

Research Article

Empowerment and Participatory Geographic Information and Multimedia Systems: Observations from Two Communities in Indonesia

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Abstract

Participatory Geographic Information and Multimedia Systems (PGIMSS) were developed and used by two rural communities in Indonesia. This paper reports on the empowerment impacts that resulted from this development project. Empowerment related to PGIMS is examined using a two-dimensional analytical framework that explores the phenomenon at two social scales (individual and community), and is related to four empowerment catalysts associated with the project (information, process, skills, and tools). This paper evaluates the appropriateness of the analytical framework and concludes with general observations about the relationship between empowerment and PGIMS.

Introduction

Increasingly, local communities throughout the world are using community mapping and simple Geographic Information Systems (GIS) technologies to communicate information about traditional lands to decision makers. Claims have been made that these uses of Participatory Geographic Information Systems (PGISs) by disadvantaged groups can be empowering by enabling community groups and members to communicate local information and world views, using the commonly recognized language of Cartography in a way that might influence decision-making processes related to land use and planning. However, others claim that PGIS is disempowering due to the cost and complexity of the technologies, inaccessibility of data, restrictive representation of local geographic information, and the often low levels of community participation. This paper reports on a research project that facilitated the development of Participatory Geographic Information and Multimedia Systems (PGIMSS) in two rural communities in the Indonesian district of West Kutai on the island of Borneo. The research was developed in response to discourse raised in the Participatory Geographic Information Systems (PGIS) literature.¹

The research described in this paper contributes to the debate regarding PGIS and empowerment. A Participatory Geographic Information and

1. For a detailed examination of the PGIS agenda see Abbot et al., 1998; Barndt, 1998; Brodnig & Mayer-Schönberger, 2000; Carver, 2001; Craig, Harris, & Weiner, 2002; Craig & Elwood, 1998; Ghose, 2001; Harris & Weiner, 1998b; Jordan, 2002; Kyem, 2004a; NCGIA, 1998; Obermeyer, 1998; Pickles, 1997; Schuurman, 1999; Sheppard, 1995; Weiner, Harris, & Craig, 2001.

Multimedia Systems (PGIMS) project was developed to overcome the weaknesses of PGIS described above. This was attempted by selecting low-cost and straightforward technologies, and by using a more participatory process that enabled communities to take ownership over the PGIMS technologies, the skills required to use them, and the information that they documented.

The primary focus of this paper is an examination of the relationship between empowerment and the PGIMS intervention. A two-dimensional framework, proposed by Corbett (2003) and introduced by Corbett and Keller (in press), for structuring an analysis of empowerment is used to make observations about both individual and community impacts of the PGIMS project's information, process, skills, and tools in two communities in Borneo. Comparisons are also made between the two communities.

Community Mapping, PGIS, and PGIMS

Community mapping is a map-making process that is undertaken at the local level. It often produces a map showing the relationship between a community and the space in which it exists.² Its *raison d'être* rests on the assumption that cartography is a commonly understood and recognized language that is useful in communicating this community-space relationship (Alcorn, 2000). Community maps can become a medium that allows local communities, or other groups of people, to represent themselves spatially, thereby gaining recognition and inclusion in land and natural resource planning and management (Bird, 1995; Brody, 1981; Flavelle, 1995; Fox, 1994; Momberg, Damus, Limberg, & Padan, 1994; Poole, 1995).

Although community maps are functional and powerful tools for communication, they cannot describe everything there is to know about the land. For this reason they are often supplemented using the written word. The written word is an imperfect medium to represent local knowledge, especially for traditional people who may be accustomed to communicating information orally. Johnson (1992) notes that much local knowledge about the land is trans-

mitted in the form of stories and legends that use metaphor and sophisticated terminology; thus, much of the context might be lost if the information is transcribed to written text. Increasingly, digital Geographic Information System (GIS) technologies are providing a medium that can combine the effectiveness of community maps with other digital communication media, such as video, images, and audio, which might be better at documenting the oral and visual aspects of complex local knowledge. GIS is popularly described as a series of computer-based instruments for the collection, storage, retrieval, display, and analysis of spatially referenced data (Aronoff, 1989; Bonham-Carter, 1994). The PGIMS project looked for a set of tools and processes that would combine the benefits of community mapping with digital multimedia.

Substantive research on the theory and potential of community GIS application has begun to emerge.³ This research field has built up a considerable following, and is now referred to as Participatory GIS (PGIS). Although primarily concerned with studies of communities in North America (Craig, Harris, & Weiner, 2002; Elwood, 2002; Ghose, 2001), some relevant commentary and discussion has appeared from other areas around the world (Foray, 2002; Fox, 1994; Harris & Weiner, 1998a; Jordan, 2002; Kyem, 2002, 2004a). Despite a growth in publications on this topic, however, there remain comparatively few instances of real-life community usage of PGIS (Carver, 2001; Harris & Weiner, 2002). This is partly because GIS software, which can be distinguished from other cartographic software types by its ability to perform powerful analyses of spatial data, is considerably more costly to purchase, as well as more complex to learn to use.

The goal of the PGIMS project undertaken in Indonesia was to facilitate a community's ability to collect digital land-related information, yet avoiding the use of costly and highly sophisticated software. The project team therefore searched for low-budget software solutions that would allow community members to master and control the technologies themselves. This resulted in the assemblage of a

2. For a more detailed description of community mapping processes and form see Aberley & George, 1998; Alcorn, 2000, 2001; Carter, 1996; Flavelle, 2002; Fox, 1998; Peluso, 1995; Poole, 1995.

3. For examples see Barndt, 1998; Craig & Elwood, 1998; Curry, 1995; Harris & Weiner, 1998b; Harris, Weiner, Warner, & Levin, 1995; Obermeyer, 1998; Pickles, 1995.

low-cost and easy-to-use suite of geographic information and multimedia technologies, referred to as a Participatory Geographic Information and Multimedia System (PGIMS) (for details see Corbett, 2003; Corbett & Keller, in press). The project's focus was on enabling community members to document their own data, using the knowledge of informants based in the community, and represent it in ways of their own choosing. A participatory process was employed to ensure that community members made all decisions related to the project and were trained in the necessary technological skills (see Corbett & Keller, 2002). People trained to use the tools were called the community's "operators."

