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Can Knowledge Management Help in Poverty-stricken Countries and Crisis Situations

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Abstract: At first sight, knowledge management for poverty-stricken countries appears to be a contradiction in terms. It sounds "high-tech" and not very applicable for "third world" countries that may not possess the necessary infrastructure. However, the aim of the paper is to show that this is not only false but that Knowledge Management (KM) has a big role to play. We begin by giving an introduction to KM systems in general before considering how they may be applied in poverty and crisis situations. We then consider specific functions of these systems before looking at some problems and possible solutions of implementing such a system.

Keywords: Knowledge management, databases, environmental issues, poverty, third world, information systems
Category: K.4

1 Introduction

We start with the all too obvious fact that many problems exist in poverty-stricken areas (starving people, poor nutrition, inadequate medicine, environmental catastrophes, and so on). Also, it is equally obvious that even "developed" countries frequently have areas that are impoverished and, of course, any country on earth can experience climatic disasters. Although the focus of this paper is definitely on poverty and crisis situations a point we will make is that often partial solutions to problems are known locally, in some place in the world, but to save lives they need to be known:

- At the right place
- At the right time
- Interactively (i.e., with expert help)

1.1 Comparison of media

	TV or Radio	Print	Databases	KM Systems
Everywhere	✓	✓	(✓) ②	(✓) ③
At the right time		(✓) ①	✓	✓
Interactive and Expert Help				✓

Table 1: Comparison of Media

In Table 1 there are three points to note:

(1) Although print can be distributed practically everywhere it is a very poor media for providing the right information at the right time – particularly in emergencies.

(2) Existing database systems are good at providing information at the right time but the necessary infrastructure is frequently not available.

(3) KM systems look to be an even better solution except that they also are not available everywhere. However, we believe that this is not only unnecessary, but that it would be counter-productive – imagine 100,000 people trying to manage knowledge in devastating flood conditions! It is only necessary for KM systems to the reach the decision makers. And this, as we shall show, is possible!

2 Introduction to KM Systems

We define a KM system as a network of servers with information that can be used actively [Heinrich and Maurer 2000]. It may consist of only a single server, perhaps with mirror sites, but its knowledge can be distributed globally using the World Wide Web and mobile technologies. To understand how networks play a large part in KM the reader is referred to [Maurer 1998].

To quote Tochtermann and Maurer "The key objective of knowledge management is to apply the knowledge which resides either explicitly or implicitly within an organisation to achieve most efficiently and cost-effectively the organisation's goals… It can ensure that knowledge is meaningful (content) relevant (context) and accurate (timely and trustworthy)" [Tochtermann and Maurer 2000]. In any third world situation this is highly relevant since, in the context of a third world situation, we assume that an "organisation" can be any political, medical, social, or emergency group.

Borghofff and Pareschi in the paper "Information Technology for Knowledge Management" ask the question "Can information technology help the growth and the sustainment of organizational knowledge?" [Borghoff and Pareschi 1997]. They answer in the affirmative – providing solutions are specially designed. Many methodologies have been developed. In the paper "Knowledge management and Environmental Informatics" [Tochtermann and Maurer 2000] the authors give a good overview of KM as it applies to environmental concerns. For example they discuss:

H. I. R. N. (Hypertext Information Retrieval Network) a system for environmental rules and regulations. They also point to, among others: a plant conservation system and PRO-PLANT a residual waste monitoring system UMA-GEFA.

We believe that any KM system should support:

Meta-data: The usual definition of Metadata (no hyphen) is machine understandable information for the web [http://www.w3.org/Metadata/]. Certainly, many man-years of work have been invested in issues such as standardisation but even one of the most active groups, Dublin Core [http://dublincore.org/], only lists one project directly concerned with environment management – the Foundations Project. [Ushold and Gruninger 1996] investigate the relationships between ecological ontologies and metadata.

However, on a higher level, metadata can be used to find people who either have the needed information or know how the find it in the most efficient way. It is this "second level" of meta-information that is valuable, and frequently easier to collect, that we will refer to as meta-data (with a hyphen). It plays a "crucial role in environmental informatics" [Tochtermann and Maurer 2000].

- Questions to experts: The point to make again here is that meta-data, in the above sense, may be one of the systems most important functions since *you* don't have to find experts. You just ask a question (by typing it) and the system automatically goes to an expert. It can enable urgent requests to reach the real experts regardless of who, what, or where they are. We shall give examples of this in Section Three.

