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Informatization Potential of Three Indian Ocean Rim Countries

Introduction

This paper makes the case that countries have no alternative but to join that revolution to compete in the world material economy. It uses a revised version of Kuo's (1993, 1994) model to document and analyze the three main dimensions of informatization—*people, infrastructure* and *economy*—as they pertain to three relatively small Indian Ocean Rim countries—Malaysia, Mauritius and Sri Lanka. Malaysia is in the process of setting up its Multimedia Super Corridor determined to implement its Vision 2020 (Abdul Hamid 1993). Mauritius, with its Informatics Park set up in 1994, has the potential of beating Malaysia in mainline telephone density at the turn of the century. Mauritius can use the proposed South Africa-Far East fiber-optic cable from Cape Town to Penang, scheduled for completion in 2000, to reap multiplier benefits from the Internet, and offer competitive services in telemedicine and teleconferencing services (Geisel 1997). Sri Lanka, though well situated on the people's dimension, lags behind because of its stop-and-go economic policies and other reasons (World Bank 1996b). Although, under current projections, Sri Lanka is likely to be telecommunications poor even at the turn of the century, it may yet achieve its goal of becoming the "telecommunications gateway to South Asia" (Samaraweera 1996) if it adopts better policies to attract capital and develop high-performance computing capability (Induruwa 1996).

Schumacher (1973) popularized the phrase "small is beautiful" in relation to the problem of production. He saw

merit in the principle of right livelihood in Buddha's Noble Eightfold Path because it implied "such a thing as Buddhist economics" (p. 44). He said the question was not choosing between "modern growth" and "traditional stagnation" but a question of finding right livelihood: the right path of development, the Middle Way between materialist heedlessness and traditionalist immobility" (p. 51).

Gunaratne (1997) argued that Buddhist values did not stand in the way of countries like Sri Lanka$_1$ to take advantage of the Third Communication Revolution to compete in the world material economy and enter the portals of the information society. Carrying Schumacher's metaphor further, this paper posits that relatively small countries, whether Buddhist, Islamic or Hindu, as well as "fertile spots" in big countries, have a good chance of becoming influential players in the world economy. Of the three countries on which we have focused in this essay, Malaysia is mainly Islamic, Mauritius Hindu, and Sri Lanka Buddhist.

Three of the Four Dragons, who have emerged winners in the world economy, are small in terms of both population and territory. A highly motivated and literate workforce helped these "dragons" to achieve economic success. Moreover, the small size of their respective territory enabled them to improve the infrastructure that produced their "takeoff" to the information society. Where similar preconditions exist, other small countries too can "takeoff." It seems that Malaysia, Mauritius, and (with some reservations) Sri Lanka, among the "dragon"-sized countries along the Indian Ocean Rim, are well placed to "takeoff" early in the 21st century in the order listed.

We can retrieve the old development paradigm and creatively revise it to suit the information age. Rostow (1960) had argued that change in Europe had evolved slowly until a critical mass of people and resources had reached a takeoff point, at which time economic growth became self-sustaining. Lerner (1958) found in the Middle East some of the same patterns Rostow had described in Europe. Lerner, however, found that mass media use had an apparent influence in stimulating rapid change through the users' inculcation of empathy – the ability to imagine what might be. Lerner's semi-theory postulated that the mass media, along with urbanization and literacy, produced the critical mass of "modernity" that took countries to

the takeoff point of self-sustaining economic and social growth. Lerner defined the goal of development as Western-style democracy. Schramm (1964) added to this paradigm by advocating the use of mass media as a key component of development programs because they functioned as the "great multiplier."

Kuo (1993, p. 324;1994, p. 143) has conceptualized informatization (i.e., the entry to the information society) in terms of three dimensions: *people, infrastructure* and *economy*. The first is a measure of a country's general literacy rate and level of education; the second a measure of the use of mass media, telecommunications and computerization; and the third a measure of the information workers and the information economy. Thus, in Kuo's terms, the last dimension represents the level of "informatization," the Third Revolution equivalent of what the old paradigm called "modernization." To informatize, a nation still must have the prerequisites of the old paradigm—literacy and mass media use—plus some more attributes: a better-educated people, a higher propensity to use telecommunications and competence to apply computer technology. Kuo's model omitted the old paradigm's prerequisite of urbanization. Our revised model would restore urbanization to fit under the people dimension because the infrastructure aspects of mass media, telecommunication and computerization are more likely to prevail under conditions of urbanization.

