1-1-2006

Technology and the People of Fondwa: An Incremental Absorption

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Abstract

The author spent considerable time in a small rural village in Haiti. In addition to the environmental stress of the region, there was an absence of basic infrastructure to support the basic necessities of life. This article reports on the introduction of a solar cooker to the community in a culturally sensitive manner. The community absorbed that change and went further, into computer networking, and a small university. The literature was useful in the process of working with the people, as reported in this article.

Keywords: technology, appropriate technology, rural development, networking, technology transfer.

Introduction

Fondwa is a village of about 7,000 people spread out around the hills and valleys in southern Haiti. There is no electricity or running water, and to get to the nearest paved road, one would have to traverse mountain trails. What relevance would this community have for this journal? The author has spent considerable time in the area and worked with the community to assist them in their attempts to overcome the effects of inadequate infrastructure, and become part of the global information technology revolution.

In 1996, a visionary priest who was born in Fondwa and moved to Port-au-Prince to study Accounting and Economics, returned to this desolate part of the country to help organize the community. Fr. Phillipe knew well that all the young people were forced to leave the village in search of employment. If unemployment hovers around 66 % in Haiti (CIA, 2003) it could be higher in this region. In fact, 80 % of the Haitian population lives in abject poverty (CIA, 2003). Fr. Phillipe first founded a farmer's cooperative named Assosyasyon Paysan Fondwa (APF) so that the people themselves would begin to have some control over their lives. They soon planned to locate faucets around the village to access water from a nearby spring. A school was started and attracted children from several miles away, and also former residents who returned as teachers. The environmental devastation is obvious to anyone passing by, as it is almost everywhere in Haiti. APF also developed a reforestation program involving the adults and children in the village.

All this planning generated considerable excitement, but it soon became clear that nothing would be possible without an infusion of funds. The Haitian government was in no position to make grants, so Fr. Phillipe started a concerted effort to raise money for the village from foreign sources. The villagers elected a committee to manage the planning and respond to the growing needs of the people. It conducted its deliberations in public and made decisions for the community. Illiterate though most of them were, their keen

sense of business and the natural human yearning for self-improvement fostered an air of excitement throughout the area.

The author will examine the evolving acceptance of technology in Fondwa starting with the evaluation of solar cookers and progressing through a cyber café and an embryonic university. The role of the community leaders in informing their peers and educating them in the uses of a particular technology was critical to implementation of each new device. The role of the researcher could be critical in ensuring that someone from outside the community was not disruptive of the local culture. The theoretical underpinnings that support the actions of the researcher and the practical realities of implementation could guide future projects in areas where technology was previously totally absent.

Technology Transfer

Using Hofstede's (1980) four dimensions of culture, Kedia and Bhagat (1988) suggested difficulties inherent in the implementation of technology transfer between cultures. They identified four characteristics of the absorptive capabilities of people who are targeted to receive technology. First, technology transfer is more readily accomplished between cultures with similar attitudes toward avoiding uncertainty. Second, there is likely to be resistance to technology, if it changes the distribution of power, status and rewards in the receiving culture. Third, individualistic cultures will be more receptive to the transfer of new technology. Finally, masculine cultures are more effective in absorbing and diffusing new technology. It might be deduced that the diffusion of technology is the clearest sign that the transfer has been accepted into the culture.

In this paper the author will examine the four characteristics above as they relate to the remote community in Fondwa, Haiti, and how the community has planned to absorb the technology in their lives. In all cases, the impetus came from the local residents not the researchers, or foreign visitors. The foreign visitors most surely raised the consciousness of some of the villagers, and perhaps gave them some ideas. There is important literature on the methodology and applicability of management techniques with which researchers involved with technology transfer should be very familiar. Kanungo and Jaeger (1990), Deihl (1987), Marcotte and Niosi (2000), Luckett, Ngubane, and Memela (2001), and others have published valuable work that will be referenced at appropriate times in this article. Their work and the author's practical application and experience in Haiti could advance the literature in the area of technology transfer in developing countries.

