

**The potentials of infosystem and communication technologies (ICT) in ensuring equity of access to information for all in the digital society: A comparative analysis of the developed and developing countries.**

**ABSTRACT**

Access to information and technologies is highly unequal in different geographic regions and social groups. This inequality contributes to increasing the gap between those who have access to abundant information resources and those who are deprived of this access, thus reinforcing the marginalization that already exists in terms of development and technical resources. One of the main challenges facing the digital society is to look for new strategies and techniques that would facilitate equitable access to information for the entire human community without any disparity and discrimination. The present study attempts to analyse the extent to which infosystem and the advancements in the ICTs work together to achieve the target of reaching every one in the society. It identifies the socio-economic and technological barriers that affect the quick and efficient transfer of information among millions of users around the world. It examines the existing gap in providing access to information and technology and suggest measures for bridging the gap in communication. It focusses on the necessity for collaborative relationships and the twinning programmes among the various institutions involved in the generation, processing and distribution of information. The 'entropy measures' and the 'information imperative index' are computed to evaluate the existing ICT potentials of the 50 countries drawn from different socio-economic background. These measures would bring out not only the strength and weakness of the existing ICT infrastructure of the sample countries, but also throws light on the different ICT categories viz: (i) social infrastructure, (ii) information infrastructure, and (iii) computer and network infrastructure. The variables selected for this study include: (i) news paper readership, (ii) secondary and tertiary education, (iii) telephone lines/households, (iv) cellular phones per capita, (v) radio and television ownership percapita, (vi) personal computers percapita, (vii) IT investment, and (viii) percentage of network connected. This index values could be adopted both to identify the ICT status of the individual countries and to 'benchmark' the progress achieved by them in providing access to information. The entropy measure is calculated by using the formula  $H(x) = X_i \log 1/X_i$  and this is adopted to identify the diversification of ICT variables among the sample regions. The information Imperative Index (III) is calculated for the countries individually by adopting the formula:  $III_i = H_i [I_i + (1 - I_i) G_i]$ , and this involves the computation of three different measures namely (i) IT availability Ratio ( $H_i$ ), (ii) IT gap Ratio ( $I_i$ ) and (iii) Gini Ratio. By combining the values of these "Ratios" the Information Imperative Index(III) will be computed. This study would help the policy makers and the planners to decide the delivery mechanisms that have to be strengthened to improve access to larger community. The index that has been suggested in this study would be a handy tool for measuring the country's ability to access, adopt and absorb information and information technology. A periodical compilation of this index will not only reflect the progress of the countries in developing the IT variables but also show the gap that has been generated between the information 'haves' and havenots'. This report would trigger the nations to devise new strategies and policies to bridge the gap.

# SOCIETY: A COMPARATIVE ANALYSIS OF THE DEVELOPED AND DEVELOPING COUNTRIES

## 1. INTRODUCTION

Access to information and communication technologies (ICT) is of paramount importance for each and every nation to participate actively in the socio-economic and political life at the national, international and global levels. Advances in electronic communication networks have created enormous opportunities for launching collaborative and partnership programmes in education, entrepreneurship, business, trade etc. across the countries. The sophistication of a nation's ICT infrastructure is considered not only an index to predict the level of economic activity within a country, but also an indicator to reflect the wealth of the nations in the modern society.<sup>1</sup> The predominant role that is being played by the ICT factors in the national development calls for an investigation of the existing ICT situation in the countries of the world and an analysis of the contribution of these parameters in facilitating better education, improved economy, empowerment of the individuals and at large in improving the quality of their life.

## 2. STATEMENT OF THE PROBLEM

But in reality one could witness a larger variation in providing access to information and communication technologies (ICT), and this inequality would intensify the gap that already exists between the information rich and the information poor countries. This disparities in the technological base would not only cripple the developmental activities but also would be determinable to the well being of the global community. Now, the major task before the modern society is to look for new strategies and techniques that would facilitate equitable access to information for the entire community without any restriction and discrimination.

