

## Design, Development, and Testing of an Indigenous Knowledge Management System Using Mobile Device Video Capture and Web 2.0 Protocols

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### Abstract

This study attempted to answer the following research questions: How can mobile devices be used by rural communities to document indigenous knowledge? How can Web 2.0 protocols be employed in an indigenous knowledge management system? How will indigenous peoples (IPs) respond to the use of mobile technology in the documentation of their local knowledge?

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

The primary technological intervention was the mobile device. GPRS enabled mobile phones, with audio-video capture and Internet browsing functionalities were provided to focal persons from three IP groups. The Principal Investigator trained the focal persons on mobile phone video capture of indigenous or local knowledge.

A content management system was designed to contain indigenous or local knowledge in agriculture in the form of rituals, practices, and others. The Principal Investigator and his assistants observed the knowledge capture and utilization process. During the conduct of the study, however, the researcher observed a marked reluctance from organized indigenous people's groups to participate in the initiative. It soon became apparent that interfacing indigenous knowledge with Web 2.0 and open access concepts held complicated issues. The intervening variables observed and deduced by the Principal Investigator were: indigenous belief systems; privacy of indigenous peoples; indigenous knowledge system (IKS) protocols; the significance of context in IKS; prejudice and value judgments among non-IP users; and misrepresentation of indigenous knowledge.

**Keywords:** *indigenous knowledge systems, Web 2.0, mobile devices*

### Introduction

Many observers are of the opinion that the future of information and communication technology for development (ICT4D) rests upon mobile phones and other mobile devices. During the IAALD-WACC Summit 2008 conducted at the Tokyo University of Agriculture, the following predictions were made by the eAgriculture Keynote Panel: <sup>1</sup>

- 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. <sup>2</sup>

<sup>1</sup> Flor et al., 2008. *eAgriculture Keynote Panel Presentation. 2008 IAALD-WACC Summit, 25 to 27 August 2008, Tokyo University of Agriculture, Atsugi, Japan.*

<sup>2</sup> 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.*

- Mobile service providers will solve the first mile/ last mile linkage challenge that has 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.
- 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 study 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.

On December 2008 to July 2009, an exploratory study was conducted by the Principal Investigator on the potentials of mobile devices for participatory content development. In the course of the study, a number of factors surfaced and 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.<sup>3</sup>

## **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;

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<sup>3</sup> Flor, 2002. *Ethnovideography: Video Based Indigenous Knowledge Systems*. Los Baños: SEARCA

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.

## Conceptual/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. <sup>4</sup>

#### 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. <sup>5</sup>

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 (18) 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. <sup>6</sup> 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.

<sup>4</sup> Flor, 2004. *Social Capital and the Network Effect in Building eCommunity Centers for Rural Development* (J.K. Lee, Editor). Bangkok and Tokyo: UNESCAP and the ADB Institute

<sup>5</sup> Montgomery, 1998. *Social Capital – Research Notes*, Cambridge: Pacific Basin Research Center, John F. Kennedy Center, Harvard University

<sup>6</sup> Gilder, 1993. *Gilder Technology Report*. Gilder Publishing.

## Reed's Law

David Reed, a sociologist and community development expert, applied Metcalf's Law to social networks and arrived at similar conclusions.<sup>7</sup> 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 the amount of radioactive material necessary to produce nuclear fission. Since the 80's, 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 developed by Oliver, Marwell & Teixeira<sup>8</sup> 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 90's, 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.<sup>9</sup>

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<sup>7</sup> <http://www.reed.com/dpr/locus/gfn/reedslaw.html>

<sup>8</sup> Oliver, P., Marwell, G., & Teixeira, R. (1985). A theory of the critical mass. I. Interdependence, group heterogeneity, and the production of collective action. *American Journal of Sociology*, Vol. 91, No. 3, pp. 522-556...