PGIMS is a system for managing, referencing, and accessing digital information stored in textual image, video, and audio format, using an interactive Cartesian map interface as the primary organizational tool. The map gives spatial reference to the attribute multimedia components and allows the user to navigate through the community's data. This style of information retrieval is referred to as hypermedia (Aitken & Michel, 1995). The map was considered important because of contentious claims made on traditional territories of indigenous groups throughout the region. One potential application of the PGIMS is to communicate this spatially related information to outsider groups using the PGIMS in much the same way that community maps are used to negotiate with outsiders, but with the added benefit of including the information in a way that is more culturally appropriate and expressive for predominantly oral-based peoples.

The process employed was fundamentally participatory in the sense that it invited (not demanded or coerced) and facilitated the inclusion of all individuals and groups from the participating communities (men and women, old and young, educated and uneducated) to join the PGIMS project. Throughout the project the intention was to encourage the entire community to become involved and take ownership over the development of the PGIMS. The main mechanism for community involvement was open meetings in which community dialogue and decision making were encouraged. This community decision making ranged from conceptual guidance—shaping the organization and content of the PGIMS—

through selecting specific community members for specialized training that would enable them to capture, manage, and store the community's information in the PGIMS under the direction of the wider community (for details see Corbett, 2003; Corbett & Keller, in press; Corbett & Keller, 2002).

Claims have been made in the literature that various PGIS approaches, models, and products empower participating communities.⁴ In *Ground Truth: The Social Implications of Geographic Information Systems* (J. Pickles, Ed., 1995), Brian Harley's (1988, 1989) "ground-breaking work on the relationships between maps and power" (Schuurman, 1999, p. 17) was extended to recognize an explicit link between GIS and the asymmetric distribution of power. The PGIS movement, therefore, was based on the assumption that GIS technology could provide "a critical complement to grassroots efforts that are undertaken to empower communities" (Kyem, 2004a, p. 38). In other words, the power associated with GIS applications did not have to be monopolized by existing power brokers, but could be harnessed by marginal sectors of society to empower themselves (Harris & Weiner, 1998a; Harris & Weiner, 1998b). This is countered by those claiming that PGIS disempowers communities due to excessive technological complexity, excessive cost, inaccessibility of data, inability to use the technology to record diverse ways of understanding space, and lack of genuine community participation (Goss, 1995; Harris & Weiner, 1998b; Pickles, 1995; Rundstrom, 1995). Our PGIMS project was developed to overcome these causes of disempowerment, with the aim of the research to analyze whether the community was empowered or not using the new technologies and the accompanying participatory process. This analysis of empowerment was inhibited by the lack of a commonly accepted operational definition of empowerment in the PGIS discourses (Elwood, 2002; Kyem, 2002; Kyem, 2004b). It was also affected by a paucity of discussion over methodologies by which empowerment related to a PGIS initiative can be evaluated (Corbett, 2003; Corbett & Keller, in press; Elwood, 2002; Howard, 1998). In response, Corbett (2003) and Corbett and Keller (in press) have proposed a framework to facilitate analysis of empowerment in PGIS.

4. See, for example, the NCGIA special session on "Empowerment, Marginalization and Public Participation" available at <http://www.ncgia.ucsb.edu/varenius/ppgis/papers>.



Figure 1. Map of Indonesia showing the location of research sites

This paper uses their framework to examine whether and analyze how the introduction of PGIMS in two Indonesian villages empowered the participating communities.

The Two Case Studies

The PGIMS project was introduced into the villages of Benung and Tepulang in the district of West Kutai, in the province of East Kalimantan (on the island of Borneo), Indonesia. (See Figure 1.) The villagers are from the *Dayak Benuaq* ethnic group. They are predominantly agriculturalists who, as with most indigenous ethnic groups on the island of Borneo, rely on upland swidden rice farming (*ladang*) for the production of their staple food crop. They are also dependent on the surrounding forests for subsistence and income-generating functions (Abdoellah et al., 1993; Gönner, 2000). The two villages are accessed by river from the nearest coastal town of Samarinda.

The PGIMS project ran in Benung and Tepulang from September 2000 until April 2002, with a follow-up visit in December of 2002. The PGIMS project was established through the CGIAR-Canada Linkage Fund (CCLF), a program managed by the Canadian International Development Agency (CIDA). The project involved collaboration among the Spatial Sciences Laboratory, Department of Geography, University of Victoria; the Centre for International For-

estry Research (CIFOR), an international research organization based in Bogor, Indonesia; and the *Sistem Hutan Kerakyatan* (SHK, or Consortium for Traditional Forest Management Systems), a regionally based Indonesian nongovernmental organization (NGO). The project is described in detail in Corbett (2003).

Observing and Evaluating Empowerment Using a Framework Structure

Corbett (2003) and Corbett and Keller (in press) propose a simple two-dimensional framework for examining empowerment. For the purpose of evaluating the PGIMS project the notion of empowerment is given two definitions:

1. *Empowerment* is a tangible increase in social influence or political power. Conversely disempowerment is a decrease in social influence or political power.
2. *Empowerment capacity* refers to aspects of the deeper process of change in the internal condition of an individual or community that influence their empowerment.

The framework incorporates two social scales, namely the *individual* and the *community*, and four catalysts of empowerment related to the PGIMS project. The catalysts include the:

Table 1. Framework for structuring an analysis of empowerment

	Empowerment of the individual	Change in empowerment capacity in the individual	Empowerment of the community	Change in empowerment capacity in the community
Information				
Process				
Skills				
Tools				

1. *Information* catalyst, which refers to the information gathered during the course of a PGIS project: this can be in diverse formats, such as maps, text, photographs, and videos;
2. *Process* catalyst, which refers to the specific participatory process used by a PGIS project;
3. *Skills* catalyst, which refers to the skills acquired by individual community members and communities as a whole through the training associated with a PGIS project;
4. *Tools* catalyst, which refers to the specific equipment used during the development of a PGIMS, including the hardware (for example, a computer, video camera, or digital camera) and the software.