## 3. OBJECTIVES

In this context, the present study focuses its attention on the following issues: (i) to identify the ICT potentials of the countries representing different spatial and economic regions, (ii) to assess the variations in the distribution of the ICT parameters and observe the technological pattern among the sample countries, (iii) to find out the technological status of the individual countries and to measure their ability to provide access to every one in the society. (iv) to develop an ICT index to assess the position of each country in relation to other countries, (v) to analyze the effect of these ICT factors on the socio-economic well being of the community, and (vi) to examine the ICT gap between the different groups of countries.

## 4. REVIEW OF LITERATURE

The importance of the ICT infrastructure in the present context has been established by Colin Cherry<sup>2</sup>, Frank Webster<sup>3</sup>, Kelvin Robins and a host of other scientists. They have highlighted the social relevance of the ICT factors and emphasized the need for building up a strong ICT base to avoid the disparity between the "haves" and "have-nots". Cleveland<sup>4</sup>, Kranzberg<sup>5</sup>, and the Congressional Office of Technology<sup>5</sup> insisted upon providing equitable access to ICT in order to achieve greater democratization, political and economic development in the society.

## 5. METHODOLOGY

The 'Information Imperative Index' is computed to evaluate the existing ICT potentials in more than 50 countries representing different spatial and economic groups. These measures would bring out not only the strength and weakness of the existing ICT infrastructure of the sample countries, but also will throw light on the direction in which they would have to be developed to achieve the globalization of information. The index will reflect the ICT status of the countries at different levels viz.: (I) the conventional infrastructure, (ii) the telecommunication infrastructure and (iii) the computer and network infrastructure. The variables selected for this study include: (I) newspaper readership, (ii) radio and television ownership, (iii) telephones, cellular phones and fax machine density, (iv) the penetration of computers and the network connectivity established per 1000 population. The index is calculated for the individual countries by adopting the formula:  $III_i = H_i [I_i + (1 - I_i) G_i]$ , and this involves the computation of three different measures namely (i) IT availability Ratio ( $H_i$ ), (II) IT gap Ratio ( $I_i$ ) and (III) Gini Ratio. By combining the values of these "Ratios" the Information Imperative Index(III) is computed. This index values could be adopted both to identify the ICT status of the individual countries and to 'benchmark' the progress achieved by them in providing access to information. This index would help the policy makers and the planners to decide the ICT parameters that have to be strengthened to improve access to larger community.

## 6. ANALYSIS AND INTERPRETATIONS

### 6.1 DISTRIBUTION OF ICT PARAMETERS AMONG THE HIGH, MIDDLE AND LOW INCOME NATIONS

The concentration of ICT variables among the countries belonging to different income groups has been analyzed and presented in Table 1. It is interesting to note that the distribution of ICT variables are found to be high in a very few high income group of countries like the USA, Japan, United Kingdom, Hong Kong and Canada, and the technological availabilities of these countries have ranged from 60 to 90 percent. A moderate level of technological distribution (30 to 59 percent) is noted in such countries as France, Germany, Israel, Kuwait, Italy, Singapore, Korea, and Puerto Rico. Among these thirteen countries that have occupied the premier positions in building up the ICT infrastructure, nearly six of them belonged to the Asian countries, four belonged to the European and three belonged to the American countries. The ICT situation in majority of the countries (74 %) are found to be very low.