Thus the much-disparaged old paradigm retains its usefulness as a base for formulating the new informatization paradigm. The "takeoff" depends on the state of the infrastructure. Empathy may still be a pertinent attribute leading to informatization while greater political participation (democracy in the Lincolnian sense—i.e., government of the people, by the people, for the people), as well as civic involvement, may well be a consequence of informatization

This paper will compare and contrast the three selected countries as potential hubs in the information superhighway against the background of the SAARC countries. Finally, it will assess the economic potential of the three countries as the World Bank Group sees them against the background of their infrastructure development.

Informatization in Selected Countries

Gunaratne (1997) has argued that developing countries have no option but to enter the information superhighway to compete in what Gunder Frank (1993) calls the "global material economy." Gunder Frank, who says that his original *dependency theory*[6] provides no way out for the developing world, now points out the reality that each country must adopt the economic strategies that best suits it to compete in the capitalist world economy. Galtung (1993) states that such competition requires each country to pay attention to three economic indicators: the ratio of price to quality, the degree of processing from the raw, and the synchrony of the finance and the real economy. The Four Dragons have already set the examples for other developing countries to try. In this context, the significance of informatization becomes quite clear.

The World Bank (1994) offers an example relating to the $100 billion garment industry, which provides substantial export earnings to Mauritius and Sri Lanka, among many other countries: When a clerk at a retail franchise in Tyson's Corner, Virginia, rings up the sale of a shirt, the information is automatically transmitted to the main computer at the company's headquarters in Europe, where demand and sales are assessed. Orders are sent to the textile mills (perhaps in Indonesia) to produce the materials and ship them to assemblers (perhaps in the Philippines and Sri Lanka), from where the final product is shipped in small batches directly to the retailer in Tyson's Corner. With these telecommunications links the restocking cycle is completed in about 30 days. Countries without these links cannot effectively participate in global trade.

Measuring Informatization

Kuo (1993, 1994) offers a three-dimensional model to measure the process of informatization by identifying 12 indicators that, not surprisingly, overlap with the modernization variables in the old paradigm as pointed out in the introduction to this essay. With the end of the Cold War and the recognition of the global material economy, as Mowlana (1996) points out, the "'rise' of the dominant paradigm was indeed real, but its reported decline was only a myth" (p. 207).

Kuo (1993, 1994) starts with the *people* dimension. To measure the information capability of the people, he suggests

two indicators: *general literacy rate* and *level of education*. The second prong of the model is the *infrastructure* dimension, which has three sub-dimensions: *mass media communication* (measured by the degree of *newspaper, radio* and *television* penetration), *telecommunication* (measured by *telephone* and *telex* use), and *computerization* (measured by *computer penetration*, degree of *computer application*, and *information technology expenditure*). The final part of the model is the *economy* dimension, which measures the information sector through two indicators: *information economy* (share of primary information sector in total economy) and *information workers* as a percentage of the total labor force.

People dimension.

TABLE 1 provides the basic demographic and economic indicators for Malaysia, Mauritius, and Sri Lanka against the backdrop of SAARC. Although Sri Lanka is ahead of all other SAARC countries in per capita income, it is well behind both Malaysia and Mauritius. The latter two countries are also way ahead in *urbanization*, an important indicator that can expedite informatization in our view. Even within SAARC, Sri Lanka falls behind Pakistan, Maldives, and India. (As we argued earlier, *urbanization* should be part of the *people* dimension.) Mauritius, however, is at the lower end of GDP real growth.[7]

The *general literacy* indicator is Sri Lanka's real strength. As TABLE 2 shows, it is ahead of both Malaysia and Mauritius, and second only to Maldives within SAARC. Kuo (1993, 1994) operationalizes the relevant *level of education* as the percentage of population enrolled in tertiary education. Although this is an important indicator, the reliability of the available data on the number of tertiary-level students is rather suspect. Because the United Nations (1995b) does not provide the particular data for Sri Lanka, the table has substituted the data from Goonasekera and Holaday (1993). However, the numbers for this indicator supplied by these two sources show wide discrepancies.[8] Therefore, we refrain from comparing the countries on the basis of the U. N. data in the table.