Technology transfer should include management training as third world businesses are increasingly linked in the international trading environment (Srinivas, 1996). However, in countries where there is poor infrastructure, access to any form of training is practically nonexistent. This will become evident in the discussion on Fondwa. Srinivas (1996) conceded that this would not be easy, but should be instituted

nevertheless. He also asserted that management techniques and training should reflect local cultural practices.

Marcotte and Niosi (2002) reported on technology transfer to China, and the forms of knowledge that may be transferred. The fact that developing countries received little technology transfer was due to the failure of developing countries to benefit from interfirm transfer. Marcotte and Niosi (2002) distinguished tacit knowledge from codified knowledge. Tacit knowledge was specific to each firm, and without interfirm communication, that element of the transfer was missing.

Jaeger (1990) cited the work of Kessing (1974) and others in concluding that culture was a set of theories of behavior that was shared by a group of individuals, and not merely an individual characteristic. He referred to Hofstede(1980) and Glen and Glen (1981) to confirm the link between culture and management. This observation could explain some of the phenomena that surfaced in Fondwa. Jaeger (1990) cited an example of a good fit between western values and those of developing countries; he stated that bureaucracies with hierarchical and well-defined relationships fit well in many developing countries, where the educated elite often occupy positions of authority and maintain a distance between themselves and the employees.

The people and their projects

A course in environmental management at Fairfield University was the catalyst in engaging a group of students in the search for alternative sources of fuel in countries where there is significant environmental stress. The instructor of the course asked the author to describe Haiti to the class. Inevitably, the class discussed the scarcity of trees and consequent soil erosion, based on available information (Worker, 1994). After a few weeks of research and discussion, the students identified solar cooking as a desirable means of saving the environment and cooking meals. The students researched and identified a well-designed commercially produced solar cooker that was viable in a rural setting. They also successfully sought funding to acquire three cookers. The students at the university tested one cooker. The students and the instructor asked the author to deliver the two remaining solar cookers to Fondwa. The uncertainty of conditions in Haiti made student travel impractical at the time. The village committee had assembled the leadership and many others to witness the demonstration when the cookers arrived in Fondwa. Gorman (2002) described the types of knowledge and the roles each might play in technology transfer. Through most early history, the transfer was mostly tacit and involved apprenticeship for the actual transfer of knowledge. In rural Haiti as in much of Haiti where due to the rate of illiteracy, most of the transfer involved the equivalent of apprenticeship, since only through practice that knowledge is transferred. As described above, it was demonstration and supervised repetition that transferred knowledge, because there were few training institutes that would be affordable to the typical villager.

However the researcher as the innovating agent needs to be conscious of Niehoff and Anderson's (1964) ten characteristics. The researcher thus deferred to the community leaders and professed to have no knowledge of the operation of the unit. The only caution

the researcher provided was the warning that the utensil inside the cooker could get very hot. Thus the cultural sensitivity and respect for the local customs was uppermost in the author's mind. He did not offer any instruction or demonstration. Instead the author informed the group that he intended to learn from them. Whereupon the leader of the group picked the unit up, took it outside and began to give orders to the cook about the menu for lunch and what could be cooked in the solar cooker. They decided to boil green bananas prior to frying them as they do at most meals. The water boiled and the bananas were delivered to the cook to complete the preparation.

Von Hippel (1995) proposed three possible patterns in what he called "The Lead User Methodology."

Manufacturer-Based Design: Effective market research develops information on user needs. The manufacturer combines this information with available in-house solution knowledge to create a product or service that is responsive to user needs.

Iterative User and Manufacturer-Based Design: The manufacturer and the user engage in problem solving in an iterative manner. There is a trial and error process as each stage is designed and tested n site.

User-Based Design: Solution information is transferred to users. Users then develop a new product or service that satisfies their own needs.