An analysis of the individual ICT factors has shown that the importance of the print media is found to be strong only in a few Asian and European countries like Hong Kong, Japan, Korea and United Kingdom and this media has not gained any significance in the rest of the countries. The percentage of importance attached to this media also has been found to be merge i.e. 5 to 10 percentage. The limited response to this media which was once considered as the 'fourth estate' of the national resource may be due to the invasion of the electronic publications. On the otherhand, the distribution of the radio and television medias are strong in more than fifteen countries (30%) and their percentage of concentration ranges from 10 to 25. Only the countries from the high and middle income groups fall within this range. It is quite ironical that the economically backward nations could not afford to build up adequately even this

conventional technology. Among the countries that have shown better performance in establishing this media, there is an equal amount of (5 each) representation from the Asian, American and European countries. Africa has not secured a place in this category. The accessibility to this traditional media is found to be poor (less than 10 percent) in majority of the middle and low income countries (70 percent). As against this situation, the telecommunication is receiving greater attention and it is evidenced from their score values. The penetration of this media is found to be high (30 to 40%) in the USA, Japan, Hong Kong and United Kingdom. A medium level (20 to 29%) of telecom density is found in Canada, France, Israel and Germany and it is found to be moderate (10 to 19%) in Kuwait, Italy, Singapore, Korea, United Arab, Puerto Rico and Malaysia. The rest of the countries (72%) have not shown promising trend in the establishment of this media. The computer and network facilities are found to be in high order (10 to 25%) only in a limited countries like the United States, Canada and United Kingdom. At the next level, Germany, Japan, France, Hong Kong, Israel, Korea, Singapore and Italy have established a moderate level (4.5 to 9.9%) of network facilities. In all other countries, the availabilities of this media is found to be less than 2 percent.

The above analysis has thrown light two important factors viz.: there exists not only the inequitable distribution of the ICT parameters among the different countries but also there prevails a vast gap in the ICT infrastructure between the countries of the different income groups.

## 6.2. ICT POTENTIALS AMONG DIFFERENT SPATIAL AND ECONOMIC REGIONS

The ICT capabilities of the different spatial regions have been analyzed and presented in Table 2A. The ICT infrastructure of the European countries are found to be higher at 35.5 percent, followed by Asian (29.5%), American (25.4%) and African (9.8%) countries. The European countries have taken a lead in all the selected ICT parameters, while the Asian countries have greater potentialities in the telecom and network sectors. The American countries have maintained a moderate development in all the ICT sectors. The performance of the ICT variables in the African countries are found to be very low. The socio-economic reasons for the variabilities in the performance of the different countries have been analyzed and presented in Table 2B. It is interesting to note from the table that the concentration of the ICT parameters are strong (55.3%) in the high-income group of countries, and extremely poor (8.8%) in the low-income countries reflecting the correlations exists between the economic status and the ICT potentials of the countries. The high income countries have seven fold advantage over the other group in their ICT potentialities and this growing gap between these two group would endanger the socio-economic status of the latter group. Even among the high and the middle income group of countries, the variation in the development of ICT infrastructure is nearly three fold. The global access to information would remain as a slogan if this gap is not bridged in due course of time. The same gradation exists in the individual ICT parameters among the different groups of countries.

## 6.3 ICT GAP IN THE DEVELOPED AND DEVELOPING COUNTRIES

In order to ensure the provision of information for the entire community, what is required at the base is the well knitted information infrastructure that is going to connect each and every individual in the community. If the nations are going to work towards this direction, that would not only empower the individuals, but also enable him to participate

actively in the community activities. This individual participation is the foundation for achieving the real democracy. To achieve this end, what must be the beginning? It goes without saying that adequate ICT infrastructure is the corner stone for the establishment of a real democratic society. The ICT situation of the sample countries has been analyzed and presented in Table 3. It is seen that a larger section of the population have limited or no access to the basic information services. Infact, a vast majority of the people in the middle and low income nations have not been able to get the benefits of the information infrastructure. Table 3 shows that the information gap is found to be negligible in the high income countries but it is found to be ranging from 40 to 90 percent in the middle and low income countries. It is seen at the maximum in majority of the African countries. It necessitates the governments of these countries to take the initiatives to build up the national information infrastructure in such a way that it should meet the broad needs of the community.