The analysis involves exploring how the four catalysts influence empowerment, as well as changes in empowerment capacity at the individual and community levels.

Each cell of the framework can be used to structure an examination of indicators drawn from the field data that relate to empowerment and empowerment capacity. As shown in Table 1, indicators in the context of the proposed framework are pointers, facts, stated opinions, or perceptions that look into and represent changes in specific conditions or situations relating to a PGIS project. This information was collected by the external collaborators, using qualitative data-gathering tools, including semi-structured interviews, short questionnaires, and participant observation. We define external collaborators as individuals from outside the communities involved in the PGIMS project throughout the time the PGIMS project ran in the communities. These indicators can be used to infer both the rise and decline of empowerment and empowerment capacity.

The indicators presented are not definitive. They

are the data categories that emerged from observed and stated events and changes that occurred during the course of the PGIMS project. If the same framework were applied to a different project, different outcomes, and therefore, indicators would likely emerge. Although each cell theoretically is used to structure the examination of empowerment as it relates to the PGIMS project, there are cells that are left blank because there were no indicators of that particular catalyst demonstrating an impact on empowerment or empowerment capacity at that scale.

The remainder of this section discusses the observed indicators in more detail, presented in the order displayed in the framework (Table 1), namely, the indicators of empowerment and empowerment capacity of the individual and community, broken down into the four catalysts, namely, information, process, skills, and tools.

Empowerment of the Individual

In both communities, individuals closely associated with the PGIMS project experienced changes in their social and political influence as a result of their involvement. Other individuals in the communities were observed to have not been affected as significantly.

Information

Decreased social influence of inaccurate informants

At the outset of the research we speculated that the informants whose information was recorded as a part of the PGIMS project would experience some change in political power or social influence as a result of having their views heard. However, no one appeared to gain status through sharing information. Those informants who were already powerful figures in the community only had their power reinforced and those informants who were less powerful remained less powerful.

On the other hand, some informants appeared to lose status through making inaccurate or unsanctioned recordings of information. A village elder in Tepulang recorded information about the location and extent of his fruit tree garden (*simpukng*). This was done to provide proof of ownership that might be used to insure its inheritance by his descendents. Others in the village contested the truth of his claim. They claimed that this elder used the PGIMS to try to validate a contentious claim to an area of land for his own family's gain, and as a result, the recording was deleted.

Complaints were also heard when a computer operator in Tepulang, an outsider who had married into the community, documented information about traditional systems of land use, using himself as the informant. Villagers stated that it was wrong for him to do this because "he has no idea about what is true" (respondent Tepulang). It was insinuated that he did not have the right to present information about a community that he was not originally from.

Process

Increased social influence of female computer operators

The process used by the PGIMS project attempted to increase the involvement of women in the project as one facet of achieving greater participation of all sectors of the community. One intervention was to request that at least one of the computer operators in each village be a woman. Both of the selected women were empowered through becoming operators, but to different degrees.

The woman selected from Benung was married with a young family. She became an able and involved member of the computer operator team. As well, she began to be more involved in general community meetings, particularly those related to PGIMS project decision making. She called and facilitated several community meetings and contributed substantially to meeting outcomes. This was a marked change from her previous role in the community. However, tensions emerged between this woman and her husband concerning her involvement with the project. He claimed that the computer training and information collection were detracting her from domestic chores.

The woman selected from Tepulang was young, and did not show a high level of initiative or interest in the PGIMS. However, she did show leadership in facilitating a women's meeting, and people ob-

served that she spoke confidently and authoritatively at that meeting, even though at non-PGIMS community meetings it was unusual for her to speak, if she attended the meetings at all.

Skills

Increased (in Benung) and decreased (in Tepulang) social influence of male computer operators

Several male computer operators experienced a significantly changed social and political role as a result of the skills acquired from their involvement in the project.

In Benung a young male computer operator noted that prior to the PGIMS project:

"I was capable of contributing ideas in community meetings, now after being involved with the project I can make decisions for the community." (respondent Benung)

This project, combined with other work he was involved in, led to suggestions that he should run for the position of village head in the future.

In Tepulang another young male computer operator appeared disempowered by his new skills. He was considered "too ambitious and put on airs of intelligence" (respondent Tepulang). This, plus his efforts to monopolize the skills and tools, contributed to his marginalization within the community and led to his resignation as the head of the village advisory committee.

It is hard to determine how much these changing social roles are a direct and exclusive result of the PGIMS project or how much they can also be attributed to other influences or pre-existing conditions.

Tools

No examples were observed of the tools used in the PGIMS project either increasing or decreasing power at the individual scale.

Changes in Empowerment Capacity at the Individual Scale

Changes in capacity for empowerment were noted in individuals in both communities, including individuals who were computer operators, informants, and community leaders, as well as community members not as closely involved in the project.

Information

Increased confidence to communicate information to outsiders

Some individuals appeared to feel an increased sense of confidence when communicating informa-

tion through the video media, compared with presenting this information directly. For example, a middle-aged Tepulang male recorded a video piece intended for presentation to elected regional leaders. In it he described the importance of the forest for the community and the need for forestry companies to consult with the community before starting logging operations in traditional village territory. In the video he expressed some strong opinions about the village's rights to its forest and his expectations of the responsibilities of the regional government to regulate this situation.

This man is often accused of being opinionated by other members of the community, yet having difficulty in expressing his views when talking to government officials. Because of the informal way in which the video was recorded, he was able to be articulate on the video. This medium allowed him to state his feelings in a way that he had been unable to in the past.

Process

No examples were observed of the participatory process used in the PGIMS project either raising or diminishing empowerment capacity at the individual scale.

Skills

Increased self-esteem of computer operators through mastery of skills

There is a connection between social status and mastery of computer skills in West Kutai. Computers are associated with urban lifestyles and higher levels of education, and are believed by many people to lead to emancipation from the drudgery of rice farming by increasing the likelihood of obtaining paid office work.

At the scale of the individual, mastery of the skills needed for using PGIMS technologies offered a link to empowerment through challenging existing stereotypes and societal roles and fostering a sense of self-confidence. As one computer operator in Benung noted, "I feel that I have been taken up a step in life by this project" (respondent Benung). Another noted, "Before I could never speak in front of other people, now I am brave enough to be involved and contribute to the public" (respondent Benung).