<sup>9</sup> Robert Chapmen et al. *Livelihood Approaches to Information and Communication in Support of Rural Poverty Elimination and Food Security. Bridging Research and Policy*. Overseas Development Institute (undated).

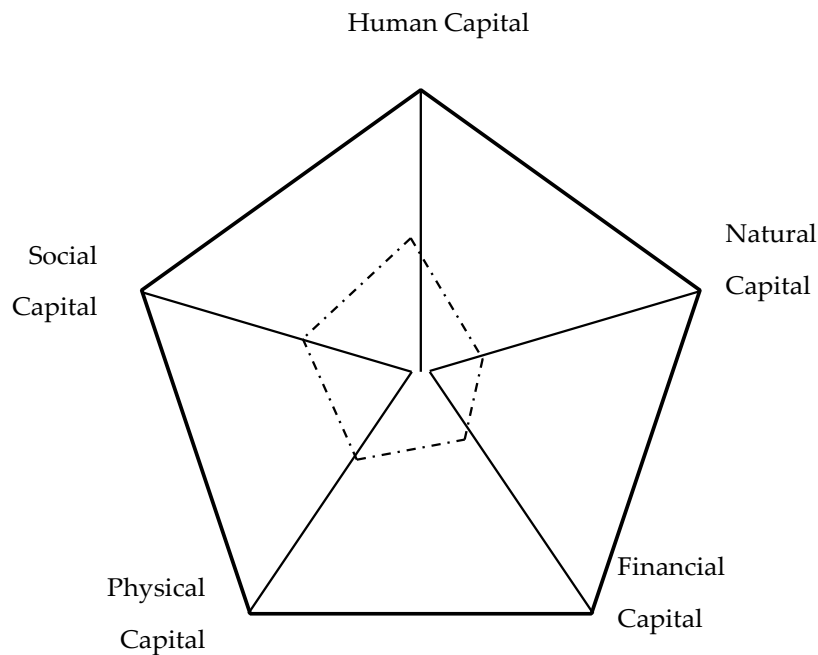


Figure 1. Sustainable Livelihoods Framework

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.<sup>10</sup>

### Conceptual Framework

Thus, this study 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.

<sup>10</sup> Flor. 2008. *Scoping Study on ICT for Rural Livelihoods in Southeast Asia*. International Development Research Center of Canada.

Figure 2 gives the study's conceptual model.