TABLE 1: Basic Demographic and Economic Indicators Malaysia, Mauritius, and SAARC

Conutry	Selected Indicators						
	Total Area in sq. km ('000)	population in milloins mid-1996 (est.))	Urban population (percent) 1	GDP 1995 in $ billions (purchasing power parity)	GDP 1995 per capita income $ (PPP)	GNP 1996 per capita income2 $	GDP real growth
Malaysia	329.7	19.96	52.9	193.6	9,800	3,930	9.5
Mauritius	1.9	1,14	40.5	10.9	9,600	3,030	2.7
Sri Lanka	65.6	18.55	22.1	65.6	3,600	660	5.0
Bangladesh	144	123.06	17.7	145.5	1,130	340	4.6
Bhutan	47	1.82	6.2	1.3	730	415	6.0
India	3,287.6	952.11	26.5	1,407.7	1,500	335	5.5
Maldives	0.3	0.27	26.6	0.39	1,560	900	6.6
Nepal	140.8	22.09	13.1	25.2	1,200	200	2.3
Pakistan	803.9	129.27	34.1	274.2	2,100	465	4.7

Sources: [1]*World Media Handbook 1995*. New York: United Nations, 1995; [2]*Asiaweek*, March 14, 1997; *1996 World Factbook*. Washington, D.C.: CIA, 1996.

TABLE 2: Literacy and Higher Education Malaysia, Mauritius, and SAARC

Country	General Literacy	Tertiary-level Students	
	Percent of those aged 15 and above[1]	Number	Percent of total population
Malaysia	83.5	121,412	0.62
Mauritius	82.9	2,179	0.20
Sri Lanka	90.2	29,781[2]	0.17[2]
Bangladesh	38.1	434,309	0.37
Bhutan	42.2	-	-
India	52.0	4,528,956	0.49
Maldives	93.2	-	-
Nepal	27.5	110,239	0.52
Pakistan	37.8	304,922	0.22

Note. — Not available.

Sources: [1]*1996 World Factbook*. Washington. D.C.: CIA, 1996; [2]*Asian Communication Handbook*. Singapore: Amic, 1993; *World Media Handbook 1995*. New York: United Nations, 1995.

TABLE 3: *Daily Newspapers: Number and Circulation—1980-1992 Malaysia, Mauritius, and SAARC*

Country	Number				Circulation							
					Total ('000s)				Per 100 people			
	1980	1985	1990	1992	1980	1985	1990	1992	1980	1985	1990	1992
Malaysia	40	32	45	39	810	1,500	2,500	2,200	5.9	9.6	14.0	11.7
Mauritius	10	7	7	6	80	70	80	89	8.3	6.9	7.6	8.1
Sri Lanka	21	17	18	10	450	390	550	1,033	3.0	2.4	3.2	5.7
Bangladesh	44	60	52	51	274	591	700	710	0.3	0.6	0.6	0.6
India	1,173	1,802	2,281	2,300	1,453	1,980	2,600	2,750	2.1	2.6	3.1	3.1
Maldives	2	2	2	2	1	2	3	4.5	0.6	0.8	1.2	1.8
Nepal	28	28	28	25	120	130	150140	0.8	0.8	0.8	0.7	
Pakistan	106	118	318	274	1,022	1,149	1,826	809	1.2	1.1	1.5	0.6

Sources: *Statistical Yearbook 1995*. Paris: UNESCO. 1995; *World Media Handbook 1995*. New York: United Nations, 1995.