An increase in self-confidence also became apparent during multistakeholder workshops, when computer operators from both communities pre-

sented their PGIMSs to representatives from the government, schools, and other organizations throughout the region. During a workshop one of the computer operators demonstrated his new skills to his old high school headmaster. He remarked,

"Within my heart I felt that I was truly proud because before [my headmaster] taught me, now I could teach him! I was happy to have been able to demonstrate my skills and I was happy to see the participants were interested to use the tools." (respondent Benung)

Increased (in Benung) and decreased (in Tepulang) self-esteem and frustration among villagers through access/non-access to training

Mastery of technical skills was considered highly desirable by people in both communities. At the outset of the PGIMS project, emphasis was placed on the responsibility of the computer operators to pass on their skills to other people in the community. This gave other community members high expectations that they too would receive computer training. However, skill transfer to other community members was not as successful as hoped. These limitations in access were mostly due to the PGIMS project's ability to install one set of equipment in each community. This led to a bottleneck in the number of people able to receive training in the PGIMS skills. Use of some tools, such as the video and digital cameras, were more widespread throughout the villages, but computing skills were restricted to a few.

The operators' levels of commitment and approaches to training were very different between the two communities. In Benung the computer operators would train other community members in response to direct requests. Demand from other community members was not high, perhaps because of a relatively high concentration of older people in the community, who tended to show less interest in being trained. By the end of the project fieldwork, seven people had been trained to varying levels by the community operators in Benung. The training had been informal and unstructured.

In Tepulang the computer operators agreed to give two structured computer training courses. The first was completed successfully, but the second failed because of disagreements that grew into open conflict between the operators. After this conflict emerged, few people from the community, including the operators, continued to show a high level of interest in the project.

The disagreement emerged because one operator began to monopolize the skills. He attempted to charge other villagers to receive training from him. He also began to control use of the computer by other villagers by using it as often as possible, and by pulling the cables out when not using it to prevent others from accessing and using the PGIMS. His actions created substantial anger in the village, as expressed by one woman:

"If we want to learn to use the computer he is always using it. We are made to feel embarrassed and to feel like beggars. While he still uses the computer I cannot be bothered to learn. Better I do not use it rather than fight about it. Many people feel this way." (respondent Tepulang)

In response to this operator's actions the community began to isolate him. He, in turn, resigned from an important administrative position in the community.

Increased critical awareness of popular media by computer operators

As noted by Richardson (1997), few communities live in total isolation from the outside world. In terms of external influences, the villages of Benung and Tepulang are reached by television, radio, and newspapers. Richardson (1997) further states that there is a need for people to sharpen their ability to interpret the information reaching them through these channels.

During the PGIMS project individuals were observed showing a more analytical approach to understanding popular media. While watching the news on the television, a pair of computer operators began to comment on different shots, cuts, and transitions used in a particular news commentary. Their PGIMS-related skills gave them a new way to analyze the information and manner in which it was presented on the television. They also commented on how they might have done a better job at editing and presenting the information. This new awareness that the popular media was fallible and that their own capabilities and skills were comparable, and perhaps superior, to those of outsiders is a further indication of how their new skills had given them an increased confidence in their own abilities.

Increased economic opportunity for computer operators

It was strongly believed in both communities that learning new—in particular, computer—skills would

"allow the youth to get jobs in companies in the region" (respondent Tepulang). As a result of the skills learned during the PGIMS project, two operators, one from Benung and one from Tepulang, were employed by the regional government. One of these operators had previously felt that getting this type of work was "beyond my imagination" (respondent Benung). Both were explicit about their feelings of pride and betterment, which in turn, are indicative of increased capacity for empowerment.

Computer operators who remained in Benung were also able to apply their new technological skills to money-making ventures through recording videos, transferring them to video compact disc (VCD), and selling them outside the village. Operators were requested to record videos for the regional government, the Department of Tourism, an NGO, and individuals. In addition to providing economic benefits, this helped the operators to develop wider networks in the region.

However, the intention of the training in the PGIMS project was not to focus on job-related skills, especially if they resulted in village operators being hired into the commercial marketplace rather than remaining in the community in which they were trained. Although the individual may have increased his or her capacity for employment and empowerment, the community as a whole lost capacity as they lost a valuable resource for developing the PGIMS and passing on their skills to others in the community.

Tools

Increased self-esteem of villagers from association with tools

There was some evidence that the PGIMS tools themselves were used by people to amplify their social status. Some people on outings from the community would take the digital and video cameras with them in order to be seen using them in public places, even if they did not know how to use them. However, sometimes people operating the tools in public were exposed to derogatory comments from other community members, such as "Here comes the journalist" (respondent Tepulang). This made the person using the tool feel conspicuous in the eyes of other community members. Yet this comment may have reflected feelings of envy or jealousy on the part of the person making the comment, indicating that these tools were indeed associated with enhanced prestige.

Empowerment of the Community

This section examines the impact of the PGIMS project on the communities in respect to empowerment. This is indicated by an increased ability of the community to influence decision-making processes and other events in the wider region.

Information

Increased social influence with regional decision makers

During the PGIMS project there were two prominent examples where information was used successfully to communicate with groups outside the village and influence events in the wider region. Both these examples involved illegal logging on Benung's traditional lands by neighboring villages.

The first incident involved multiple incursions by illegal loggers from a neighboring village onto Benung's traditional land. The village leaders confronted the illegal loggers and videotaped the incident. During the confrontation the loggers admitted fault, apologized, and departed. Four months later the same group of illegal loggers returned to the forest and began to poach timber again. The village leaders wrote to the local government requesting a meeting, at which they presented the recorded evidence from the previous encounter. The government was sympathetic and ordered all the felled timber returned to Benung. They also threatened the illegal loggers with severe fines if they encroached again.

Increased social influence with other communities

The second incident involved illegal logging by Tepulang on the traditional lands of Benung. As logging activities increased in the area, the people of Benung and Tepulang decided it was necessary to document the location of the boundary between the two villages. On a prearranged day, elders from both villages met and walked the boundary between the villages, agreeing without conflict on the position of the boundary. Using a video camera, people from Tepulang recorded the entire process.