#### References:

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**Table 1: ICT INFRASTRUCTURE INDEX (III)**

S.N	Country	Continent	Economy	V1	V2	V3	V4	Total	Rank Cluster
1	United States	America	HIN	3.3	24.8	39.6	23.6	90.3	1
2	Japan	Asia	HIN	7.9	18.8	32.5	8.2	67.4	2
3	United Kingdom	Europe	HIN	5.3	19.8	30.4	10.7	66.2	3
4	Hong kong	Asia	HIN	10.9	11.8	37.0	6.3	66.0	4
5	Canada	America	HIN	3.3	19.8	27.3	12.2	62.6	5
6	France	Europe	HIN	3.9	17.2	24.1	7.2	52.4	6
7	Germany	Europe	HIN	3.3	17.2	20.1	8.9	49.5	7
8	Israel	Asia	HIN	3.3	9.1	22.0	6.1	40.5	8

9	kuwait	Asia	HIN	3.3	11.8	18.8	2.7	36.6	9
10	Italy	Europe	HIN	2.0	10.2	18.0	4.5	34.7	10
11	Singapore	Asia	HIN	2.0	10.2	18.0	4.5	34.7	11
12	Korea ,South	Asia	HIN	5.9	5.4	16.2	5.5	33.0	12
13	United Arab	Asia	HIN	2.5	9.1	15.1	2.7	29.5	14
14	Puerto Rico	America	UMIN	0.7	15.0	13.0	1.7	30.4	13
15	Malaysia	Asia	UMIN	2.0	10.2	9.8	2.7	24.7	15
16	Argentina	America	UMIN	2.0	11.8	4.8	1.7	20.3	18
17	Chile	America	UMIN	2.0	9.1	5.3	2.7	19.1	19
18	Brazil	America	UMIN	1.3	9.1	3.7	1.7	15.8	25
19	Mexico	America	UMIN	2.0	6.4	3.7	2.7	14.8	27
20	South Africa	Africa	UMIN	0.7	5.4	4.2	2.7	13.0	29
21	Lithuania	Europe	LMIN	3.3	11.8	7.2	1.7	24.0	16
22	Jamaica	America	LMIN	1.3	13.4	5.6	1.7	22.0	17
23	Lebanon	Europe	LMIN	2.6	9.1	5.6	1.7	19.0	20
24	Costa Rica	America	LMIN	2.0	8.0	5.6	2.7	18.3	21
25	Turkey	Europe	LMIN	1.3	7.0	6.9	1.7	16.9	22
26	Venezuela	America	LMIN	3.3	6.4	4.5	1.7	15.9	24
27	Kazakhstan	Europe	LMIN	2.0	9.1	4.0	1.7	16.8	23
28	Thailand	Asia	LMIN	1.3	8.0	4.5	1.7	15.5	26
29	Panama	America	LMIN	1.3	6.4	4.0	1.7	13.4	28
30	Ecuador	America	LMIN	1.3	5.4	3.5	1.7	11.9	30
31	Uzbekistan	Europe	LMIN	0.7	6.4	2.9	1.7	11.7	31
32	Tunisia	Africa	LMIN	0.7	5.4	3.5	1.7	11.3	32
33	Philippines	Asia	LMIN	0.7	5.4	2.4	1.7	10.2	33
34	Indonesia	Asia	LMIN	0.7	5.4	1.9	1.7	9.7	34
35	Moracco	Africa	LMIN	0.7	5.4	1.9	1.7	9.7	35
36	Domnica	America	LMIN	0.7	3.8	3.0	1.7	9.2	36
37	Peru	America	LMIN	1.3	3.8	1.9	1.7	8.7	37
38	Algeria	Africa	LMIN	0.7	4.3	1.9	1.7	8.6	38
39	Egypt	Africa	LMIN	0.7	4.3	1.9	1.7	8.6	39
40	China	Asia	LIN	0.7	7.0	1.9	1.7	11.3	40
41	Nicaragua	America	LIN	0.7	6.3	1.9	1.7	10.6	41
42	Cameroon	Africa	LIN	0.7	5.9	1.9	1.7	10.2	42
43	Vietnam	Asia	LIN	0.7	5.4	1.9	1.7	9.7	43
44	India	Asia	LIN	0.7	3.8	1.9	1.7	8.1	44
45	Burkina faso	Asia	LIN	0.7	2.7	1.9	1.7	7.0	45
46	Kenya	Africa	LIN	0.7	2.7	1.9	1.7	7.0	46
47	Mozambique	Africa	LIN	0.7	2.7	1.9	1.7	7.0	47
48	Niegeria	Africa	LIN	0.7	2.7	1.9	1.7	7.0	48
49	Senegal	Africa	LIN	0.7	2.7	1.9	1.7	7.0	49
50	Ghana	Africa	LIN	0.7	2.7	1.9	1.7	7.0	50