Scheraga, Tucker, and Tellis (2000) described this particular implementation of the Lead User Methodology. In this introduction of technology the authors implemented the first of the patterns since the particular cooker was acquired from the manufacturer, and thus was a "manufacturer-based design" as von Hippel classified it. It was not long before the community found the device unusable for a variety of reasons, including the size of the cooking pot, and the type of food typically eaten in the village. It is noteworthy that the apparent disuse of the technology did not result in total abandonment of the concept. Clearly the local community accepted the viability of an appropriately designed device.

Tucker and Tellis continued to disseminate information in the non-academic press, and one particular publication resulted in what was to become phase two of the von Hippel patterns. In more recent work von Hippel explored the concept of using "toolkits" as an alternative approach to develop usable products (von Hippel and Katz, 2002). An engineer in St. Mary's, Ohio used an article by Tucker and Tellis in Company (1998) as the basis for a Rotary International project proposal. The engineer redesigned the original solar cooker so that it could be assembled and disassembled easily and hence, easily transported. An important feature of the redesigned cooker was that it cost only one quarter of the original. The toolkit (von Hippel and Katz, 2002) became relevant in this phase as the users soon realized that the design needed further modification. However they had no means by which to execute their ideas. The author accompanied the engineer to Fondwa. Fr, Phillipe assembled a group of schoolchildren to learn how to assemble the cookers, hoping that they would learn a skill that might serve them well in the future if Fondwa became a center for the assembly of solar cookers.

Since the redesign at this point did not involve the local user community, it could not be included in the "iterative user – manufacturer based design" described by von Hippel (1995), but as von Hippel and Katz (2002) pointed out, the engineer was freed from the design responsibility as the users developed the design from their intimate knowledge of the terrain. As the young people were assembling the cookers, the author observed one of the workers in animated discussion with his team. This young man had moved to the user – manufacturer based design. As one of the assembled units was being tested with a bowl of water, this young student asserted his conviction of the impending failure of the design. He explained the environmental conditions to the engineer. Apparently in this hilly region, the sun was frequently obscured by clouds and by mountain shadows. It would be necessary to move the unit continually to catch the sun. Polanyi (1966) described tacit knowledge, which is specific to each firm, and codified knowledge. However, in rural Haiti, there are no firms, and hence tacit knowledge is nonexistent. Polanyi (1966) asserted that supplier employees passed on tacit knowledge to recipient employees. The bakery had to send potential employees to the capital for training. Since none of them could read, an "instruction manual" would be unusable, but a running bakery was able to transfer the technical knowledge to the student bakers.

Furthermore, the young student told his team, that without a cover on the top of the stove, too much heat would escape while the sun was obscured, making it highly inefficient to complete a task. He asked the engineer if he could design a transparent cover, and a device to maintain the cooking pot level even if the cooker was tilted, as it would have to be to catch the sun. The engineer explained that both items were extremely important and agreed that they were essential. His only concern was the cost of producing units with those features. The young man replied that without them the units were unusable. In fact, the test proved him correct, since the cookers were unable to warm the water sufficiently in one hour. The engineer accepted the suggestions of the local people and the proposed design of the local users. He would have to return to the U.S. to determine the impact of those additions on the total cost of the cookers and return with a prototype for testing by the local community. Clearly, this step was important because in stage one it was determined that while a solar cooker was viable, the cost of the manufacturer-based design was too high, and the size of the cooking pot was too small for the size of the average family. In this stage, the cost was reduced, the size of the pot was increased considerably, but other local conditions rendered the redesign unusable. All this was done prior to major production, so the iterative dialogue between the users and the manufacturer was productive. Rosenberg (1980) would classify this phase as "learning by using" under the evolutionary approach where user feedback is important. Cognitivists consider learning-by-doing to be simplistic (Simon 76). Mere access to information is no guarantee of the capacity to interpret adequately such information and then to use it effectively (Marcotte and Niosi, 2000).

The solar cooker project did not reach the final stage of local design and production, mainly because of the inability to obtain materials reliably, and the infrastructure to support production. However, the experience convinced the village committee that

developing some local infrastructure to support business ventures was critical to the survival of the region.