Six months later Tepulang began logging in the vicinity of the boundary between the villages. Soon after operations had commenced Benung claimed the logging operation was straying onto their territory. A joint village meeting was called. The computer was set up in the meeting hall and the video taken during the boundary walk was displayed. As a result of the information contained on the video, the conflict swiftly was resolved, and the logging

operations withdrew from the contentious area, leaving the felled timber behind.

Both these examples show the community of Benung using the information gathered as part of the PGIMS project to successfully resolve conflict with outside groups. However, it cannot be assumed that these successes indicate a long-term increase in power for local communities. It is also unlikely that these incidents by themselves will lead to greater involvement in regional decision-making processes.

Process

No examples were observed of the participatory process used in the PGIMS project either raising or diminishing power at the community scale.

Skills

No examples were observed of the skills used in the PGIMS project either raising or diminishing power at the community scale.

Tools

Increased bargaining power with outsiders

Increased bargaining power associated with the project's tools occurred when a timber investor came to the village of Tepulang with the intention of purchasing timber from the community's traditional forest land. Timber investors are known to verbally offer large sums of money during the negotiation stage with the villagers. At the end of the operations these high sums are, however, often not paid in full.

During a village meeting to negotiate the price for the timber being sold from Tepulang's territory, residents recorded the meeting using the digital and video cameras. The video operators made a big show of using the equipment in front of the investor. The investor was noticeably uncomfortable about being recorded and cautious about promises that he made, and the community felt the equipment had given them a more powerful position from which to negotiate a good price for their timber. The community appeared to be less interested in the recording itself, as the information was never edited or incorporated into the community's PGIMS.

It is speculated that the presence of the tools provided the community with some advantage by representing them as a relatively sophisticated group with access to tools more often used by educated elites. It is unclear how lasting this means of empowerment will be in the region as these tools lose their novelty.

Changes in empowerment capacity at the community scale

The analysis of empowerment capacity at the community scale explores how groups within the community, defined by gender, education level, and age, as well as the community as a whole, gained increased empowerment capacity through the PGIMS project.

Information

Increased community confidence to make statements to outside groups

The PGIMS was used by Benung to present community views on their vision or plans for the future. One recording was made to demonstrate to the regional government the community's ideas on how to log the forest using traditional, more sustainable practices. Another recording from Benung explained the importance and history of their longhouse, and ended with a request to the regional government for funding for its repair.

Showing information in this way complements the traditional oral system of communication, and furthermore, enables villagers to present visual information. It also bolsters the villagers' confidence by giving them the means to prepare a presentation in advance, rather than have to talk directly to people in positions of power. However, success in influencing decision makers still depends on the nontechnical ability of community members to interact with these powerful people. As Shiffer (1999) notes, information is only powerful when it is effectively understood by those who use it. The information as it stands alone is unlikely to influence outsiders, but it might be useful in providing communities with support and increased confidence in promoting evidence and plans to decision makers.

Increased community identity through understanding local history, culture, and "adat"

In West Kutai traditional leaders recognize the need to reconstruct their local history, culture, and *adat* (in this context *adat* refers to the traditional Benuaq system of laws) that have been steadily eroded over the past 40 years. An understanding of *adat* is recognized as key to restoring a strong sense of Benuaq identity. It is also thought to be key to understanding the more ecologically sustainable land and resource management system associated with Dayak culture.

There are a number of examples of historical and

cultural information being recorded and stored in the PGIMS, primarily by women. There are also recorded examples of *adat* on laws relating to rights over land and resources, the location of territorial boundaries, and healing ceremonies. Despite recognition of the importance of documenting *adat* within the community, there were times when tensions emerged over the use of the PGIMS as a mechanism to record and store that information. This is because control over who may learn and use *adat* knowledge is tightly regulated in Benuaq society. Certain information may only be known by certain people within a community. Information is acquired only after long apprenticeship and the payment of expensive gifts. It is then carefully guarded because power is institutionalized through possession of this knowledge (Hopes, Madrah, & Karaakng, 1997). The mechanism used to maintain control over this information is called *temai*.

"*Temai* is the law which determines that we cannot give information to others even if we know it, because if we tell people the knowledge loses its potency." (respondent Benung)

This traditional mechanism of knowledge transfer conflicts with the idea proposed by the PGIMS project, notably that local knowledge needs to be recorded and stored for communal use. As noted by Scoones and Thompson (as cited in Parpart, 2000), "Knowledge is not just ready to be picked like an apple on a tree. It is embedded in social contexts and attached to different power positions." The individual wanting to record or contribute information that is regulated by *temai* is breaking *adat* law. Thus when recording information about traditional medicinal plants in Tepulang, the woman describing the plants was conscious not to break the *temai* attributed to this knowledge; as a result, the information presented was intentionally incomplete.

However, others disregarded *temai* to describe some forms of *adat* knowledge, such as the location of territorial boundaries. They did this in recognition that in the context of contemporary land title negotiations, the information was too important to be hidden. They also felt that there is a danger of information being lost if they continue to respect *temai*, as most youth are unwilling or unable to spend the time and money necessary to undergo the traditional apprenticeship. Nonetheless, the existence of

temai diminishes the potential of the PGIMS as a mechanism for increasing understanding of *adat* in the youth and future generations.

Community ability to own and control information

Both communities demonstrated a need to balance communicating information with outsiders with limiting information distribution so that it remains in the control of people in the village. As asserted by Parpart (2000, p. 1), recording information "can disempower if it removes the ability to control the dissemination of knowledge." As with the *temai* system, there appears to be an explicit relationship between empowerment capacity and the regulatory mechanisms that the communities develop to control and effectively manage information contained within the PGIMS. The presence and use of these mechanisms indicate that people in the community remain in control of their information, even as they adopt new ways to communicate and store it.

