INDICATORS OF INFORMATION DEVELOPMENT AT CROSSNATIONAL LEVEL: A PROPOSED METHODOLOGY

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K E Y W O R D S:

Education
Social development
Developed countries
Information development
Less developed countries

CROSSNATIONAL INDICATORS OF INFORMATION DEVELOPMENT:
A STATISTICAL METHODOLOGY

by

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ABSTRACT

Information development determines the type of information needs of a nation. In this paper, it was assessed using library and publishing indicators of 31 countries over an 18 year period. Some of the conclusions reached in the study were that less developed countries (LDCs) seem to be one cluster of nations when their information development is compared with highly developed countries (HDCs). Information development seems to speed up, until countries have met the satisfaction of basic human needs of the population. Libraries were, on the other hand, declining in HDCs during the period under study.

THE ECONOMIC BOOM OF THE 601S

The 1960s and the early 1970s marked the beginning of a new era in economic development. Industrialised countries began a transition from one type of economy to another.   Economies began leaving behind manufacturing structures to create service oriented organisations, where the pivot of developed economies was no longer manufacture. Highly developed countries (HDCs) recognised that economic and social progress was dependent on knowledge, and that knowledge had to be continously updated with new information. Indeed, countries stood at the threshold of an era of new productivity based on information, which was to become the main ingredient in gaining technological knowledge, and knowledge of management and marketing, among other multiple applications (Rubin, 1985).   Information was to become not only an important element in the drive to increase productivity, but the basis for the production of new goods and services (Masuda, 1975).

Changes in less developed economies were not as dramatic as in their developed counterparts. Despite increased income, less developed countries (LDCs) did not accumulate enough wealth to solve most of their basic problems.   Economic growth was uneven and information provision seemed to lag behind other services (O'Brien and Helleiner, 1983).   Information development was scarcely O'Brien and Helleiner, 1983 studied in LDCs, to the extent that it is still not known what kind of information development took place in LDCs during the economic boom, despite the fact that use of information had increased dramatically in developed nations.

Information development is a complex process which involves most elements contributing to the process of generating knowledge (King, 1987). The development of these elements varies according to the socio-economic development of a country. Information is generated, stored and used in high technology media in HDCs, whereas information follows similar processes in LDCs, but it is stored in more conventional media, e.g. printed records. Therefore, if countries with different developments are compared, a common information yardstick has to be found to measure their information progress.

The goal of this thesis is to study information development in relation to the social development of HDCs and LDCs. Information is narrowed to measure what could be called basic measures of

information, that is, library and publishing activities. Information is taken to comprehend measurable aspects of information activities, in particular library and publishing activities. This is a narrow specification, but it fits the availability and accessibility of statistics. It also permits the assumption that such activities occur in most countries. The same could not be said, of course, of electronically produced and stored information which is greatly limited to HDCs. Both types of economies, that is LDCs and HDCs, are compared in their social and information dimensions. The comparison is performed in an evaluative fashion, which means that assumed country objectives are measured against performance ``in order to determine whether there had been any change in performance for a given period, if so, whether the change was in the desired direction, and if so, to what extent.'' (Goldhor, 1977:vii). A discussion of issues realted to the assessment of development is included in Chapter three.

The period of information development assessed is from 1960 to 1977. These years were a period of massive economic development. The world enjoyed the highest rate of economic and social growth in history. Therefore it is considered that positive information changes in LDCs could have occurred during such time.   The cross-time approach offers a broader base for studying socio-economic and information development, since development is an evolution that takes place over long periods.   Information activities, as part of the overall socio-economic growth, also take time to expand even in periods of healthy economic expansion.   User information demands also require time to develop from sectors like education, science and industry.

It is assumed in the study that if material wealth was accumulated, and standards of living were improved in most LDC countries between 1960 and 1977 then, presumably, those countries would have relied more on recorded knowledge to improve their economies. If this is true, countries should have increased their knowledge accumulation in a similar pattern to economic development. Furthermore, if societies fulfilled their basic needs, their capabilities to create and use recorded knowledge may have also increased. Such hypothetical improvement should have increased demand for publishing, creation of libraries, and building of collections.

