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WILL DEVELOPING COUNTRIES MISS THE INFORMATION REVOLUTION, TOO?

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ABSTRACT: Information is regarded by some as the current key element of developed economies. Others even consider that there is an information revolution similar to the industrial one, especially in terms of service oriented economies. Moreover, as in the Industrial Revolution, not all countries are participants in this change. Nations that missed the manufacturing revolution use little information and produce and organise even less. They appear to constitute a dormant market with little potential for online information use. However, not all developing countries are a equally dormant cluster of nations, indeed there is a range of information development among them.

Which countries might develop their potential to use and organise electronic information? Which developing nations might avoid missing the "information revolution"? Such questions are the concern of this paper, which attempts to analyse the socio-economic and technological characteristics that developing nations require to increase online information use and to organise it. The argument is developed taking into account the fact that there are international information differences as well as economic ones, and that most developing countries aim to attain a level of self-information sufficiency, as industrial sectors do. Finally, the paper also discusses the incipient implementation of commercial database organisation by some developing countries from the western hemisphere. The argument is supported with some statistics from secondary sources.

1 LESSON OF A SHORT-LIVED HISTORY

The online industry has a short and unique evolutionary history. Online events are characterised by participation of a few countries, whose geographical areas of origin and backgrounds are well defined: they are the high income countries (HICs). The nations that are not participants of the online age have characteristics which are more difficult to group. However, the name: less developed countries (LDCs) comprises the wide range of socio-economic characteristics applied to the nations that are middle income countries (MICs), as well as to the low income ones (LICs). Most LDC nations are located in the southern hemisphere. In other words, they are not part of Western Europe, the non-market economies from Eastern Europe, North America, Australia, and Japan.

The concern of this paper is to study the two groups of LDC nations, with regard to the information features which limit them in creating commercial databases. Therefore, we make some generalizations with the aim of providing a framework which to place LDCs. However, it has to be kept in mind that similarities may be as great as differences among LDCs.

According to an early seminal work published in 1961, LDCs had the common characteristics of having tropical climates, subsistence-type economies, low levels of living, and had been colonies until recently (Ref. 6). This description of more than 25 years ago seems to apply almost correctly now, despite the fact that the world witnessed the greatest accumulation of wealth in the 60s and the early 70s. Some developing countries managed to begin industrialization processes in this period, in many cases because heavy manufacturing and labour intensive industries from developed nations, like steel and textiles moved south.

While LDCs engaged in their first industrial processes, the already industrialised countries continued their developmental evolution to reach the stage of the so-called information age. Their economies became increasingly service-oriented, achieving an economic stage, where information was the key element which optimized production processes and improved lucrative services like financing, banking, and trade.

As a result LDCs can now be defined slightly differently. They are no

longer recently independent countries, and their agricultural economies now co-exist with basic industries. However, they still keep their poor living standards and are located in warm climates. They are also termed information-poor nations, computer illiterate and regarded as industrially inefficient, in contrast to the high living standards, computer literate northern societies, which have their new efficient high technology based industries, and now strong service oriented sectors. Moreover, the description of LDCs include poor productivity which is strongly related to limited information technologies. Their production processes lack quality control and are prone to waste resources, either human or material ones.

2 MAIN BARRIERS TO ONLINE INFORMATION IN LDCs

In addition to the above characteristics of the developing world, the 1980s added a new one: they are not part of the short but revolutionary life of the online industry. Their socio-economic development restricts them from having enough institutions or individuals to generate all the required knowledge. This constraint is reflected in limited information production and a low user information demand. A closer look at the process of generation, recording, dissemination and use of information can help us to understand the barriers which prevent the entry of LDC's into the online business.

2.1 Generation

The generation of information is a main barrier for LDCs, many of which are still oral-based societies, where the spoken word is a better communication medium than the written. They lack writers in most fields and literary authors are scarce. Besides, at the root of the information problem of LDCs lies their limited amount of research. For LDCs research is an expensive investment: Unesco estimates that only 10reflect the same trend, since it is considered that only 6of the international research budget is spent in LDCs (Ref. 13).

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This lack inhibits database production, since research has the important dual role of producer and consumer of information. It is known that Dialog and SDC appeared thanks to contracts with NASA and the US Department of Defence. Nowadays, North American, European, and Japanese research not only generate information but heavily use online systems. The lack of this structure, which is typical of late stages of economic development, limits LDCs generation of information and consequently the production of commercial automated systems.