Rural Haiti - as much of the country – suffered from poor infrastructure. Where there was electricity, it was unreliable. There were few radio stations, and fewer television stations. Thus, communication was largely by word of mouth, effectively depriving organizations of interfirm knowledge exchange. Marcotte and Niosi (2000) described interfirm technology transfer as one way to access technical and organizational knowledge in developing countries. They also stated that some companies learned very quickly, how to use the knowledge acquired during technology transfer. Such examples of innovation and creativity were evident in Fondwa.

The author and his colleagues were invited to assess the viability of starting a bakery in the village. The university team of faculty and students assisted in developing a series of questions related to the surrounding region, including the population, the climate, the estimated quantity of bread currently sold by vendors, and the availability of raw materials such as flour. Based on the data that was gathered, a team of MBA students developed a business plan for the bakery. In 1998, the bakery started operations and within one month began to show a profit. In fact the bakery was successful in repaying a microfinance loan on time. Kanungo and Jaeger (1990) have raised the issue of developing indigenous management in developing countries. They pointed out that when the prospects of financing the organization and obtaining appropriate technology were inadequate or uncertain, then organizational efficiency suffered. They went further, in suggesting that political stability was essential to creating confidence in the business community. The bakery had to cope with all the factors Kanungo and Jaeger (1990) mentioned above. There was no infrastructure, and political instability was rampant. To overcome so many obstacles, was a remarkable achievement for the villagers. However, it was not clear whether management knowledge was available in the area, as discussed later. Initially the university team investigated a solar oven capable of producing enough bread, and identified a unit that met its criteria. However, the environmental conditions and the uncertainty of consistent energy precluded its acquisition. Instead, the bakery acquired a locally designed and installed diesel fired oven and a generator to provide the power for the various presses and the oven (Tucker, Tellis, 2002).

Luckett, Ngubane, and Memela (2001) developed a phased plan for designing a management system in a rural community. The Fondwa bakery was technically functional, because each employee had a physical task in the bread-making process. With the APF team leading the project, the researcher did not intervene in the day-to-day management of the bakery. However, it would be surprising to find people in the village with management experience. This agrarian community was only equipped to deal with matters related to farming. The bakery was run in an informal manner, with no discernable management structure. APF only showed interest in the cash drawer which they used to pay bills for materials. They did not have a control system in place to deter any pilferage. A future study could examine that aspect of the project in the light of studies such as Luckett et al (2001). Deihl (1987) noted the failure of management in "instance after instance" citing a lack of training for middle-level people. Deihl (1987)

cited the lack was for philosophical reasons, indicating that the transferring agent made assumed that the local people did not have decision-making skills, those skills could not easily be transferred.

Throughout this process, the village committee, and the people were not intimidated by the technology introduced into their lives. They were enterprising enough to extend electrical cables from the generator in the bakery to other locations on the property so that radios and lights were placed in areas that were not previously usable except during the day. Most Haitians start work at dawn and continue until dusk, so there is limited need for electric lights until the sun sets.

The earlier discussion of Lead Users is relevant in this application because von Hippel (1995) defined lead users as having two characteristics: they face needs before others in the community do, and are positioned to benefit from devising a solution to those needs. Clearly, the innovators who developed the bakery had to resolve the technical obstacles to obtain services such as energy and water supply, but in solving them, they could have positioned themselves for further creative activity.

The telephone system in Haiti had a reputation for unreliability, resulting in unpredictable interruption of service. Most businesses were forced to resort to generators to be sure of a continuous supply of electricity. The waiting period for an applicant to receive a new telephone line was over seven years. The nearest telephone to the village in Fondwa was at least 20 minutes in a car or bus after one walked to the location where a passing bus might stop. Thus, it was another application of user-based design that confirmed von Hippel's (1995) principles, when across the street from the bakery the author documented a newly installed telephone available to customers for a fee. A cable connected to the generator in the bakery supplied the power for the telephone. The cable was pulled across the street to a little store that was started when the bakery became operational. The branches of trees provided support for the cables going across the street.