V1 = (4.1, 7.5, 10.9)

V2 = (10.07, 17.44, 24.81)

V3 = (14.47, 27.04, 39.51)

V4 = (9, 16.3, 23.6)

TOTAL = (35.1, 63.2, 91.3)

V1 -> PRINT MEDIA

V2 -> RADIO AND TELEVISION

V3 -> TELEPHONE, MOBILE PHONE & FAX

V4 -> NETWORK (COMPUTER & INTERNET)

Table 2a: VARIATIONS IN THE ICT INFRASTRUCTURE AMONG DIFFERENT GROUPS

Country Category	No. of Countries in each Category	Index values of the Infrastructure				Total Index Values
		V1	V2	V3	V4	
HIN	13	5.0	15.3	26.5	8.5	55.3
UMIN	7	1.6	10.3	6.8	2.4	21.1
LMIN	19	1.4	7.4	4.1	1.9	14.8

15	Lebanon	Europe	LMIN	0.50000	0.62619	0.7550 0	0.45366
16	Lithuania	Europe	LMIN	0.50000	0.84782	0.7570 0	0.48151
17	Argentina	America	UMIN	0.62500	0.28621	0.7530 0	0.51481
18	Chile	America	UMIN	0.62500	0.33886	0.7580 0	0.52500
19	Malaysia	Asia	UMIN	0.75000	0.10544	0.7520 0	0.58361
20	Kazakhstan	Europe	LMIN	0.75000	0.39795	0.7500 0	0.63712
21	Jamaica	America	LMIN	0.75000	0.50158	0.8110 0	0.67935
22	Brazil	America	UMIN	0.75000	0.62297	0.7530 0	0.68016
23	Venezuela	America	LMIN	0.87500	0.29091	0.7580 0	0.72455
24	Turkey	Europe	LMIN	0.87500	0.40993	0.7540 0	0.74799
25	China	Asia	LIN	0.87500	0.65938	0.7450 0	0.79900
26	Costa Rica	America	LMIN	1.00000	0.19255	0.7610 0	0.80702
27	Mexico	America	UMIN	1.00000	0.31168	0.7540 0	0.83067
28	Thailand	Asia	LMIN	1.00000	0.36635	0.7480 0	0.84032
29	Panama	America	LMIN	1.00000	0.37519	0.7550 0	0.84692
30	Cameroon	Africa	LIN	0.87500	0.87220	0.7550 0	0.84760
31	Uzbekistan	Europe	LMIN	1.00000	0.47661	0.7390 0	0.86340
32	Nicaragua	America	LIN	1.00000	0.54585	0.7440 0	0.88374
33	Ecuador	America	LMIN	1.00000	0.49555	0.7700 0	0.88398
34	South Africa	Africa	UMIN	1.00000	0.51691	0.7620 0	0.88502
35	Tunisia	Africa	LMIN	1.00000	0.53383	0.7540 0	0.88532
36	Indonesia	Asia	LMIN	1.00000	0.59052	0.7450 0	0.89558
37	Peru	America	LMIN	1.00000	0.58002	0.7560 0	0.89752
38	Philippines	Asia	LMIN	1.00000	0.60697	0.7450 0	0.89975
39	Morocco	Africa	LMIN	1.00000	0.61054	0.7530 0	0.90380
40	Dominican Rep	America	LMIN	1.00000	0.62974	0.7450 0	0.90558
41	Viet-nam	Asia	LIN	1.00000	0.67811	0.7330 0	0.91406