Governments, through their ministries and departments, have played the major roles in the generation of databases in HICs. Certainly the bulk of the information generated by government offices accounts for the major output. Governments of developing countries produce information, too. However, many areas of national activities are still untouched in terms of statistics or reports. Administrative processes and know-how are lost for lack of information recording or poor information control. Statistics of many activities are collected insufficiently. In some developing countries this fact is seen as a positive characteristic; in a few such as Equatorial Guinea, Guinea and Kampuchea, it is even illegal (Ref. 10)

Furthermore, in the HICs arena, databases are increasingly being dominated by profit-making organizations. Institutions from the banking, financial, and media sectors have entered the field, taking a strong hold due to the large amounts of automatically generated data. Again, the HICs have here a domain that will be difficult for LDCs to penetrate. Large private companies have their information share which is as monopolistic as their actual share in areas where they generate the information, e.g. news agencies: New York Times and Reuters (Ref. 14). It is difficult for the LDCs to obtain a stake in the market sector. Previous information limitations of LDCs become greater in this sector: the only areas that they may have are those of local character, where national companies are prevalent.

2.2 Recording

Countries strong in research are also strong in recording their academic and scientific achievements. They have publishing houses and large numbers of scientific journals to disseminate research findings. Major countries that pro-

duce databases now began their information evolution with the publication of journals; as a result they control the leading international periodical literature. The high output of journals led them, in turn, to initiate indexing and abstracting activities (A&I). Later, the availability of computers paralleled with the fast growing literature, sparked the transformation of these large bibliographic files into automated databases. The important A&I services were, in Williams' terms, the spinoffs of the first databases (Ref. 14).

For example, The USA and Britain are the main database centres of the world, the first with 60systems (Ref. 8). Their strength is based on their printed information recording. A content analysis of life sciences literature conducted in the Pascal database, revealed that 47American origin, and 10the presence of these two information powers was strong, leaving only 43to seven other countries, including France.

In contrast, the LDCs have little information to start from; they account for few journals, and A&I activity has been almost non-existent. In fact two of the major problems of LDCs are that they have had limited success in recording the production of primary information, and even more limited success in indexing and abstracting their periodical literature. Most of these tools are imported from the HICs.

Publishing is a better established type of information in LDCs, although not widespread in all of them. However, their production is small. Unesco statistics show that the great bulk of book publishing, 73despite the fact that Gutenberg developed the printing press over five centuries ago (Ref. 13).

Low book production is a sign of the weak standing of LDCs to enter the online era, because publishing is an important part of the communication process of society. If a nation has not been able to record its knowledge production in book form, it is less likely that it will produce secondary information tools, like databases, in the near future, and even less so to generate full text information retrieval systems, which are emerging as substitutes for the old printed formats.

2.3 Dissemination

The dissemination of information in LDCs is, as might be expected, at the same level of their generation and recording activities, or perhaps even lower. Libraries from the underdeveloped world have not had the chance to grow like their counterparts from HICs. LDCs have scattered library services that often fail to meet the growing demands of national clientele. Libraries from LDCs lack the budgets to automate bibliographical activities, a preliminary task to database production. HIC library collections played the double role of being the bibliographic source for databases, while providing the documents themselves.

The incipient library organization and lack of information networks pose a problem for LDCs. Despite the fact that LDCs have limited printed resources, their bibliographic centres tend to develop independently from one another. Centres seem to evolve with worse organizational limitations than those of other LDC institutions; they lack budgets to acquire the ever growing literature to meet the also growing user demand. Foreign online databases now generate more demand for foreign up-to-date literature that LDC libraries seldom have. Such demand must then be met by foreign sources, whenever there is enough hard currency available.

2.4 Use

The establishment of libraries in LDCs has proved difficult because of insufficient user demand. LDC societies, as expressed above, have traditionally relied on oral transmission of information rather than on printed documents. Such factors together with educational systems that are limited on one textbook, few postgraduate programs, few or no research centres and graduates who do not read a foreign language (particularly important in the non-English speaking LDCs) limit the launching of commercial databases and the use of current HIC online systems. On the other hand, the private economic sector from LDCs have still to discover what online information can do for it. Even the LDC service oriented sector, although the more developed in the economy, lags behind in information use compared to HICs. The demand for online information to improve services has still to grow in order

to create a sizeable market for future commercial databases. In the next sections we discuss some examples of online demand in the LDCs.

Finally, in Table 1 is a list of the information barriers discussed so far, plus others that space prevents us from discussing. They are grouped for clarity purposes, although most factors play a role in more than one stage of the information process. Of course, the applicability as well as the degree of the barriers will vary from country to country.