If countries did not improve basic conditions of populations at

the same rate as economic development was achieved, then the demand for recorded material may not have increased either. Therefore, the growth of information activities may have lagged behind that of national economic growth. Whether or not the first, the second or a combination of both possibilities is true, forms the considerations of this study.

Other political issues in regard to government systems, such as capitalism and communism, are ignored, despite the fact that they have a bearing on this problem. Political differences of this kind influence the gathering of statistics, the creation of libraries, and the use of information services themselves. However, these issues require their own study.

HYPOTHESIS AND OBJECTIVES

This work endeavours to study the development of recording and storing information activities at national levels in relation to social development with the following general hypotheses:

a) The level of national information development is positively associated with social development.

b) Information development is substantially achieved by countries when they have met basic needs of their populations.

c) The information gap between highly developed countries and less developed countries is greater than socio-economic differences.

The hypotheses are tested in the socio-economic context of a group of 31 countries, among them low, middle, and highly developed nations, between the years of 1960 and 1977. The definition of parameters taken to test these hypotheses are presented in Chapter four.

SIGNIFICANCE OF THE STUDY

Perhaps the most valid benefit from mapping information development is to enable LDCs to understand their own information problems.   Little is understood about national information problems. LDCs show little awareness of each other, despite the fact that they may share similar struggles to overcome

backwardness in information provision (Blickenstaff and Moravcsik,

Furthermore, countries in the southern hemisphere, where most LDCs are located, have entered this information age with an eagerness to understand their information needs.   The study of the information stocks and recording activities in LDCs can contribute to the identification of macro information needs in LDCs. Government agencies from the underdeveloped nations can benefit by knowing how their countries score in the activities of recording and storing information at the international level

On the other hand, there is a new trend in the development of information systems. They are becoming international. There are examples of efforts by international organizations to create transnational cooperative information systems. Unesco, and other UN bodies, have launched programmes such as UNISIST, UNIDO system (industrial design), INIS (nuclear sciences), AGRIS (agriculture), and bibliographic projects such as the Universal Availability Program (UAP), and the Universal Bibliographical Control (UBC) (Neelameghan and Tocatlian, 1985). The best way to succeed in helping   to build these international information systems is by understanding   the present information development and the socio-economic milieu where information is fostered and used.

Finally, the contribution of a study, such as this, to the description of information growth in relation to social development may enable policy makers to undertake purposeful planning, and ensure resource allocation closer to the optimum (Jequier, 1983; Wionczek, 1983).

DEFINITION OF TERMS

The two key concepts used in the work are information and development.   Both terms are widely used by many disciplines, although each discipline may give them different connotations. So, in the next sections, the meaning given to both terms in this work is discussed, along with assumptions and some further limitations of the research.

Definition of information

Information is differentiated from data in the terms defined by
the UN Centre for Transnational Corporations (1983), where data
are defined as symbols, and information as the combination of data
into messages intelligible to human beings; that is, the processed
form of the raw material. In this thesis the definition of
information is further narrowed to include messages of data
arranged and recorded in printed formats, which are in most cases
labelled as secondary sources of literature.

Furthermore, the word information is used only in relation to the
activities of recording and storage of knowledge and facts, in
which the particular measures are printed documents published or
stored in libraries (Vinken, 1984). Publishing is regarded as an
activity which preserves and diffuses national knowledge.
Libraries or information centres, on the other hand, are taken
as the interface between the universe of printed documents and
users. It is also assumed that libraries aim at making such a
universe   (or part of it) accessible to potential users
(Lancaster, 1977).

It is assumed that countries have the aim of providing
information services to their population by creating libraries,
and expanding their information stocks. To measure such factors
the study relies on statistics of information input type, that is
the number of libraries or information units, and the number of
 volumes as opposed to information output statistics such as
the benefit of information use. Hence, there is no attempt to
evaluate services, in the sense defined by Lancaster, as to how
well a service satisfies the demand placed
upon it by its users, or evaluation of library internal operating
efficiency, or whether the value of services are more or less
than the cost of providing them (Lancaster, 1977). Lancaster's
concepts are not applied due to the absence of comparable
statistics on the intangible factors of information services at
the international level.