- Annotations: Ideally, particularly in a third world area, documents should be able to be annotated by voice and we believe that this will be common place in the foreseeable future. However, in the short term, text messages that can be easily available as "sticky notes" are available on systems such as Hyperwave right now [HIP 2001]. And, since sticky notes can be placed on sticky notes this allows discussions to "erupt" wherever the need for such appears.

- Active documents: The idea of "active documents" has been presented in [Heinrich and Maurer 2000]. The authors argue that in any large system where a document will be used by many different users the same questions are asked repeatedly and hence after an initial phase most questions can be answered by the system. Once again this calls for support from server system (see Section 2.1).

- Discussion Forums: The difficulty with most current discussion forums is that they get "out of hand" very quickly. In the next section we shall describe system support to help alleviate the consequences of this.

2.1 Systemic Server Responses

Knowledge in KM network increases through usage and "systemic" server responses. Just how we can encourage a "critical mass" of system users to begin with we shall discuss in Section Four. Here we consider systemic responses. First of all, the server can make similarity checks in all sorts of media: email, discussion forums, text documents and even video since a well structured sever will make good use of attributes and good algorithms to check documents for textual similarity are starting to be available. Secondly, as we mentioned in the previous section, if users have questions they should be able to ask them, in their natural language, and receive prompt replies from the system itself. AI techniques are now available that can compare questions with answers provided by experts and stored in the database [Loerch and Guesgen 2001]. Similarly, discussion forums have been compared to spaghetti, but the system can look in archived material and compare text with segments in the earlier discussion threads isolating "similarities". The system can then alert users of previous work and solutions.

Another point to note at this stage is that not only will we have meta-data pointing to individual experts, but a good KM system will support groups of experts who can work together in "editorial board" roles. Often, the "hard" problems have no one right or wrong solution but with such groups acting as mediators the chances of any better outcome is much higher.

3 Major Functions of a KM System

There are three major functions of KM Systems we want to consider for our application area:

- Basic functions such as help in "standard" situations (see Section 3.1)
- Discovery functions such as distributing knowledge selectively on user profile: (see Section 3.2)
- Crisis functions (see Section 3.3)

3.1 Basic Functions

In the introduction to this paper we pointed to the fact that lives can be needlessly lost because knowledge that is known in one area is not known in the place it is needed. There are many concrete examples where a good KM system can make a significant difference: make buildings more earthquake, storm, and fire proof; provide flood and storm warnings; show simulations of the consequences of clearing forest by fire, etc., etc. Take, for example, the case of extreme flooding. Some areas have frequent floods and have learnt to better cope with them. But with global warming other areas such as in India have an increasing problem. Computer simulations have provided some solutions. For example, traditionally, rectangular sandbags, used for makeshift floodwalls, have been placed as shown in Figure 1.a. But with the smaller edges creating complex eddy forces it may be thought that it would be better to place them lengthways: as shown in Figure 1.b However, not only did simulations show that this, for a given weight of bag, was not so stable but that the optimal solution was to make them square as shown in Figure 1.c. It is this sort of knowledge that could be effectively transmitted by a KM system.

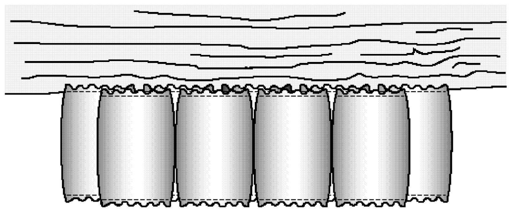

Figure 1.a

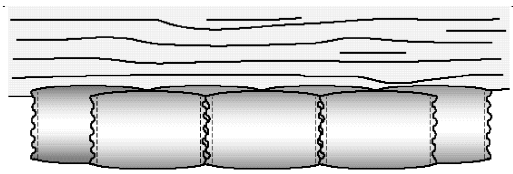

Figure 1.b

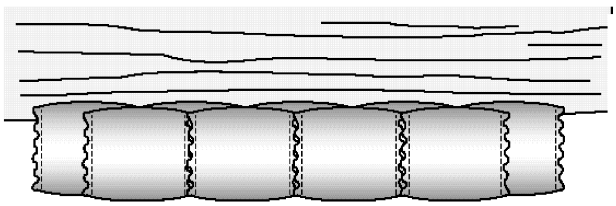

Figure 1.c

3.2 Discovery Functions

The discovery function of a KM system can find and distribute new knowledge selectively based on user profile. For example, the problems encountered by a Bedouin in Arabia , Jordan, or Syria will probably be similar and the KM system can provide tailored responses to queries. In addition, local knowledge can be effectively discovered and distributed – here we will give just three examples. First, many subsistence cultures have traditionally built their fire places using stones or bricks placed on the ground in the shape of a “U”. Often fuel is so short that dung is used.