BARRIERS TO ONLINE INFORMATION IN LDCs (Table 1)

a) Generation	c) Dissemination
lack of writing tradition	inadequate libraries
few authors	limited booksellers
few or no research programs	no library networking
scattered postgraduate studies	poor library funding
limited computing facilities	few info. professionals
small info. related enterprises	limited telephone links
lack of info. technologies	lack of data networks
b) Recording	d) Use
few publishing houses	no reading habits
few or no journals	low foreign language capability
lack of communication tech.	poorly trained researchers
little A&I activity	one-text education
few reference works	cultural barriers
limited gov. data collection	low info. demands by business

3 MIDDLE INCOME COUNTRIES

So far we have talked about LDCs, as being one block of nations.. As suggested at the beginning of the paper differences among LDCs are greater than among the HICs.. Developing nations are hard to classify, no matter

what criteria is used. If Gross National Product (GNP), which measures the wealth produced by a nation, is taken as a basis, we would find that there is a stratum of countries, which extends, with the wealthy nations on the top, to the low income countries - LICs. In the middle fall the cases that are hard to classify, which are called middle income countries - MICs - by the United Nations. They share characteristics with the wealthy nations and with the poor nations, resembling an international social middle class. Their economies are polarised, which is also reflected in the information sector. They can use information technology in one area, while they may rely on a manual system in other. For example they may have urban banking services like a European nation, while barter may take place in villages.

Some sectors from MICs are showing signs of being ready to enter the online era. The rest of the developing countries, LICs, have more problems to overcome in order to be potential database producers or even be online users. Therefore, the list of information barriers which we have listed above applies to a certain degree to MICs, while to a fuller extent to LICs. MICs countries will be the subject of the next two sections, where their achievements are described.

4 ONLINE USER DEMAND IN THREE MICs

Statistics on number of passwords are difficult to obtain, so it is difficult to determine demand from all LDCs for online information; Moreover, commercial online information is accessed through one service point in many LIC countries. Statistics on the number of passwords from three MICs could give us an idea, at least, of the online demand of the "middle class" group of nations. Venezuela, the first case, had 32 online institutional users, who paid US $60,000 for online searches carried out in 1986 (Ref. 1). Secondly, South Africa reported in 1983 that 46 institutions had contracted online services with 12 database vendors. In other words, South African figures may be reduced, because some institutions may appear as clients of more that one host system (Ref. 3). Thirdly, Mexico has about 333 institutional users at the present, who spent US $320,000 on online information in 1986.

Of the three, Mexico has the largest number of institutions offering online

services, due perhaps to a larger economy than the other two. It ranked 18th in size of GNP worldwide. Another factor could be that Mexico was probably the first LDC, in 1976, to offer access to commercial online databases, or at least it was in Latin America, having as a consequence a more established demand.

These three nations are in the upper tier of the MIC nations. Venezuela and Mexico have economies which escaped for a few years the difficult recession of the last twelve years, but fell into an economic crisis in 1982. In other words they have had more income to develop their information structure than other LDCs. South Africa, although a non-oil producer, has also a strong economy based on exports of minerals and industrial goods. Despite its social problems it has kept the development leadership in Africa.

However, the number of passwords subscribed to Mexico and the two other countries appear comparatively few in number considering the prediction that by next year there will be over two million online users (Ref. 7). It has to be said again, that the number of passwords in these countries does not reflect national demand, because institutions act as intermediaries. End users in LDCs are untouched yet by commercial databases services, as they still are to a large extent in HICs.

5 MICs' ONLINE SHARE

A quick review of the Cuadra Directory of Online Databases shows that there are just 14 commercial databases produced by LDCs; their names are listed in Table 2. This number is very small compared to the 3369 databases that are listed in the same directory. Moreover, the comparison does not take into account the size of the systems, of which some are small (Ref. 2,12). The producing countries are Israel, Mexico, South Africa, Thailand, Yugoslavia, plus the contribution of Singapore, Malaysia and Indonesia who contribute to a Thai database. Here again all these countries are regarded as MIC economies by the World Bank and the United Nations.

Since commercial databases are not products created in a vacuum, the absence of countries with low incomes - LICs - in the online markets is sig-

nificant. The database efforts of above MIC countries are laudable, because some of the other MICs with strong economies and information potential, like Brazil, South Korea, and Kuwait, are still absent from the online market. However, it is expected that more LDCs databases will enter the commercial scenario in the near future. A survey carried out in Spanish and Portuguese speaking countries showed that there were more than 150 databases in Latin America in 1985 (Ref. 4). Although not all the databases in process may enter the market, it is an indicator of the online activity which is underway in a major group of LDCs.