Another aim is to measure the transmission   of information
records to persons, as parts of Machlup's flows of knowledge,
which distinguishes between communication flow through space, and
flow at a rate per unit of time, the former being of three
kinds: ``transmission from persons to records, from records to
persons, and from person to person without record.'' (Machlup,
1977-1980:160). Therefore, libraries and information centres are
taken as part of such a knowledge communication process. In King

et al's (1976:6) words, they are regarded as important ``intermediaries in the spiral of information transfer'', fulfilling mainly the role of acquisition and storage of recorded human achievement, providing a guaranteed source of access to information records.

So, the study concentrates upon printed records publicly available, and not private collections of books and journals, which in some LDCs could be as quantitatively important as library collections. Archival documents, micrographic materials and electronic records, among others, are also excluded because statistics are scarce. Electronic information was in its infancy between 1960 and 1977. Therefore the recording and storing of information carried out in most countries was still in printed formats at this time (Molino, 1982). This situation is changing now, especially in HDCs, where great amounts of information are recorded and stored in electronic media.

However, it is believed that LDCs are less advanced in the use of online information and information technology. Consequently, it is considered that the failure to test such variables would not affect the study results. Printed information, which is considered to be more readily available than information stored in new media in LDCs, has not reached all nations owing to scarce economic resources (Nwafor, 1984). Woolston (1984) even considers that journal and book markets barely exist, in the commercial sense of the term, in developing countries. Publishing activities are also limited to book publishing, journal publication, and newspaper circulation, leaving out electronic recording of information for the same reasons explained in connection with library collections. In these circumstances the decision was taken to focus attention upon the basic activities and measurement of recording and storing information.

Publishing and libraries exist with a clientele in mind, in LDCs as in other countries. They are established to serve the needs of certain sectors of society. It is assumed that countries record the production of knowledge, and store it for public use in libraries with the aim of preserving and diffusing knowledge. Within this context, user is defined as any ``individual who may potentially look for facts, advice or opinion, and may receive any of these in writing or orally'' (Wilson, 1981:5). It is also assumed that users seek information to satisfy cognitive and affective needs, and that information needs are influenced by

socio-cultural environments, plus personal and interpersonal
inter-actions.   In other words, the search for and use of
information are regarded as   social activities (Wilson, 1981).
In this case,   the whole national population is studied as
potential information users, despite the fact that not all members
of society use printed information, not even the majority of
society form part of the clientele of the studied types of
libraries.   However, a   socio-economic study of populations at
national level can offer clues in respect of the way in which
countries are socially divided, and therefore how they can gain
potential benefit from national information resources.

Definition of development

The aim of studying the relationship between social factors and
information provision at the national level presupposes the use of
the concept used in economics. In spite of the common usage given
to the term by economists,   definitions of it   are not readily
available. The popular Penguin Dictionary of Economics (Bannock
et al, 1979), for instance, lacks an entry for this term. Such
an absence may   indicate the vagueness of the concept.   The
definition appears if one looks under the   composite entry   of
economic development, where change,   modernisation and growth are
the descriptors.   A second concept comes at the end of the entry,
defining development as associated with   social and political
change,   although the latter are by no means inevitable.   The
same entry at the end gives a concept saying   that   the main
objective of development is to raise the living standards and
the general well-being of people in the
economy.

Baster (1972),   in a similar definition attempt, considers
development as multidimensional,   having political, social
and economic dimensions.   These three aspects are also popularly
regarded as important targets of development. In other words
development is an integral evolution involving three interacting
factors, where those three parts change as a whole. Crosswell
(1981) considers that, to measure such changes, goals have to be
identified.   Only then can a country's developmental performance
be assessed.

Hagen (1980:9), on the other hand, defines development as
referring to a) economic growth with improvement in the

distribution of material gains in welfare. In other words, the
increase of economic wealth is paralleled by better living
conditions of the population. More technically b), he refers to
all the complex effects of growth, planned or unplanned,
beneficial, detrimental, or neutral; to changes in the kind of
goods produced, the methods of producing them, employment
patterns, effect in the rate of population growth, foreign
trade, urbanisation, and in the distribution of material
welfare. Hagen's concepts of development are used interchangeably
in the study. Moreover, economic growth is used in the same
sense as economic development.   Therefore, it does not
specifically refer to the increase in gross domestic product (GDP)
per capita, Gross National Product (GNP) per capita in a country
(Hagen, 1980).