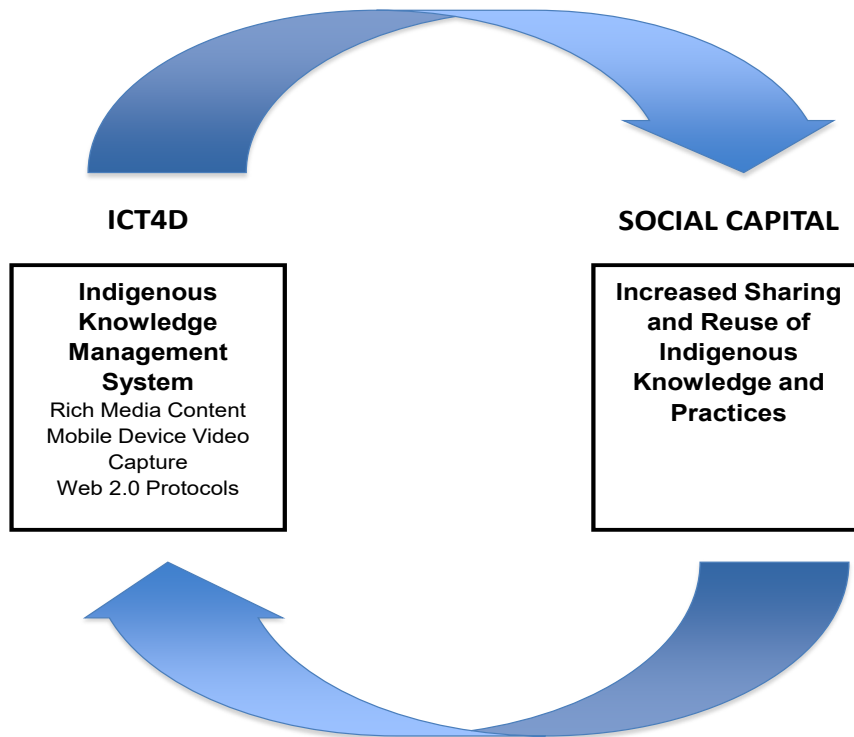


Figure 2. Conceptual Framework

### Methodology

#### Design

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

#### 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 (6) indigenous communities were identified in the provinces of Mindoro Oriental, Mindoro Occidental, Camarines Norte, Camarines Sur, Misamis Oriental and Misamis Occidental. Twelve (12) 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 (FPAVAS). An Appropriate Use Agreement for the unit was signed between the focal persons and FPAVAS. 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 Principal Investigator developed training modules on mobile videography and trained the focal persons on the video capture of indigenous or local knowledge.

#### Data gathering procedure

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.

#### Distribution and Contribution to the body of knowledge

Preliminary results of the study were presented in the 2010 AAOU Conference in Vietnam. Additionally, a journal article on this study will be prepared for submission to the *Journal of Emerging Trends in Computing and Information Sciences*.

Finally, online learning modules on mobile videography are being prepared by the Principal Investigator for the conduct of continuing education or formal courses for NGO workers, local government units, indigenous peoples, and regular students of the UPOU Faculty of Information and Communication Studies as well. Draft content of these modules have already been piloted on MMS198 students during the Second Semester of School Year 2010-11.

This section includes brief discussions of data collection procedures and analyses. Data must be presented in appropriate tables.

### Results and Discussions

#### Capacity development: Equipment provision

##### Mobile Device

Through the sponsorship of The EU FPAVAS, each of the twelve (12) participants was provided with a Nokia 5230. Although the model of choice among ethno videographers 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 touchscreen smartphone.” 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.



Figure 3. Nokia 5230

Image wise, the unit provides four (4) 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 AlanofromItbog, 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.



Figure 4. Felicitas Alano with NCIP FP



Figure 5. Indoor shooting exercises

### 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 SEARCAT Training Hall and its Residence Hotel located within the UPLB Campus. The course had twelve (12) participants broken down as follows: six (6) representatives from IP communities within FPAVAS focus areas; and six (6) staff members of the NCIP. The course was learner-centered and employed experiential, participatory, mentoring, and coaching procedures.





Figure 6. Outdoor shooting exercises

### Training Materials

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

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

### Training Curriculum

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

### Training Plan

The course adopted the following schedule:

Table 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/Digital cameras 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
<i>Continued on the next page....</i>	

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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 Ethnvideography has five lessons:**

1. Ethnvideography

- 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. Ethnvideography 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 has 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 through 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 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 overcome 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 outlines 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 workflow 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 (Wikipedia, accessed 12 August 2011).

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 NCIP after testing and may eventually be adopted nationally by all IP groups.

### Content Management System

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 taggable 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.



**Figure 7. HP Proliant ML150G6 E5520**

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 gives the high level data flow diagram.