TABLE 4: *Radio Broadcasting: Number of Receivers, and Density—1970-1993 Malaysia, Mauritius, and SAARC*

Country	Estimated number of receivers('000)					Receiver per 100 people				
	1970	1980	1985	1990	1993	1970	1980	1985	1990	1993
Malaysia	600	5,650	6,600	7,680	8,080	5.5	41.1	42.1	42.9	43.0
Mauritius	110	260	335	385	399	13.3	26.9	33.0	36.4	36.6
Sri Lanka	640	1,454	2,551	3,400	3,600	5.1	9.8	15.8	19.7	20.1
Bangladesh	500	1,500	4,000	4,855	5,360	0.8	1.7	4.1	4.5	4.7
Bhutan	3	7	18	24	27	0.3	0.6	1.3	1.6	1.7
India	1,174	2,600	5,000	6,700	7,200	2.1	3.8	6.5	7.9	8.0
Maldives	1	7	19	25	28	1.1	4.4	10.3	11.6	11.8
Nepal	55	300	450	650	720	0.5	2.0	2.7	3.4	3.5
Pakistan	3,000	5,500	8,500	1,065	1,166	4.6	6.4	8.3	8.7	9.1

Sources: *Statistical Yearbook 1995.* Paris: UNESCO, 1995; *World Media Handbook 1995.* New York: United Nations, 1995.

TABLE 5: *Television Broadcasting: Number of Receivers, and Density—1970-1993 Malaysia, Mauritius, and SAARC*

Country	Estimated number of receivers('000)					Receiver per 100 people				
	1970	1980	1985	1990	1995	1970	1980	1985	1990	1995
Malaysia	130	1,200	1,800	2,640	4,500	1.2	8.7	11.5	14.8	23.1
Mauritius	25	92	140	233	242	3.0	9.5	13.8	22.0	22.2
Sri Lanka	-	35	450	600	1,200	-	2.4	2.8	3.5	6.6
Bangladesh	8	80	261	525	850	.01	.09	.26	.49	0.7
India	28	3,000	10,000	27,000	57,000	.01	.44	1.3	3.2	6.1
Maldives	-	1	3	5	10	-	0.7	1.7	2.4	4.0
Nepal	-	-	20	35	60	-	-	.12	.18	0.3
Pakistan	99	938	1,304	1,989	2.800	.15	1.1	1.3	1.6	2.2
World					1,288,478					22.8
Asia					578,323					17.2

Note. — Sri Lanka started TV transmission in 1979; Nepal in 1985 (*Asian Communication Handbook*, 1993).

Sources: *Statistical Yearbook 1995*. Paris: UNESCO, 1995; *World Media Handbook 1995*. New York: United Nations, 1995; *World Telecommunication Development Report 1996/97*. Geneva: ITU, 1997.

Infrastructure dimension: Mass media.

TABLE 3 to TABLE 5 provide the U. N. data relevant to determining each country's general mass media penetration. In *daily newspaper circulation* per 100 people, Malaysia stands out despite a circulation dip for 1992. Sri Lanka leads the SAARC countries in newspaper penetration even though it has failed to reach the minimum standard of 10 daily newspaper copies per 100 people that UNESCO proposed in 1962. Considering Sri Lanka's high literacy, its newspaper penetration should logically be higher than that of Malaysia or Mauritius. Its low per capita income, as well as the relatively high price of daily newspapers, i. e., about 20 U. S. cents per copy, stands in the way of expanding circulation. In the case of Pakistan, data show a 56 percent dip in circulation from 1990 to 1992.

Radio penetration, i.e., receivers per 100 people, has consistently gone up for all the countries listed. Malaysia, Mauritius, and Sri Lanka head the list in that order. Only Maldives has reached double digits among the other SAARC countries. The minimum standard that UNESCO set in 1962 was five radio receivers per 100 people. Bangladesh, Bhutan and Nepal has yet to reach that standard.

Television penetration, i.e., receivers per 100 people, has also consistently gone up for all the countries listed. Again, Malaysia, Mauritius, and Sri Lanka head the list in that order. However, all the SAARC countries are well below the average television penetration for the world, 22.8 per 100 people, and for Asia, 17.2 per 100 people. Because television sets and computers are in the process of merging, the *television penetration* indicator is significant as a measure of informatization.

Infrastructure Dimension: Telecommunications.