Development in the context of the study is used to refer more to
social development. Countries' success in development is measured
according to the social benefits gained by the population from
economic growth. It is considered that the period of economic
growth that benefited most nations between 1960 and 1977 helped
countries to expand their economies. Consequently some kind of
improvement in the meeting of basic needs may have been achieved.
 If national economies expanded, countries had the opportunity to
fulfil their goals of meeting people's basic needs. Obviously,
increases of living standards in different countries varied,
because some of them may not have had such commitments in their
national policies. On the other hand variations were inevitable
because countries which did commit themselves to channel their
resources to such goals, had different incomes and different
socio-economic development to start with. The differences are
indeed great, since countries do not develop equally. Therefore,
there is a need for studies on the mapping of socio-economic
development.

Other economics terms

Besides the definition of the two basic concepts related to
information and development, it is necessary to define some other
concepts or terms that are used frequently in this thesis.

In this work, the terms ``countries'' and ``nations'' are regarded
as synonymous, even though they denote different stages of
population unity, language, political boundaries, political

independency and national cohesiveness (Taylor and Jodice, 1982a).
 The use of the term ``developed countries'', on the other hand,
is related to high income countries (HICs), or highly developed
countries (HDCs) with industrial self-dependent economies, and
extended provision of welfare services to the population.

The term less developed countries (LDCs) is used to comprise two
types of nation: middle income countries (MICs) and low income
countries (LICs). So, the abbreviation LDCs is employed for both
groups of nations that have a limited national industrial base and
a poor welfare state, characteristics that include problems of
illiteracy, sanitation, and health. MICs, in a stricter sense,
are regarded as nations with polarised societies which can have a
sizeable industrial input in their GDP, but may also have striking
problems in meeting basic needs of the population. LICs are
considered to have economies based mainly on agriculture or
extraction of raw goods, and have very limited provision of social
services to their population.

OUTLINE OF THE THESIS

In   conclusion,   information   development   is   studied   using
information indicators of book and journal publishing, newspaper
circulation, library volume stocks, and numbers of libraries;
along with five indicators of basic needs satisfaction met by 31
countries between 1960 and 1977.

2. **ASSESSMENT OF INFORMATION DEVELOPMENT**

In this study,* information development was studied along with
social development. The number of countries studied was 31 (see
Table 1). They were selected according to the availability of
statistical data. The selected population included nations of
different levels of socio-economic development, that is, low,
middle, and highly developed nations. The period assessed was
between 1960 and 1977, when the world reached the peak of economic
growth of this century.

Information and social development phenomena were studied under
the assumption that:

2.1. Between 1960 and 1977 highly developed countries (HDCs)
improved their economies at a high rate.

2.2. This process was characterised by an increased use and
awareness of information activities.

2.3. During the same period less developed countries (LDCs) also
improved their economic performance.

2.4. If LDCs improved their economic performance then, presumably,
their economies relied more on recorded information.

2.5. Since LDC economies improved, living standards also improved
correspondingly.

2.6. If living standards or basic needs satisfaction were improved
then, LDC populations should have also increased their demand for
recorded information.

These hypothetical assumptions led to this investigation, where
information development was narrowed to three printed information
components: (1) centres storing information, (2) stocks of
information accumulated by countries, and (3) recording of
information.   The first two components were characterised by ten
library indicators and the third factor was represented by five
publishing variables.   Socio-economic development was, on the
other hand, limited to five social components: health, education,
food, water supply, and sanitation.   These social components were
represented by five indicators of basic human needs [2].   For a
complete list of indicators of each component, see the Appendix.

International time-series data were gathered from secondary
sources [10,11] and missing data were calculated using regression
techniques [7].   The same regression results were used to analyse
type and amount of change of information and social indicators.
Countries were also studied with clustering analysis which is a
classificatory statistical technique [8,9].   They were classified
using different combinations of indicators.   Finally, bivariate
and multiple regression analyses were applied to study the
relationship between social and information development of
countries with time-series, and with cross-sectional data [7].

3. **INFORMATION AND SOCIAL DEVELOPMENT ARE CLOSELY LINKED**

In this section some of the main results obtained with the statistical analysis of the data are summarised. For a complete version of the results see [5,6].