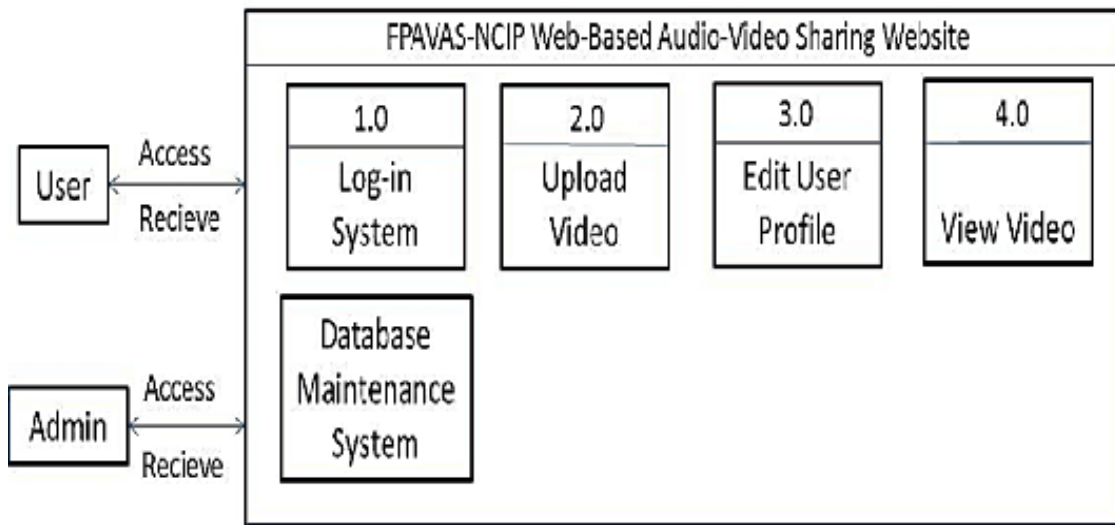


Figure 8. High Level Data Algorithm

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

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

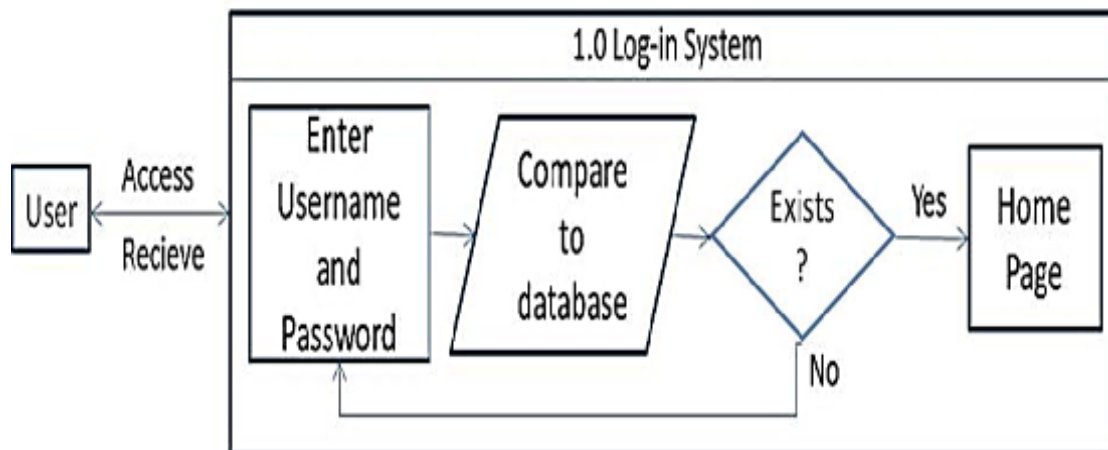


Figure 9. Log-In System Subroutine

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