COMMERCIAL DATABASES PRODUCED SO FAR BY MICs (Table 2)

country	database
Mexico	BIBLAT (Science & Tech, Social Sc. & Hum.)
	SIE-BANXICO (finance and economics)*
	UNAM-JURE (law)*
Israel	MIDEAST FILE (political science)
South Africa	WATERLIT (aquatic sciences)
	ADINDEX (marketing)
	AMP CHILD STUDY (marketing)
	S A ADVERTISING RES. FOUND. (marketing)
Thailand	AGE (earth sciences, eng.)
	ENSC (environment)
	AFIC (construction)
	RERI (energy)
Yugoslavia	IRSS (chemistry)
Thailand, Singapore, Malaysia, and Indonesia	MEDIA INDEX SURVEY (marketing)

*Not included in the directory (Ref. 12)

6 EFFECTS OF HICs' ONLINE INFORMATION ON LDCs

6.1. Online information is a product designed to meet the needs of the HICs. In the main, databases record and disseminate information of the countries of their origin. Since developing countries do not yet have an important demand for online information, they use what is available. But, online information follows the already established pattern that communication between the HICs and the LDCs is predominantly a one-way flow. Online information conveys the use of solutions envisaged by the developed world, thus implicitly recommending alien means or technology discussed in it. This statement is not true in all cases, but applies to many types of information related to technology.

6.2. Online databases offer another good reason for LDC scientists to publish in the developed countries. The new reference tools ensure that the contributions by scholars are known or can be made accessible to most corners of the world. It is necessary for LDC scientists to publish in the information capitals of the world, otherwise they will not receive the necessary feedback from peers, or simply, they will be left out of the mainstream of science. Jagodzinski-Sigogneau describes the situation well by saying that "two biologists working in the Pasteur Institute in Paris may ignore each other, but each may be so closely related to the American scene that both of them receive their rewards, their information and their computerised bibliographies independently from the US and they send their papers to American journals" (Ref. 9).

6.3. Online information has reduced the demand for local information. Now, it is easier for someone in Africa or Latin America to get automated bibliographic data stored in Palo Alto, and to obtain the hard copies of the document from Boston Spa, than to manually identify and obtain local materials in the neighbouring libraries. These local materials are probably more relevant to their indigenous problems.

7 CONCLUSIONS

7.1. Information maturity, a facet of which are databases, is achieved by nations with solid socio-economic development; this maturity is normally a subsequent stage of industrialization. Most nations that missed the industrial revolution and the results of this, such as becoming colonial powers, are likely to miss the information revolution, too. Even the ability to use online information may be a difficult problem to overcome by LDCs, which is a severe limiting factor. They will continue to have fewer online users if their socio-economic conditions do not improve. LDCs with more developed economies (MICs) have better potential in the online field, therefore they may participate in the information revolution as users and as commercial database producers.

7.2. Databases are just new packages of information, formats that are still based on previous information developments. Databases are not created in a vacuum, they require the generation of information to be input, appropriate communications technology, computing facilities, and qualified manpower: all in all, socio-economic development. These factors are not common in most developing countries, or at least not all present.

7.3. The future is bleak for LDCs; some or most of them will be forced to depend in great extent from the centres of the world for online information. Despite the short past of the online industry the division of the market is already clear. The size of some databases is now so great that the task of creating another in similar subject by LDCs would be foolish if not impossible. However, they have to adopt online mechanisms to store indigenous information, especially in those fields that are strategic to national objectives, and where transborder data flow may be a problem.

7.4. The advent of more powerful microcomputers at low cost will ease database creation for LDCs, especially bibliographic files. However, the creation of bibliographic or more complex input databases by LDCs will not mean that they are at the forefront of the information revolution. The arrival of some LDCs in the international online business arena is already late and they are doomed to lag behind. HICs are entering such a well advanced database stage of full text, laser printing, optical scanning input, integrated files, and efficient information retrieval, that the online cleavage

will be comparable to the abysmal publishing division that exists between the high and the low income countries.

7.5. The building of cooperative databases is probably the best way for LDCs to succeed in the online markets. Their support for actual and new bilateral and international agreements can ease the creation of commercial databases by reducing the burden of costs, increasing the size of files, and ensuring greater demand (Ref. 11). Countries with language and cultural affinities could embark on joint ventures, taking advantage of the present support provided by international organizations.

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