3.1. Social and information indicators were cluster analysised independently. Basic needs indicators of 1977 grouped countries into three clusters, which agrees with the known division of countries of low, middle and highly developed nations (see Table 1). However, the classification obtained showed that countries grouped differently from what they would do if GNP per capita were taken into account, e.g. Kuwait with a high income fused with nations of lower social development.

3.2. The classification of countries using library and publishing indicators fused most nations in two groups: those with high values and those with low values. These results reflected that LDCs lack significant information differences between them, despite the fact that some were middle income countries (MICs) nations, and others were low income countries (LICs). Therefore, information differences were greater than those of social aspects. See, as an example, Table 2 which was obtained testing the surrogate indicators of library and publishing activities, that is total national number of volumes and newsprint consumption per 100,000 inhabitants.

3.3. Growth/decrease in library and publishing indicators was studied in the five groups of nations formed in the cluster analysis of 1977 basic needs indicators. The regression models fitted to the variables and their resulting slope coefficients were used to determine change, that is growth/decrease. Information change in the five groups had the following characteristics:

3.3.1. Group one. The 13 countries that formed this HDC group showed, in general, that libraries were declining, but volumes were increasing. However, number of libraries were increasing in new developed countries, like Spain and Hong Kong. In social aspects, most nations experienced little change, meaning that they had already reached the satisfaction of basic needs of the population by 1960. Countries like Spain achieved high gains in this period, reflecting that its social development was recently achieved.

3.3.2. Group two. This group which falls between HDCs and MICs showed varied information change. Yugoslavia and Cyprus had similar growth to that of group one nations, however Kuwait and Yugoslavia had a low change which did not match their HDC social development. The four countries were, on the other hand, characterised by having high social gains.

3.3.3. Group three. The group of eight cases included in this group are regarded as middle income countries. Their social and information development was with a constant, linear rate of change. Cases like South Korea and Mexico had substantial increases in number of libraries and volume stocks, as well as in the meeting of basic needs of the population.

3.3.4. Group four. This low income group formed by Sri Lanka,

TABLE 1

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-------------------------------------------------------------------
|COUNTRIES GROUPED ACCORDING TO THEIR 1977 SOCIALDEVELOPMENT  |
|                                                                 |
|        Classification obtained with cluster analysis            |
|-----------------------------------------------------------------|
|                                                                 |
|     GROUP 1                    GROUP 2             GROUP 4       |
|                                                                 |
|     Austria                    Cyprus             Sri Lanka     |
|     Bulgaria                   Kuwait             Thailand      |
|     Finland                    Portugal           Western Samoa |
|     Hong Kong                  Yugoslavia                       |
|     Hungary                                                     |
|     Ireland                                                     |
|     Japan                      GROUP 3             GROUP 5       |
|     Norway                                                      |
|     Poland                     Bahamas            Comoros       |
|     Rumania                    Colombia           Gambia        |
|     Spain                      Fiji Isls          Malawi        |
|     USA                        South Korea                      |
|     USSR                       Mexico                           |
|                                Panama                           |
|                                Trinidad and Tobago              |
|                                Venezuela                        |
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TABLE 2

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-----------------------------------------------------------------
|       FUSION OF COUNTRIES USING 1977 INFORMATION INDICATORS**   |
|                                                                 |
|          Classification obtained with cluster analysis          |
|-----------------------------------------------------------------|
|GROUP ONE (HDCs)                  GROUP TWO (LDCs)               |
|                                                                 |
|Austria    Japan                  Colombia    Portugal          |
|Bahamas*   Norway                 Cyprus      Spain             |
|Bulgaria   Poland                 Fiji Isls   Sri Lanka         |
|Finland    Rumania                Gambia      South Korea       |
|Hong Kong  Trinidad and T.*       Kuwait      Thailand          |
|Hungary    USA                    Malawi      Venezuela         |
|Ireland    USSR                   Mexico      Western Samoa     |
|                                  Panama      Yugoslavia        |
|                                                                 |
|* Fusion in this group may be due to missing values             |
|**number of volumes and newsprint consumption                   |
|  per 1000 inhabitants 1977 values                              |
|***Comoros was excluded due to lack of data in one variable     |
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Thailand and Western Samoa had an erratic social and information development. Change was high in some variables, but low in others, showing that development was not even.

