promotion. Increased capacities in knowledge generation must be accompanied by strengthened capabilities in knowledge sharing, reuse and knowledge products design and development.

Along this line, a proposal was submitted by the Southeast Asian Regional Center for Graduate Study and Research in Agriculture (SEARCA) for the design and development of a capacity development program on information and knowledge management (IKM) in October 2011. The proposal focuses on knowledge capture, knowledge products design and knowledge sharing for the Philippine agricultural and fisheries sub-sector. It was subsequently approved; the resulting project renamed Capacity Development Program on Information and Knowledge Management. The project will be implemented from January to December 2012.

RATIONALE:

The design of a Capacity Development Program on IKM should be based on a Strategic Plan for IKM. On the other hand, a strategic plan must be based upon a strategic framework. SEARCA adopts a participatory approach in capacity development program planning. Hence, it intends to involve agricultural and fisheries information and knowledge management stakeholders, otherwise known as the IKM community of practice (CoP), in the vetting of a proposed strategic framework and the design of a strategic plan for IKM.

However, members of the agriculture and fisheries IKM CoP come from diverse academic and technical backgrounds, spanning agriculture to fisheries science, communication to research. Furthermore, they have had different conceptual and practical exposure to information and knowledge management.

Before the vetting of the strategic framework and the design of the strategic plan can be effectively undertaken, there is a need to level off on information and knowledge management: the concept, the practice and its application to agriculture and fisheries research. The IKM CoP should be "on the same page," so to speak. It is essential that they have an adequate and accurate appreciation of IKM, how it evolved as an area

of practice, what its underlying assumptions are, and how it is applicable to the agricultural and fisheries sector.

As a final input to the capacity development program planning process, the informal, nonformal and formal training requirements of the stakeholders should be identified vis a vis the IKM sub-sector's strategic plan. Such training needs will become the bases of the capacity development program.

To address the above needs, a series of three consultative workshops is being planned for implementation in March 2012 covering the three island clusters. This concept note outlines the rationale, objectives and mechanics of the consultative workshops. A levelling off session should form part and parcel of the workshop program providing an opportunity for the stakeholders to be "on the same page" while serving as a venue to answer the most frequently asked questions (FAQs) on IKM.

OBJECTIVES:

After the workshop, the participants should be able:

1. To agree on a conceptual definition of and an approach to IKM that could apply to the agriculture and fisheries sector;
2. To validate proposed elements of an IKM Strategic Framework for the agriculture and fisheries sector;
3. To contribute to the crafting of an IKM Strategic Plan for the agriculture and fisheries sector; and
4. To share their formal, nonformal and informal IKM training requirements with the workshop facilitators.

MECHANICS:

Participants. Workshop participants will be composed of agriculture and fisheries IKM stakeholder representatives: DA BAR Technical (research management, communication,

information science and information technology) Staff; agricultural librarians; Public Information Officers/ RPIOs Staff; and NARDSAF member agencies or institutions. Participants will be grouped according to island clusters: Luzon, Visayas and Mindanao.

Dates and venues. The workshops (inclusive of travel time) are tentatively scheduled on the following dates in venues mutually agreeable to DA-BAR and SEARCA.

Luzon Cluster 5–7 March 2012
Visayas Cluster 19-21 March 2012
Mindanao Cluster 26-28 March 2012

FAORAP BENCHMARKING CONCEPT NOTE

TITLE: Institutional Visit to FAORAP by Senior Officers of the Bureau of Agricultural Research, Department of Agriculture. Republic of the Philippines

RATIONALE:

In the past two decades, the state of agricultural research in the Philippines has greatly improved due to revitalized programs, increased government investments in R&D, networking and consortium building at the local, national and regional levels, and research capacity development in regional and provincial state colleges and universities. Improved capacities have generated new knowledge on agricultural and fisheries technologies across sub-sectors and commodities. However, these newly generated knowledge assets have not been adequately managed in terms of knowledge capture, sharing and reuse. Research findings have not been fully utilized. Increased capabilities in knowledge generation must be accompanied by strengthened capacities in knowledge sharing and knowledge products design and development.

How can the Philippine agricultural research community develop its capacity on information and knowledge management (IKM)? What can it learn from its counterparts abroad? What opportunities for IKM capacity building are currently available?