Telephone density, i.e., main telephone lines per 100 people, is a vital indicator of informatization. TABLE 6 shows that Malaysia and Mauritius are ahead of both the world average, 12.4 per 100 people, and the average for Asia, 5.38 per 100 people. All the SAARC countries, except Maldives, are well below the average for Asia. It is clear that populous India and Pakistan have beaten Sri Lanka, which has now awakened to the problem. The annual report of the Central Bank claims a 1996 telephone density of 1.39 for Sri Lanka in comparison to 1.11 for 1995 in the ITU data (*Sunday Observer*, May 18, 1997). Current

projections show that in the year 2000, Mauritius will beat Malaysia in main telephone line penetration; and Maldives, Pakistan, and India will substantially increase their lead over Sri Lanka.

Since Kuo's (1993, 1994) study, *cellular telephone density* and *radio paging density* have become important indicators of the infrastructure dimension. TABLE 7 shows the data for these indicators. Malaysia stands way ahead in *cellular telephone density* followed by Mauritius. Sri Lanka's cellular mobile subscribers (71,228 at the end of 1996, according to the Central Bank annual report), however, constitute 20.6 percent of total telephone subscribers compared to Malaysia's 20.8 percent and Mauritius' 7.3 percent ((ITU 1997, pp. A-32-34). Malaysia leads in *radio paging density* as well although it is below the average for Asia, 0.85 per 100 people. The Central Bank annual report claims Sri Lanka had 10,721 radio paging subscribers at the end of 1996.

Kuo's (1994) use of *telex* as an indicator is already outdated because of its decline resulting from greater use of facsimile, e-mail, and other value-added services (*APT YearBook* 1997, p. 528). TABLE 7 provides the number of telex subscribers with no attempt to estimate its decreasing density. The table also presents the data for *international outgoing telephone traffic* (minutes per person) as another indicator of informatization infrastructure. Malaysia, Mauritius, and Maldives stand at the top on this indicator.

Infrastructure Dimension: Computerization.

Kuo (1993) says, "Computerization is an indicator that is commonly believed to be most closely associated with the level of informatization. Similar to telecommunications, computerization also has a mutually causal relationship with economic development and the level of per capita income" (p. 329). TABLE 8 shows the estimated number of computers, as well as the *computer density*, i.e., computers per 100 people, for the listed countries. Malaysia and Mauritius are again in the lead even though they are below the world average of 4.23 per 100 people. SAARC countries, where data are available, are below the average for Asia, 1.23 per 100 people, except for Maldives.[9]

TABLE 8 has introduced another important indicator of computerization, *Internet user density*, i.e., Internet users per 1

million people. Unfortunately, the data are not available for all the listed countries. Malaysia is miles ahead of SAARC countries on this indicator. Within SAARC, India and Nepal are ahead of Sri Lanka. Internet became popular worldwide with the onset of the World Wide Web. At the time of the Kuo (1993, 1994) study, the worldwide use of the Internet was at an incipient stage.

Kuo (1994) suggested two other indicators to measure computerization: *computer application*, i.e., percentage of organizations using computer systems, and *IT expenditure* per US$1,000 GDP. However, he did not report the data for *computer application*, although he cited the *IT expenditure* reported in *Straits Times* (Dec. 4, 1986). Malaysia's IT expenditure was reported as US$5.2 per US$1,000 GDP. Our search for more recent data failed.

Economy Dimension.

Kuo (1993) admits the difficulty of finding the data to measure the *economy* dimension. He wrote that data on the *information economy*, i.e., share of primary information sector in the total economy, and on *information workers*, i.e., percentage of information workers in the total labor force, "are both missing from most of the countries in our study" (p. 330). We found the same true for Mauritius and the SAARC countries in this study. However, we contend that the data for the first two dimensions—*people* and *infrastructure*—provide a sufficient idea of the degree of informatization in developing countries even without the data for the *economy* dimension.

Jussawalla, Lamberton, and Karunaratne (1988) provided some theoretical and methodological guidelines for the measurement of the information sector in several Asian and Pacific countries. Kuo (1993) cited their estimates of the size of the primary information sector as a percentage of the GDP (factor cost) for four ASEAN countries. That percentage for Malaysia in the 1970s was 16. Our attempts to find authoritative estimates of the current percentages for any of the selected countries were not successful.