LIN	11	0.7	4.4	1.9	1.8	8.8
TOTAL	50	8.7	37.4	39.3	14.6	100

V1 -> PRINT MEDIA  
V2 -> RADIO AND TELEVISION  
V3 -> TELEPHONE, MOBILE PHONE & FAX  
V4 -> NETWORK (COMPUTER & INTERNET)

Table 2b: SPATIAL DISTRIBUTION OF ICT PARAMETERS

Continent	No. of Countries in each Continent	V1	V2	V3	V4	TOTAL INDEX
Africa	11	0.9	4.4	2.5	2.0	9.8
America	15	2.0	10.9	9.3	3.2	25.4
Asia	15	3.2	9.0	13.5	3.8	29.5
Europe	9	3.0	13.0	14.5	4.8	35.3
		9.1	37.3	39.8	13.7	100

V1 -> PRINT MEDIA  
V2 -> RADIO AND TELEVISION  
V3 -> TELEPHONE, MOBILE PHONE & FAX  
V4 -> NETWORK (COMPUTER & INTERNET)

Table 3: INFORMATION AND COMMUNICATION TECHNOLOGY PAUCITY INDEX

Rec #	COUNTRY	CONTINENT	ECONOMY	H	II	GINI	ZI
1	United States	America	HIN	0.00000	0.00000	0.7760	0.00000
2	Japan	Asia	HIN	0.00000	0.00000	0.7690	0.00000
3	United Kingdom	Europe	HIN	0.00000	0.00000	0.7680	0.00000
4	Hong Kong	Asia	HIN	0.00000	0.00000	0.7650	0.00000
5	Canada	America	HIN	0.00000	0.00000	0.7660	0.00000
6	Germany	Europe	HIN	0.00000	0.00000	0.7650	0.00000
7	Israel	Asia	HIN	0.00000	0.00000	0.7770	0.00000
8	Singapore	Asia	HIN	0.00000	0.00000	0.7820	0.00000
9	France	Europe	HIN	0.12500	0.03901	0.7610	0.09629
10	United Arab Rep	Asia	HIN	0.12500	0.90563	0.7650	0.12223
11	Kuwait	Asia	HIN	0.25000	0.39329	0.7620	0.21390
12	Puerto Rico	America	UMIN	0.37500	0.86633	0.7480	0.36237
13	Italy	Europe	HIN	0.50000	0.51133	0.7570	0.44063
14	Korea, South	Asia	HIN	0.50000	0.51057	0.7590	0.44102



42	Egypt	Africa	LMIN	1.00000	0.67526	0.7970	0.93408
43	India	Asia	LIN	1.00000	0.76426	0.7370	0.93800
44	Algeria	Africa	LMIN	1.00000	0.77574	0.7620	0.94615
45	Sanegal	Africa	LIN	1.00000	0.86945	0.8010	0.97402
46	Niger	Africa	LIN	1.00000	0.90946	0.7530	0.97764
47	Kenya	Africa	LIN	1.00000	0.91888	0.7570	0.98029
48	Ghana	Africa	LIN	1.00000	0.92528	0.7570	0.98184
49	Burkina Faso	Africa	LIN	1.00000	0.95921	0.7550	0.99001
50	Mozamque	Africa	LIN	1.00000	0.93713	0.8600	0.9912

Note:

- $H_i$  -> Head Count Ratio
- $I_i$  -> Information Gap Ratio
- $G_i$  -> Gini Ratio
- $Z_i$  -> Information Paucity Index