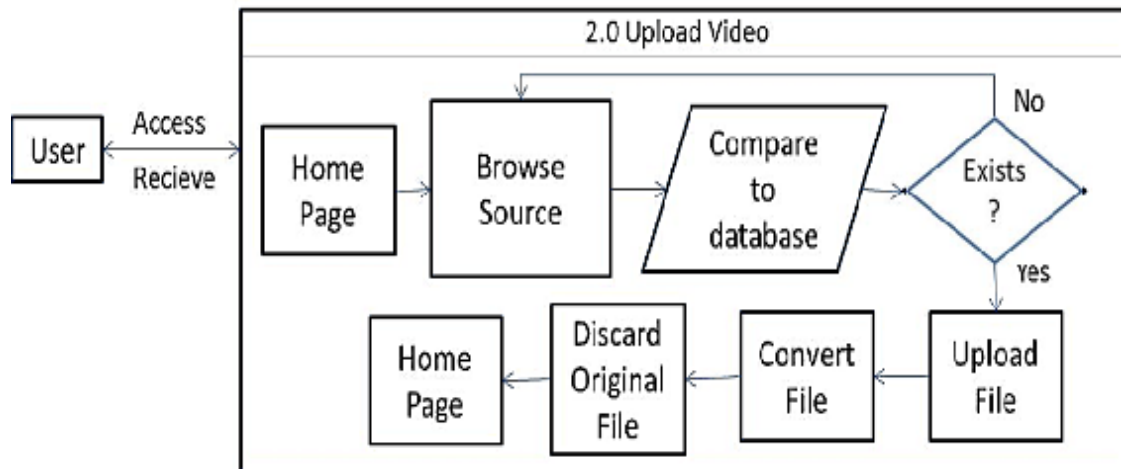


Figure 10. Upload Video Subroutine

The Edit User Profile subroutine allows privacy options.

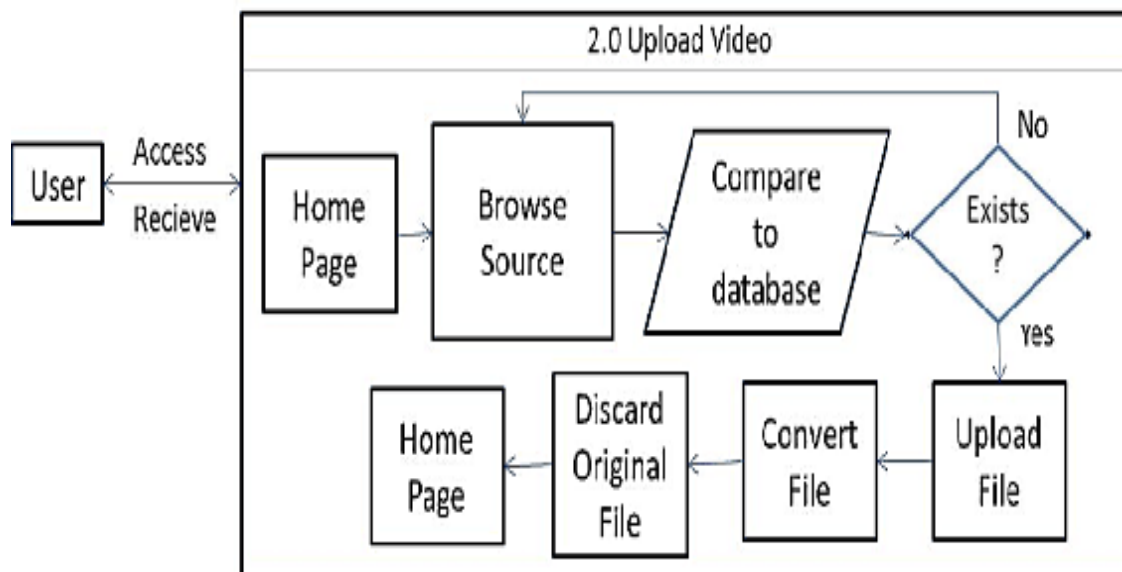


Figure 11. Edit user Profile Subroutine

Finally, the View Video subroutine enables sharing and reuse.