TABLE 6: Telephone Penetration Rate, and Projections for Year 2000 Malaysia, Mauritius, and SAARC

Country	Total main telephone lines ('000) 1995	No. per 100 people 1995	Projected telephone lines ('000) 2000	Projected No. per 100 people 2000	Estimated investment 1996-2000 2000 US$ (mil.)	Estimated per year investment US$ (mil.)
Malaysia	3,232	16.56	7,003	31.83	5,506	1,101
Mauritius	148	13.11	223	39.53	371	74
Sri Lanka	294	1.11	344	1.81	209	42
Bangladesh	287	0.24	340	0.26	80	16
Bhutan	5	0.62	15	0.73	14	3
India	11,978	1.29	28,272	2.78	24,441	4,888
Maldives	14	5.67	31	11.13	25	5
Nepal	77	0.36	146	0.61	103	21
Pakistan	2,127	1.64	5,364	3.62	4,856	971
World	692,101	12.14	1,107,094	18.14	623,021	124,604
Asia	182,454	5.38	459,954	12.66	416,379	83,276

Note.   Projections are based on the last six years' average growth rate in main telephone lines. Estimated investment based on US$1,500 per main line.

Source: *World Telecommunication Development Report 1996/67*. Geneva: ITU, 1997.

TABLE 7: Cellular, Paging, Telex, and International Telephone Traffic Malaysia, Mauritius, and SAARC

Country	Cellular telephone subscribers	Cellular telephones per 100 people	Radio paging subscribers	Radio paging per 100 people	Telex subscribers	International outgoing tel. traffic (minutes per person) 1995
Malaysia	872,800	3.34	128,820	0.64	6,858	18.3
Mauritius	11,700	1.04	-	-	400	17.7
Sri Lanka	60,600	0.33	10,100	0.12	1,500	1.5
Bangladesh	4,000	-	3,000	-	2,800	0.2
Bhutan					100	0.5
India	135,600	0.01	221,000	0.02	49,063	0.3
Maldives	-	-	900	0.37	130	12.6
Nepal	-	-	-	-	500	0.6
Pakistan	43,000	0.03	5,700	-	7,060	0.5
World	86,667,700	1.56	56,829,300	1.01	741,200	11.0
Asia	21,155,200	0.62	28,371,800	0.85	183,400	3.1

Note.   Data are for the mid-'90s. Where the sources showed discrepancies, the higher data for the latest year were selected.
Sources: *The APT YearBook* 1997; *World Telecommunication Development Report* 1995 and 1996/97.

TABLE 8: Indicators of Computerization: Penetration of PCs and Internet Malaysia, Mauritius, and SAARC

Country	Estimated personal computers		Internet			
	Total ('000) 1995	No. per 100 people 1995	Total No. of hosts 1995	Hosts per million people 1995	Total estimated users 1995	Users per million people 1995
Malaysia	800	3.97	4,194	208.39	40,000	1,987.48
Mauritius	36	3.19	-	-	-	-
Sri Lanka	20	0.11	6	0.33	60	3.27
Bangladesh	-	-	-	-	-	-
Bhutan	-	-	-	-	-	-
India	1,200	0.13	788	0.85	10,000	10.76
Maldives	3	1.23	-	-	-	-
Nepal	-	-	19	0.87	185	8.44
Pakistan	155	0.12	17	0.13	160	1.23
World	205,081	4.23	9,474,065	1,661.89	23,746,487	4,833.77
Asia	36,336	1.23	412,508	121.79	2,290,318	759.02

Note. — Zero or a quantity less than half the unit shown. ... Data not available.

Source: *World Telecommunication Development Report 1996/97*. Geneva: ITU, 1997.