This concept note proposes an institutional visit to FAORAP Bangkok by senior officers of the Bureau of Agricultural Research, Department of Agriculture (DA BAR) as part of its environmental scanning of possible opportunities and providers of agriculture and fisheries IKM capacity building programs. The visit will input into the design of a capacity development program on IKM that focuses on knowledge capture, knowledge products design and

knowledge sharing for the Philippine agricultural research sector.

OBJECTIVES:

1. To implement agricultural and fisheries IKM benchmarking visits of DA BAR technical staff to FAORAP and other agencies in Bangkok for capacity building program planning purposes.
2. To scan for possible opportunities and training providers of agriculture and fisheries IKM capacity building programs.

MECHANICS

Areas of Interest. The institutional visit will focus on agriculture and fisheries information and knowledge management best practice and lessons learned as compiled by the Asian eAgriculture community. Possible training opportunities, training providers as well as internship arrangements with FAO and its partners will likewise be discussed.

Participants. The participants of the institutional visit are: Ms. Zuellen Reynoso, Applied Communications Division, Bureau of Agricultural Research, Department of Agriculture; and Ms. Anna Marie Gumapac, Applied Communications Division, DA-BAR; and Ms. Kristine Villagarcia, Project Development Division, SEAMEO SEARCA.

Venue. The participants will visit: the FAORAP and its IKM partner agencies in Bangkok.

Inclusive Dates. Tentatively, 20 to 21 August 2012.

Costs. Costs attendant to the institutional visit will be borne by DA BAR through SEAMEO SEARCA.

NATIONAL CONFERENCE CONCEPT NOTE

BACKGROUNDER

From March to June 2012, DA BAR and SEAMEO SEARCA conducted a series of consultative workshops on agriculture and fisheries information and knowledge management (IKM). Participants were composed of agriculture and fisheries IKM stakeholder representatives: DA BAR technical (research management, communication, information science and information technology) staff; agricultural librarians; Public Information Officers/ RPIOs Staff; and NARDSAF member agencies. The workshops were convened: to arrive at a conceptual definition of and an approach to IKM that could apply to the agriculture and fisheries sector; to validate proposed elements of an IKM Strategic Framework for the agriculture and fisheries sector; to contribute to the crafting of an IKM Strategic Plan for the agriculture and fisheries sector; and to identify formal, nonformal and informal IKM training requirements of the participants.

Since then, an IKM Strategic Plan has been designed and developed by SEARCA. The Plan was subjected to an online validation process utilizing SEARCA's knowledge management platform, KC3. Additionally, IKM officials and staff of DA BAR have conducted benchmarking visits to knowledge management divisions and programs in Singapore, Bangkok, Penang, Brisbane, Sydney and Rome. Based on the results of the online validation and the benchmarking visits, the Strategic Plan was finalized and can now become the basis for the crafting of a Capacity Development Program on IKM for the agriculture and fisheries R&D community.

RATIONALE

The design and development of any capacity development program requires stakeholder participation if only to establish

program ownership. This particular activity is no exception. SEARCA is drafting a Capacity Development Program on IKM for the agricultural and fisheries R&D community based on the IKM Strategic Plan. However, its finalization must involve agricultural and fisheries information and knowledge management stakeholders, otherwise known as the IKM community of practice (CoP).

This concept note outlines the rationale, objectives and mechanics of a National Conference on Agricultural and Fisheries IKM Capacity Development. It addresses the need for strengthened capabilities in knowledge sharing, reuse and knowledge products design and development that should accompany the current capacities in knowledge generation now possessed by the agriculture and fisheries R&D community.

OBJECTIVES

The objectives of the national conference may be classified under activity, output and learning objectives;

Activity Objective. The objectives of the national conference are to convene the agricultural and fisheries R&D community:

1. to draft the terms of reference of information and knowledge management staff;
2. to propose information and knowledge management staffing policies; and
3. to validate, input into and finalize a capacity development program on information and knowledge management.

Output Objectives. The outputs of the national conference are:

1. draft terms of reference of information and knowledge management staff;
2. draft IK staffing policies; and
3. a comprehensive capacity development program on agriculture and fisheries IKM

***Learning Objectives*.** At the end of the workshop, the participants should be able to:

1. agree on the terms of reference of IKM staff;
2. advocate or champion proposed IKM staffing policies; and
3. recall the formal, nonformal and informal components of the capacity development program on agriculture and fisheries IKM.