3.3.5. Group five. Comoros, Malawi and Gambia were included in this LIC group. Some of their social and information gains were the highest, but some others were of the lowest among all groups. This was because of the low starting point of development of these countries in 1960. In a few words, their development was polarised and uneven.

4. **CONCLUSIONS: EDUCATIONAL IMPLICATIONS OF INFORMATION DEVELOPMENT**

Education as part of the socialisation process offered by the state becomes more complex in societies which are undergoing the

process of early development. Therefore, developing countries,
whose development includes backwardness and modernity at all
levels of activity, have more problems to educate or train
information specialists.   These countries require more than one
kind of information specialists to meet needs generated by an also
polarised information development.

According to the results of this study, countries information
differences were greater than social ones.   HDCs' libraries were
declining between 1960 and 1977, a fact that may have shown early
HDC reliance on non-printed information.   Moreover, countries that
had not met the satisfaction of social needs, even if they had a
MIC economy, did not show an overall information development.
These results are an indication that:

4.1. **HDCs** nations (groups 1 and 2) have an easier task in the
training of information specialists, despite the fact that they
are undergoing the transition from industrial   society to
information society.   Their information needs are better defined,
therefore educational programs can be oriented towards the needs
of the information technology era.

4.2. **MICs** (group 4) require a dualistic approach in the education
of information specialists.   Their social development implies that
they have large groups within the society with basic information
needs, but also groups with high level information needs.
Therefore, MICs need to train information specialists that can
cater to traditional information services, but also to information
technology services if MICs are to compete in the international
economy.

4.3. **LICs,** with the lowest income in the population studied
(groups 4 and 5), are likely to require educational programs which
are more oriented towards the traditional information needs of the
population, which are mainly orally satisfied.   Their limited need
for IT specialists is likely to be met more cheaply by training

personnel abroad.

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APPENDIX

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|             LIST OF INDICATORS ASSESSED IN THE STUDY        |
|                                                             |
|           Number in brackets indicate data sources          |
|-------------------------------------------------------------|
|                                                             |
|LIBRARY INDICATORS [10]:        PUBLISHING INDICATORS [10]:   |
|                                                             |
|National number of libraries:   Total number                 |
|National                        Book titles and pamphlets    |
|University                      Daily newspaper circulation   |
|School                          Newsprint paper consumption   |
|Special                         Non-daily newspaper circul.   |
|Public                          Other periodical titles       |
|                                                             |
|National number of volumes:     BASIC NEEDS INDICATORS [11]:  |
|National                                                      |
|University                      Food consumption in calories  |
|School                          Life expectancy at birth      |
|Special                         Infant mortality rate         |
|Public                          Adjusted enrollment rate in   |
|                                  primary schools             |
|                                Adult literacy rate           |
|                                                             |
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EDUCATIONAL IMPLICATIONS OF INFORMATION DEVELOPMENT

If information development takes place when a country has met the satisfaction of social needs of the population, any educational program to train information specialists must take into account this factor if it is doomed to succeed.   Countries with characteristics similar to group 2 to 5 are countries which are likely to have unven levels of information development.   In other words education will have to cater for polarised information needs, at one extreme basic information needs and at the other extreme high technology needs of information.

Nations with characteristics of group one, are countries which have even information development.   Their information needs are not polarised as in countries of lower social development. Therefore, education of information specialist becames easier since they have to cater for less varied infomation needs.

LDCs, which fall in groups four and five, are likey to have greater problems in forming cadres of information profesionals. They are engaged in meeting basic needs of the population, while they are in need of information to speed up socio-economic growth.

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countries that have dualistic or polarised economies, where tribal and industrial organisations are present, have an unsourmontable task in education.

The results discussed in the previous section give some orientation to the kind of educational policies that countries could follow to train information specialists.   They are summarised again in order to draw conclusions in regard to education policies.

Information gap between HDCs and LDCs is greater than that in social aspects.

Less developed countries look as one cluster of nations when information development is compared with HDCs.

Libraries are declining in HDCs, but growing in LDCs between 1960

and 1977.

Countries that reached social development lately have just started to achieve information developmen.

Middle income countries made advances in meeting social needs but their information progress was inferior during the period under study.

Low income countries made uneven progress in social and information development during the 18 year assessed.