Summary

Malaysia and Mauritius are most likely to be winners in the communication revolution at the turn of the century in comparison to the SAARC countries. Current data show that these two countries score relatively well on the *people* and *infrastructure* dimensions of Kuo's (1993, 1994) informatization model, which we revised to include indicators such as urbanization, and density of cellular telephones, radio paging, and Internet users. We have not found any recent data for the *economy* dimension. However, the other two dimensions can clearly show the level of informatization for most developing countries. As a small country that scores high on literacy, Sri Lanka can become another winner if it emulates Malaysia to formulate an information society vision. If not, Maldives, Pakistan, and India, despite the latter two's weakness on the people dimension, can beat Sri Lanka on the telecommunications front in the year 2000.

Economic and Infrastructure Assessment

Read and Youtie (1996) point out the telecommunication successes of small cities, not just states or countries. This is the reason why we take the view that smaller countries, as well as "fertile spots" in larger countries, with high achievements on the people dimension can leapfrog into "cyberspatial heights" in the global information society. Hence the success of Bangalore, the "fertile spot" in India, which will take many years to informatize as a nation.[10] Naisbitt (1996) writes: "Bangalore, with its seven software development parks and 5 million people, is one of the world's largest exporters of computer software" (p. 184). Putrajaya (or Cyberjaya) will be the "fertile spot" in Malaysia, which has a vision of informatizing as a nation by 2020. Sri Lanka, which is smaller than Malaysia in territory, has yet to envision its "fertile spot" despite its telecommunication minister's wish for the country to become the "telecommunications gateway to South Asia" (Samaraweera 1996). Such "fertile spots" are likely to generate multiplier effects throughout a country. Perhaps its worthwhile for Sri Lanka and Maldives, the two small SAARC countries that are quite high on the people dimension, to work on a joint "fertile spot."

Malaysia

The World Bank (1996a) says that Malaysia's real GNP has grown at an annual rate of 8.5 percent since 1988. This growth has been led by a strong expansion in manufacturing, especially in export-oriented industries such as electronics and electrical machinery. The Fifth Malaysia Plan (1986-90) promoted the private sector as the main engine of growth and introduced some deregulation. Poverty alleviation has been one of Malaysia's outstanding achievements. Malaysia's dynamic economic performance has placed it in a strong position to achieve its "Vision 2020" objective of reaching the status of a developed country by 2020. This requires sustaining an annual growth rate 7 percent over three decades. The Sixth Malaysia Plan (1991-1995) allocated more than US$1 billion to higher education and US$232 million to industrial training. A main objective of the Seventh Malaysia Plan (1996-2000) is raising productivity growth in the medium term with initiatives to upgrade the labor force, restructure poverty alleviating policies, improve the transport infrastructure, protect the environment, promote technological deepening of firms, develop the service sector, and privatize public enterprises (Malaysia 1996).

Malaysia has put in place a plan to leapfrog into "cyberspatial heights" in the global information society with the creation of its Multimedia Super Corridor. MSC has targeted seven flagship applications for development by 2000: electronic government, telemedicine, smart schools, a national multipurpose card, R&D clusters, worldwide manufacturing webs, and borderless marketing centers. The MSC, a 15-by-50 kilometer zone extending south from Kuala Lumpur to the new international airport in Sepang, will have a high-capacity global telecommunications and logistics infrastructure built upon the MSC's 2.5-10 gigabit digital optical fiber backbone. Malaysia's attempt is to develop its own socio-technical capability for a smoother transition into the information age (Mahathir 1996). The MSC is the brainchild of the National Information Technology Council, which the government created in 1994 to guide the nation's IT development

Karthigesu (1993) has provided a description of the communication scene of Malaysia. Lowe (1994) has documented the policy formulation and articulation process that went into the shaping of Malaysia's current IT policy. Hudson (1997) has

described Malaysia's telecommunication sector and the policy issues involved. She makes the point that Jabatan Telekom Malaysia, the regulatory agency, "is really not independent of either the government" or Syarikat Telekom Malaysia, the partially privatized operator. She says, "The reliance on Telekom Malaysia as 'career of last resort' is also problematic" (p. 311). The APT Yearbook (1996, 1997) provides a historical sketch of telecommunication development in Malaysia, and describes the contemporary growth of the country's telecommunications network, including the cellular systems, data communications services, and satellite systems.