However, according to work done by TERI [Patchauri 2000] simply breaking the side bricks in half (or using pairs of similar stone) to avoid much heatloss in the open part of the U can increase the efficiency three- or four-fold (see Figure 2).

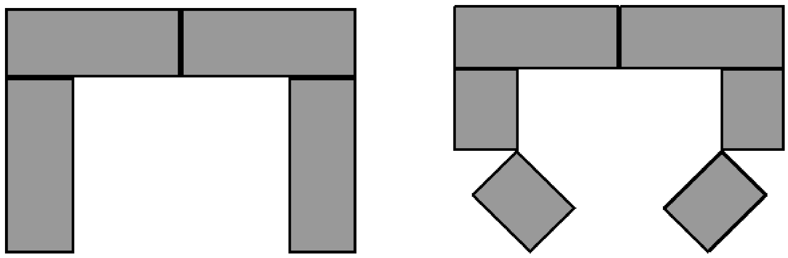

Figure 2

Our second discovery that almost defies imagination are the houses that are being built of bricks made by gluing together empty soft-drink cans! This must be the ultimate in recycling technology! The bricks are light, very good insulators, and dispose of waste material [Maurer 2001].

Schistosoma is a nasty condition found in many countries including New Guinea. The lifecycle includes a worm that enters the blood vessels when people drink water, or even just swim in water, containing the small larvae; they hatch and through the blood create bad cysts, e.g., in the liver – or they even can burrow through flesh. A partial solution to the problem now exists in New Guinea but, as far as we know, nowhere else. This is because when Ex-president Carter was visiting New Guinea he is reputed to have suggested that surely a firm as large as Dupont could develop a suitable yet cheap solution for a water filter. They did, and it consists of simple piece of material of a certain density of weave. However, variants of Schistosoma or other small organisms are dangerous also in waters ranging from the Amazon to the Rocky Mountains to New Zealand. Yet the fact that simple "Hankerchief-like" pieces made of the right material can be used to filter water is little known in such far flung regions.

3.3 Crisis Functions

In a crisis situation a KM system can be the most efficient way of getting the right information to key people – at the right time. Consider the following case. New Zealand is a country with snow covered mountains that are active volcanoes and has experienced one particularly devastating eruption just a few years ago. The flow of mud swept away a bridge with a crowded train on it. Following disasters such as this, teams of doctors, first aid helpers firefighters, and many volunteers have amassed considerable expertise for coping with such emergencies. Now with global warming we have countries such as Nepal or Northern India experiencing thawing of the permafrost that is endangering land stability. A KM system, in an emergency, could efficiently link key personnel in such areas with experts in New Zealand with untold saving of lives. Thus, even in a crisis situation we could have interactive consultation facilities, or targeted information from previous experts being presented by systemic alerts.

In addition the KM system could discover similarities between an existing crisis and past documented cases and help to resolve the current one: from hostage crises, to droughts, to etc.

4 Implementation: Some Problems and Solutions

As in any initiative of this type the problems can be summarised in terms of time and money. We need to involve the decision makers and these are probably the busiest people in a country. However, it may also be that in a particular area the local priest, politician, or teacher is a store of local knowledge and is available to help.

We need to ask organisations such as UNESCO, WHO, the Vatican, etc. to help support the System both financially and by word of mouth – particularly in the beginning. And perhaps someone from Microsoft could provide at least a server and some PCs in strategic places!

As mentioned previously, getting the system used, particularly in a third world context, is a major undertaking. It may be that people will have to be encouraged by the use of "brownie points" (as we have seen done in at least one large European organisation). Perhaps, to begin with, everyone who puts a document into the system gets a point towards some needed commodity. And the person who refers to the document generates not only points for themselves but also a point for the author. This way we encourage critical environmentally-sensitive knowledge to be both stored and used.

5 Conclusion

The system we have discussed in the paper could be implemented with just one server together with strategically placed low-end (even second hand) browser-capable PCs. We have just touched on some of the more obvious problems that could benefit from KM systems. We have said nothing, for example, about the complexities of eco-system management. We maintain that KM Server with a teams of expert editors can make decisions that may help balance at least some of the inequities we see around us.

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