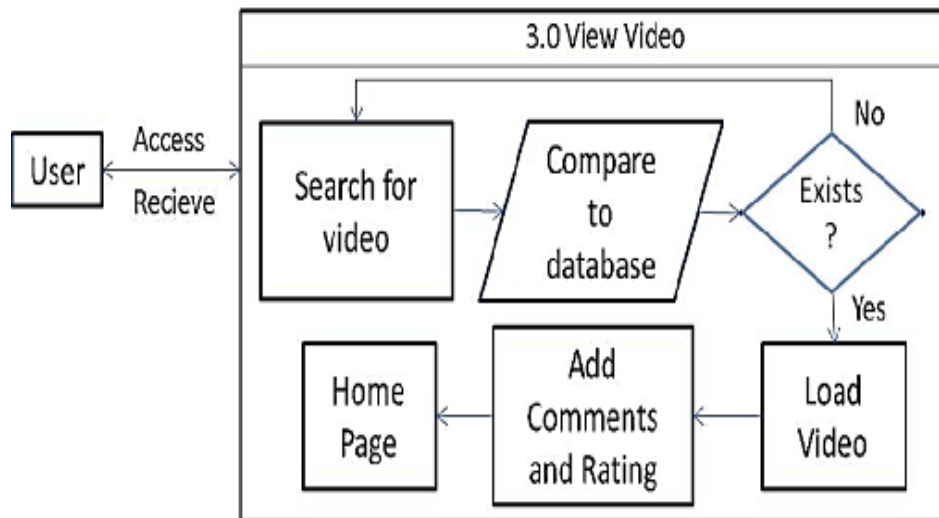


Figure 12. View Video Subroutine

### Field Testing

For six (6) 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 (3) 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.”<sup>11</sup>

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

<sup>11</sup> 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).



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 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.<sup>12</sup>

Indigenous belief systems covering knowledge transfer, sharing, and reuse were likewise guided by this exact same tradition of hierarchy, exclusivity, ritual, and secrecy. Indigenous communities, as a rule, have invisible colleges 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 ethnographic 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 full moon, naked.<sup>13</sup>

Like many of their counterparts from all over the world, the members of the tribe plant the crop during full moon, naked. 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 YouTube 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. On 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.

<sup>12</sup> Alexander G. Flor and Narong Sompong. 2011. *An Online Conversation among Southeast Asian Higher Educational Institutions and its Observed Oppressions. Meta Communication for Reflective Online Conversations: Models for Distance Education.* (Ugur Demiray, Gulsun Kurubacak and T. Volkan Yuzer, Eds). Hershey, Pennsylvania: IGI Global Academic Publishers

<sup>13</sup> NOTE: The researcher 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.

Prejudice and Value Judgments among non-IP users. In the early 90's, I supervised an Indonesian graduate student who employed ethnographic 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.

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 merchandise; 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 NCIP is 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 of 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.

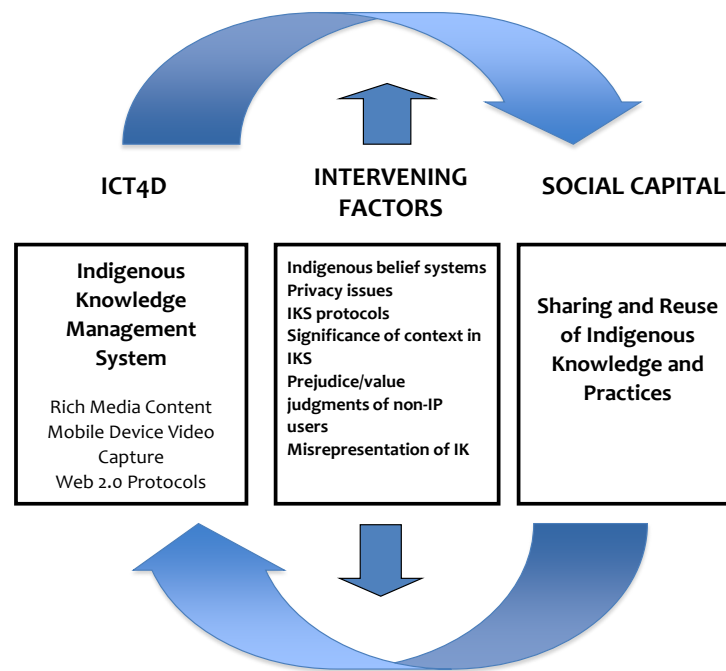


Figure 13. Alternative Conceptual Model

### Summary, Conclusions, and Recommendations

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.

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