Both communities developed regulations to control the access, copying, and dissemination of information. Yet these regulations appear only to have been enforced in Benung. An example of this occurred when representatives from a local NGO requested a copy of Benung's PGIMS from the computer operators. Computer operators and other prominent community members responded that they could not freely distribute the information before they had discussed the issue in more detail in a community meeting. The restraint shown by Benung is an indicator of empowerment capacity, but it is difficult to know if this can be directly attributed to the PGIMS project or to pre-existing levels of empowerment capacity in the community. It does, however, show an ability to use traditional social mechanisms to control the information contained within the PGIMS.

In Tepulang, the PGIMS was treated in an open-access fashion. Outsiders were observed coming into the community and freely accessing the computer and its data. Despite protests from some community members, there was no control exercised by the community to regulate access. This attitude might have been related to the tensions concerning monopolization of the skills and tools. As a backlash to this, nobody was prepared to enforce the community's regulations for fear of appearing equally monopolistic. This attitude is further indication of the low value given by the community members of

Tepulang to the information contained in the PGIMS.

Increased (in Benung) and decreased (in Tepulang) community cohesion between generations through sharing information

Successive political regimes over the past 30 years have sought a homogenous Indonesian identity. The resultant monoculturalism has been introduced and reinforced through the education system (Leigh, 1999) and popular media (Ricklefs, 2001). As a result, a strong Benuaq identity has been declining primarily through a growing alienation between the youth and elder generations. Many indigenous groups throughout the world are attempting to reconstruct their identity through the process of documenting and expressing their cultural information (Davidson-Hunt, 1999).

During the PGIMS project, youth in both villages were attracted to learning to use the technologies. The community elders, however, controlled the local knowledge. Successful development of the PGIMS, therefore, required an exchange between these two groups. In turn, this process contributed to strengthening community cohesion, as well as identity.

There is evidence from Benung that the PGIMS project facilitated the transfer of information among generations within the community and contributed to greater community cohesion. Several examples indicate that the interest of younger computer operators in cultural information was raised as a result. For example, one computer operator began to record his father's folktales. As he became increasingly well-known for his interest in culture, history, and *adat*, a regional NGO offered to pay for his expenses to undergo an *adat* apprenticeship as required by *temai*.

There remains a need to have a pre-existing and functional relationship between elders and youth within the community for successful information flow to take place. In Tepulang, there were only two elders who were involved and highly motivated by the project. The others felt removed from the process, and persisted in thinking that these tools were only something to help the young to find work. The result was that the management of the tools was largely left to the youth who used the computer in an undirected way and without the support of the elders. At the same time, some people from the older generations accused the young operators of

documenting information that was false and asserted that they had no right to record this information in the first place. It was partly because of the youth having to manage the tools and implement the PGIMS process that the project came to a halt in Tepulang. This reflected the dysfunctional state of the community, where the PGIMS project appeared to further exacerbate preexisting divisions among generations.

Process

Altered community cohesion among villagers

Throughout the course of the PGIMS there was a notable difference between the two villages in their administrative styles. In Benung, the village chief was democratically elected and held the respect of the community. However, decision-making mechanisms were relatively authoritarian, and attendance in non-PGIMS community meetings, as well as the participation level by attendees, was generally low, especially for women. Throughout the PGIMS project, village leadership tightly controlled the proceedings. Nonetheless, the participatory process of this project contributed to a relatively more relaxed meeting style where more people contributed to decision-making outcomes. Turn-out was high at the PGIMS meetings (relative to nonPGIMS meetings) throughout the duration of the project.

In Benung, tension between the leadership and others in the village seldom occurred as a result of this increased participation, mainly because the leaders and the other villagers were generally in agreement. However, a situation where there was strong but unpopular leadership might have caused the introduction of more participatory processes to result in an open display of existing internal conflict.

In comparison, Tepulang exhibited high initial participation, as well as high turnout in community meetings, even by some women. However, the village chief was a self-motivated and unpopular man. The PGIMS village meetings, often held in his absence, were marked by strife among the factions in the community. People would freely give their opinions and decisions would appear to be made, but follow-up was often poor since there was little feeling of accountability due to a lack of official leadership and no clear delegation of responsibilities. By the end of the project, meeting turnout was low. The participatory process of this project, therefore, was insufficient to ensure that community cohesion was increased in Tepulang.

Increased organizational capability of women

Despite encouragement at community meetings for women to contribute, the women interviewed felt that as a group they were excluded from the PGIMS project. In Benung women were often absent or noticeably passive at most meetings. In Tepulang, more women attended and contributed to meetings. Even here, however, women felt they were excluded from access to the tools, because, apart from one young woman computer operator, all of the operators and external collaborators were men. Involvement of women was encouraged by holding a decision-making meeting and training session in each community specifically for women. The women in both communities went on to organize their own meetings afterward. After making a video showing older women teaching local dancing to girls and young women, the women in Benung revived a women's dance group (*tarian gantar*) which was then invited to perform at weddings outside the village. The women in Tepulang organized the recording of a singing session of traditional songs (*brijooq*). Audio and VCD recordings of this session were requested by the regional radio station, as well as other communities. Afterward the women continued to meet to sing.

Although the participatory process did not noticeably affect the role of women at general community meetings, it did have a notable achievement in helping women to take a greater role in the project and providing them with an element of influence and control over the PGIMS development and use. This they used to increase information content aimed at fostering the community's sense of cultural identity. It also contributed to improving the ability of women in both communities to organize themselves. These are indicators of their increased empowerment capacity.

Increased (in Benung) and decreased (in Tepulang) independence from external collaborators

Initially, the presence of the external collaborators was necessary for the progress of the project in the communities. External collaborators introduced the project and facilitated the initial process, and they provided training and support to the community. Furthermore, the external collaborators were important in facilitating and mediating between computer operators when conflict emerged. However, one intention of using a participatory process was to enable the community to increasingly take on the

project management. An important indicator of raised empowerment capacity is the ability of the community to continue the project independently in the absence of the external collaborators.

Computer monitoring information showed increasing signs of independence in Benung, demonstrated by an increased use of the PGIMS software while the external collaborators were absent. In Tepulang, computer monitoring data showed that dependence on external collaborators continued to the end of the project.