MECHANICS

A. Venue and Inclusive Dates

The workshop will be held at an appropriate venue in Tagaytay City from 6 to 8 February 2013.

B. Participants

Conference participants will include all attendees of the island cluster consultative workshops conducted from March to June 2012 and other appropriate information and knowledge management staff of the National Research and Development System for Agriculture and Fisheries (NaRDSAF).

C. Facilitation

Logistical arrangements and workshop facilitation will be done by SEARCA ProDev and DA-BAR. Resource persons from the academe will be invited. The main resource person will be Dr. Alexander G. Flor, Professor of Information and Communication Studies, UP Open University and SEARCA KM consultant cum Team Leader.

D. Program

The following program for the national conference is proposed:

DAY 1 Thursday, 6 February 2013

08:00 - 11:00	Travel Time from Manila
11:00 – 12:00	Registration
12:00 – 13:30	Opening Program and Lunch
13:30 – 14:00	Conference Overview
14:00 – 15:00	Presentation of the IKM Strategic Plan
15:00 – 15:30	Open Forum and Snacks
15:30 – 16:30	*Workshop 1*. Drafting the IKM Staff Terms of Reference
16;30 – 17:00	Plenary Presentations
17:00 – 19:00	Free Time
19:00 – 22:00	Dinner and Socials

DAY 2. Friday, 7 February 2013

08;30 – 09:00	Review of Day 1
09:00 – 10:00	*Workshop 2*. Drafting IKM Staffing Policies
10:00 – 10:30	Plenary Presentations and Snacks
10:30 – 11:30	Presentation of Draft IKM Capacity Development Plan
11:30 – 12:00	Open Forum
12:00 – 13:30	Lunch
13:30 – 15:00	Presentation of Benchmarking Reports
15:00 – 15:30	Open Forum and Snacks
15:30 – 17:00	Workshop 3. Improving the CapDev Program
17:00 – 19:00	Free Time
19:00 – 22:00	Dinner and Night Out

DAY 3. Saturday, 8 February 2013

08:30 – 09:00	Review of Day 2
09:00 – 10:00	Plenary Presentation of Revisions
10:00 – 10:30	Open Forum and Snacks
10:30 – 11:30	Presentation of Final IKM CapDev Program
11:30 – 13:00	Closing Program and Lunch
13:00 – 15:00	Travel Time to Manila

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ABOUT THE AUTHOR

Dr. Alexander G. Flor is Dean, UP Scientist III and Professor 12 of the UP Open University - Faculty of Information and Communication Studies. He currently holds a One UP Professorial Chair in Knowledge Management (KM4D) for teaching and research. He served as Chair of the Commission on Higher Education's Technical Committee on Alternative Learning Systems (2010-2013), Vice Chancellor for R&D of the UP Open University (2002-04) and founding Program Manager of the SEARCA Knowledge Management Program (1998-2002). He has worked with the University of the Philippines since 1976 and has served as technical adviser in eighteen countries under official development assistance missions.

Dr. Flor has authored the following books, among others: *Broadcast Based Distance Learning Systems* (UP Press, 1995); *eDevelopment and Knowledge Management* (SEARCA, 2001); *Ethnovideography* (SEARCA, 2002); *Digital Tools for Process Documentation* (SEARCA, 2002); *Introduction to Development Communication* with Ila Virginia C. Ongkiko (UPOU-SEARCA, 2003); *Environmental Communication* (UPOU, 2004); *Development Communication Praxis* (UPOU, 2007); *Developing Societies in the Information Age: A Critical Perspective* (UPOU, 2007); and *Innovative Strategies and Frameworks for Climate Change Adaptation Research* with Benjamina Paula Gonzalez-Flor (IGI Academic Publishers, 2018).

This volume presents KM4D case studies, where the author was personally engaged from 2000 to 2018, as field examples of how knowledge management has been applied within selected sectors and themes in the international development assistance community. The materials were compiled and made available on the course sites of two online courses offered by the UPOU Faculty of Information and Communication Studies in several installments from 2010 to 2020. The casebook is intended to enable the student to move from abstract conceptualization to empirical application of KM4D.

- From the Acknowledgement