However, behind the store was a small house that APF rented from the owner. In the front room were 5 reasonably recent PCs connected in a local area network. The power from the bakery's generator was harnessed not just for the telephone, but also to power 5 computers. APF was conducting classes in Excel to help local merchants to manage their businesses better. The technology and design to connect the cables, construct the oven for the bakery, design and install the electric lights in both the bakery and the computer room was all local. No doubt the suggestions and perhaps the ideas were from foreign visitors, but the implementation of those ideas was entirely indigenous. Thus, even without the benefit of infrastructure, and formal education, there were individuals who were enterprising and creative enough to design local solutions. The "toolkit" in this case was a visit to Fonkoze's main office in Port-au-Prince where one bright person observed the cables connecting the PCs. He acquired information and instruction from his peers, and upon his return to Fondwa, started implementing the network. The researcher installed the Fonkoze network several years earlier, with the active assistance of the person in charge of technology at Fonkoze.

The technology became part of their lives to the point that the five PCs mentioned above were connected in a Local Area Network, and one of the units used a satellite telephone to permit email over the Internet. Families in Haiti were now able to speak on the telephone with siblings in other countries. The cost of the calls was a minor detail for the individuals in the Diaspora who were suddenly able to have a regular conversation with a loved one in Haiti.

Similarly, the literate family members used email for more regular communications. In a country where foreign remittances were the major source of currency transactions, these messages were of vital importance. APF developed the computer room into a "cyber café" to service both the local residents and the numerous international visitors to the Community Center.

Most recently, Fr. Phillipe developed a plan with the University of Guantanamo, Cuba to start a university in Fondwa. It will serve students from all over Haiti who must promise to return to their communities to share their knowledge and implement community projects that were designed while at the university. However, behind the store is a small house that APF rented from the owner. In the front room were 5 reasonably recent PCs connected in a local area network. Thus the power from the bakery's generator was harnessed not just for the telephone, but also to power 5 computers. APF was conducting classes in Excel to help local merchants to manage their businesses better. The technology to connect the cables, construct the oven for the bakery, design and install the electric lights in both the bakery and the computer room was all local. No doubt the suggestions and perhaps the ideas were from foreign visitors, but the implementation of those ideas was entirely indigenous.

Conclusion

The literature in the area transfer of technology is replete with cautions regarding the preservation of and respect for the local culture. The researcher plays an important role in the assimilation of technology and other innovations in a way that places the local people in control of the decision making. The author has provided several examples of technology introduction including computers, networking, and the Internet in an area that had no infrastructure at all. The genesis of the introduction of technology in this community lay in the invitation by the Fondwa Peasant Association to the researchers. The community already distinguished itself by harnessing a natural spring and piping the water to various locations throughout the village. Most people had a short walk to a communal faucet instead of a trip of perhaps two hours, which is common in Haiti. The community followed that project by cutting a road by hand about two miles long around the hills to the main road.

APF realized that they were losing their most important resource (their youth) as they migrated to the capital, Port-au-Prince in search of work. Their invitation to the researchers was an attempt to address this problem. They asked the researchers to assist in the development of a bakery in their village. Though there was no electricity and no

running water, and the availability of the raw materials problematic, they were sure of the need for the product, and more importantly, deeply interested in creating employment in a self-sustaining venture. The electricity for the bakery was supplied by a generator acquired for the bakery, but with extra capacity for other potential projects.

One of those projects was a computer room with five PCs that were networked and using a satellite telephone, connected to the Internet. Currently the only use for the Internet is email, but a university is scheduled to admit students in 2004. Those students might need to conduct online research. The author will continue to be involved in the community to assess the effect if any, of the computer technology and the Internet in particular, on this rural community. Most of the residents have never had electricity, but will soon have access to some good information and some disturbing material on the Internet.

With each technological introduction, there is some cultural alteration. The use of email has linked people who were unable to communicate before. However, since the users are mostly illiterate their messages have to be entered by staff in the café. The cultural distance and the digital divide though still considerable is showing signs of closing slightly. Future research projects could examine the effect of the computers and networking in Fondwa particularly once the university has been in operation for a few years.

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