Skills

Decreased community cohesion between educated and less educated

The tools were initially chosen for the simplicity of their use, and there were examples of people with only primary school education using the computer and learning specific software, as well as elders with no education who learned to navigate the information on the computer using the mouse. It is speculated that education level was not the main factor influencing the ability to use the computer equipment. More important factors were personal motivation and unhindered access to training and the equipment. Nonetheless, it was observed that the PGIMS skills were monopolized by the better-educated youth in the village, while the less-educated were further marginalized.

Tools

Increased community prestige associated with the tools

In Tepulang, community members were active in promoting the PGIMS tools to other communities. They were especially proud about having a computer located in their village. The tools generated a sense of prestige for the whole community. Community members were swift to inform their neighbors of the PGIMS project. The tools were often used in such a way as to give prominence to the village. At a large regional meeting the Tepulang villagers recorded the event using the justification that they could show the results to the other community members who could not go to the meeting. Duly, they recorded the meeting with much fanfare, and the result was that the village and the PGIMS project received substantial public exposure. Yet on return to the village, there was no interest by the two representatives who recorded the meeting in showing the video material to the other community mem-

bers. This material was soon forgotten and eventually erased. It is speculated that the intended objective of the exercise was to be seen in public using the equipment and that the information from the meeting was of lesser importance. The individuals undertaking this activity on behalf of the community felt they had enhanced their social prestige through their association with these high-tech tools.

Increased (in Benung) and decreased (in Tepulang) community ability to own and control tools

The ability of a community to organize itself is an indication of empowerment capacity. One sign of ability to organize came from the way in which the communities chose to manage and mobilize resources around the tools. Effective management is an indicator of the communities taking ownership and showing a level of mastery over tools which are novel and have the potential to intimidate people unused to them.

Benung was efficient in managing the tools. The computer was meticulously maintained, and the other equipment was kept in a locked room. Village elders considered password protecting the information on the computer. The village administration and other power brokers in the community invested time and resources into managing the use of the tools and locating them in a neutral and accessible location. They organized for the electricity bill to be paid by the village through the community tax and oversaw the development of the list of regulations to govern the use of the tools.

Tepulang was more haphazard in their management of the tools. The video and camera equipment were frequently scattered throughout the village and there appeared to be no centralized or recognized system for managing the equipment. There also appeared to be little willingness to pay for the upkeep of the computer. There was reluctance to create a list of regulations due to a feeling that the tools should be accessible to everyone in the community.

The ability to manage the tools is indicative of empowerment capacity, but it appears from these examples that this was dependent on preexisting conditions in the communities.

Empowerment Summary

The empowerment framework revealed that different catalysts of empowerment were more significant than others at different social scales. For an overview of these trends, the empirical findings of the

	Empowerment of the individual	Individual empowerment capacity	Empowerment of the community	Community empowerment capacity
Information	↓	↑	↑	↑↓
Process	↑			↑↓
Skills	↑↓	↑↓		↓
Tools		↑	↑	↑↓

Figure 2. Summary of findings using the empowerment framework; upward arrows denote increased empowerment and downward arrows denote disempowerment

PGIMS research have been put into the empowerment framework summarized in Figure 2. Further results are summarized below.

Comparison of empowerment and empowerment capacity

The above analysis, indicated by specific observed incidents, demonstrates that the PGIMS project both empowered and disempowered individuals and communities. In particular the results show that empowerment and empowerment capacity are more closely related to the multimedia components of the project, rather than the geographic/mapping element of the technologies. Overall, the PGIMS project appeared to fit into, rather than change, the preexisting power structures of the community and region. In itself, PGIMS did not lead to significant structural change within the communities, although there was evidence of raised and diminished power at the individual level. Furthermore, there is no evidence that the PGIMS project facilitated structural change in power for the two communities in the region (an empowerment requisite identified by Ristock & Pennell, 1996; Thomas, 1992), although the communities experienced success in influencing certain decisions.

It would have been useful to separate empower-

ment from empowerment capacity in the analysis, because it is in the latter category that the potential can be seen for the project to empower the individuals and communities in the future. These internal changes in capacity are likely to be more substantial and, hence, more permanent than the direct indicators in empowerment observed in this study. Observed indicators of increased (and in some cases decreased) individual empowerment capacity included heightened (and lowered) self-esteem, enhanced critical awareness, and improved access to new economic opportunities. Observed indicators of increased (and in some cases decreased) community empowerment capacity included heightened (and lowered) confidence, stronger community cohesion (between old and young), an improved sense of cultural identity, demonstrated independence from external collaborators, an ability to own and control the information and tools, and the enhanced ability of women to organize themselves.

Comparing social scale and catalysts of empowerment

The empowerment framework revealed that different catalysts of empowerment were more significant than others at different social levels. Individuals appear to have been more empowered by the skills learned and by the participatory process used. The skills that the individuals acquired helped to alter their social role within the community and wider region. Combined with this for some people was the influence of the process which, by ensuring that less powerful people were included (particularly women), served to increase the influence of these people in project decision making.

At the community level the primary catalysts of empowerment appear to be the information gathered and the tools used by the PGIMS project, as these were used to enhance the community's power over outside groups or individuals. These two catalysts were owned and used by the community as a whole, as opposed to the skills and the process, which empowered only individuals. The empowerment capacity of the communities, indicated by, among others, stronger cohesion, identity, confidence, and ability to organize themselves, was most influenced by the information, the process, and to a lesser extent, the tools.

The benefits of individual empowerment can conflict with community aspirations for empower-

ment. Individual motivations for learning these new technologies are often selfish and not aimed at benefiting the community. Also, greater access to new economic opportunities resulting from the new skills contributed to individuals being hired away from the community, decreasing the community's capacity for empowerment.

In Benung the computer operators were motivated for both personal and communal reasons. Their actions were more directed by the decisions of the community, perhaps because of the more communal nature of Benung. As a result, their capacity to take a greater role in community decision making and to access new economic opportunities were raised because of the PGIMS project. In Tepulang one individual appeared to be involved in the project for personal benefit. This motivation hindered the community from benefiting because he did not want to share his skills with other community members or take direction from the community. The conflict surrounding the PGIMS project led to the disempowerment of the operator within the community and overall loss for the community because the full extent of empowerment capacity of the PGIMS project was never realized.

In the long term, those individuals who worked with their communities benefited more than those who did not, by gaining rather than losing status in the community. Several examples already discussed show how the community is still able to exert strong control over individuals who try to act selfishly, such as the operator described above or the informants who tried to unilaterally record their own information.

Examining empowerment and disempowerment

In concurrence with Harris and Weiner (1998b), this research shows and provides clear examples of how PGIMS simultaneously empowered and disempowered people within the two participating communities, as well as how it empowered and disempowered communities within the region. This happens in two ways. The first way was through the PGIMS project, impacting some individuals and communities, giving them relative power over those that the project did not reach. For example, obtaining these skills gave the trained individuals an increased sense of self-esteem at the expense of those who were not trained, and who consequently felt dimin-

ished. It can be assumed that the increased confidence of the participating communities might also have been at the expense of neighboring communities.

The second way is through the project impacting individuals or communities differently. As shown earlier, obtaining technical skills empowered some individuals but disempowered others, depending on their personalities and their relationship with the community and to the project. At the community level, the project contributed to one community developing increased cohesion and ability to organize its information and tools. However, in the other community the project only added to the existing state of conflict and disorganization.

Comparing the two communities

Despite the PGIMS project's more or less equal implementation in both communities, they appear to have been empowered by different catalysts and the observed indicators of empowerment differed greatly.

Benung appears to be empowered by the information that they collected and through the manner in which they used it to influence decision-making processes. This strategic use of the information may have only been possible due to the preexisting high level of community cohesion and the strength of the governing institutions in the village. The community was sufficiently high in empowerment capacity that they recognized how use of the information could increase their power base. Different catalysts of the PGIMS project, such as the information, process, and skills, further increased this empowerment capacity, with no catalyst appearing to have had a negative effect.

Conversely, Tepulang appeared to be initially empowered by the superficial benefits of having the new tools, as they were able to use them to improve their bargaining power with outsiders. Empowerment in Tepulang was based on having the tools located in the village and the prestige and "novelty factor" associated with this. It was not based on strategic collection and use of information with the intention to influence decision making. It is unclear how effective or lasting empowerment related to the use of the tools will be. The low pre-existing empowerment capacity in Tepulang, particularly its low level of community cohesion and poor ability to organize, meant that these villagers

were less able to use the PGIMS strategically. Different catalysts of the PGIMS project diminished their empowerment capacity further, although there were some exceptions: notably, the enhanced ability of women to organize themselves; and the increased cultural identity through learning about local history, culture, and *adat*.

Empowerment in the PGIMS project appeared to be significantly affected by preexisting conditions within the communities. For example, computer operators who were mature, committed, and had good relations with their community became more empowered by the project than the operators who were more immature, less committed, and in conflict with other members of the community. Likewise, a community needed to already be cohesive and well-governed in order to take advantage of the PGIMS project and use it in a meaningful and efficient way to increase and consolidate their power. It further appears that PGIMS, if developed in a community that is fractured and poorly-governed, may heighten levels of disharmony. In other words, the higher the empowerment capacity an individual or a community already had, the more likely they were to use the PGIMS project to empower themselves.

Evaluation of the Empowerment Framework

There are various ways to evaluate empowerment, each with different goals and methods (Elwood, 2002; Heckman, 1998). This paper used a framework proposed by Corbett (2003) and Corbett and Keller (in press) to present an analysis of empowerment that showed the impact of a customized PGIS project on individuals and communities in West Kutai, Indonesia.

The project team found that the framework presented a clear and logical structure with which to categorize field data and analyze empowerment. The framework analysis revealed that some catalysts of the project were more instrumental than others at different social levels in the community. It also was useful for differentiating between increasing power and increasing empowerment capacity.

Two weaknesses of this empowerment framework analysis concern the analysis itself, and issues associated with the use of indicators.

1. Weaknesses of the analysis include:

- Determining to what extent the PGIMS project catalysts contributed to observed indicators of empowerment or empowerment capacity, as there may have been other, more significant external factors influencing the emergence of these indicators.
- Determining which indicators belonged in which cell of the empowerment framework. Sometimes several catalysts may contribute to observed indicators of empowerment or empowerment capacity. For example, the participatory process used in this project empowered the women computer operators by stipulating that at least one woman should be given the opportunity for training, but the skills they were taught could also be said to have empowered them. Similarly, several social levels may be affected by a given catalyst at the same observed event, making it difficult to determine in which cell the indicator belongs. For example, the participatory process can be said to have increased a marginalized individual's involvement in decision making; it can also be said to have increased a community's cohesion through increasing involvement of marginalized community members.

2. Weakness due to the use of indicators include:

- Observations rely on the researcher's interpretation and judgments. Possible causes of bias or error in interpretation include cultural differences, language constraints, lack of objectivity, and closer associations with certain individuals. It might have helped if the researcher involved community members more directly in the interpretation of data, although this approach also has the potential for bias and error.
- Indicators may be small and internal, making them difficult to observe. Some indicators of empowerment capacity, such as feelings of self-esteem, require delicacy in the questioning of the researcher and self-awareness and articulation on the part of the respondent.
- It was sometimes difficult to determine how permanent the observed indicators of empowerment or changes in empowerment capacity were, especially since the study took place over a fairly short time.

There is a need for further research to address these weaknesses, and in particular to test whether the PGIMS process and technologies developed when working with Dayak communities in Indonesia are universally applicable or are limited by the geographic and cultural setting in which they were created. Such a study is currently being undertaken by the authors with the Chemainus First Nation on Vancouver Island, British Columbia, Canada.

Summary: Implications for PGIS Initiatives

As noted by Kyem (2004b, p. 14), PGIS projects "target empowerment as a direct outcome" of their activities. This paper has shown that when examining PGIS initiatives, it is inadvisable to assume that a particular project is empowering across all social levels. Rather, there is a need to analyze what aspects of the initiative are empowering at what social level. This can help project designers better plan a project to achieve certain empowerment targets. There is also a need to differentiate between increasing empowerment capacity (something that is internal and might be long lasting) as opposed to increasing empowerment itself (something that may be more visible, but that is likely to be less long lasting). ■

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