The Malaysia East Asia Satellite 1 came into operation in January 1996 to carry regional telecommunications traffic and to provide broadcast services. MEASAT-2 began operation in November 1996. A bigger third satellite is schedule for launching in 1998 to allow Measat Broadcast to use several hundred channels for broadcast into niche markets around the world. Measat Broadcast aims to develop 22 digital TV channels of laser disc quality and eight radio channels with compact disc quality sound under the name Astro.[11] The company will locate its All-Asia Broadcast Center in the MSC. The Malaysia Space and Telecommunications Research Consortium was scheduled to launch the country's first micro-satellite in 1997 and a second by 2000.

By 2005, Malaysia will have a fiber-optic cable network of 57, 200km in the country thereby establishing a telecommunication infrastructure on par with the advanced world. Moreover, Malaysia, South Africa, and Mauritius are in the process of laying the South Asia-Far East submarine fiber-optic cable from Cape Town to Penang via Mauritius, a project due for completion in 2000. Because this project is open to other international players, SAARC countries like Sri Lanka and Maldives can take advantage of the opportunity. With these and other developments, Malaysia appears determined to be a winner in the Third Communication Revolution.

Mauritius

A mid-ocean island state, Mauritius for the past two decades has moved steadily away from an essentially agricultural-based (sugar) economy to a manufacturing (textile and apparel) economy, and is now diversifying toward an informa-

tion economy. This second transition is by no means an easy process because it involves a shift from traditional labor-intensive industries to capital-and technology-intensive industries. However, the island possesses some of the fundamental ingredients qualifying it for such a transition: strong human-resource capacity, good information infrastructure and the required commitment from government.

The World Bank (1995) expert S. Gray states that Mauritius is synonymous with an African success story. Its real growth, over a quarter century, has averaged an annual 6 percent thereby increasing its real per capita income four fold and eliminating the country's unemployment. However, new competitors (e.g., China) have emerged in the traditional Mauritian labor-intensive exports, causing a steady decline on returns to investment in the Export Processing Zone. The problem is the failure of productivity to keep up with wages. Mauritius, thus, has taken steps to strengthen its technology capacity, and to enhance flexibility in the markets for labor and capital. The government and its partners have focused their efforts on developing a more supple and competitive incentive framework while building the structures for a know-how rich and information-based economy. Mauritians view their country as a potential Indian Ocean "tiger," and they are emulating the Hong Kong and Singapore approaches. Their vision is to grow at 6 percent annually through the year 2000. Their long-range plans include the development and export of financial, consulting, trade, communications, education, and other information-intensive services.

To meet the challenges from international competitors, Mauritius has taken steps to boost productivity, quality, and technology. It has implemented a program to introduce productivity measurement at both the company and sectoral levels, along with productivity awareness campaigns. It has also set up the Mauritius Technology Diffusion Scheme, a demand-responsive means to promote private sector delivery of technology services. To ensure quality, the government has developed an integrated MSTQ (metrology, standards, testing, and quality) strategy for execution by the Mauritius Standards Bureau. The World Bank has collaborated with the National Computer Board (1991) to provide advice on how best to establish an information-based economy. The World Bank (195) asserts that for small countries like Mauritius, foreign invest-

ment can be an effective instrument of accelerated technology transfer because such investment can allow countries to leap-frog stages of economic development.

Geisel (1997) says that Mauritius will emerge a winner in the communication revolution if it can accomplish computer education and training in schools; provide easy and cheap access to telecommunication, especially the Internet; maintain the smart policies on reasonable taxation, attractive offshore regulations and institutions, no exchange controls, etc.; and protect intellectual property; He points out that Mauritius can strongly compete in the IT world in finance, training, manufacture of IT and telecommunication products, and effective use of the SA-FE submarine cable (described in the preceding section).

Mauritius has set up several training institutes to cope with the retraining and upgrading of its workforce. To fully classify itself as an information society, the island is targeting a critical mass of information workers by the turn of the century. Thus, steps are afoot to disseminate computer, information and technology literacy across the Mauritian workforce. Projects such as the Mass Computer Awareness Program and the introduction of IT in the school curriculum are expected to forge this new culture among the working population.

High investment in building information infrastructure has resulted in an excellent telecommunications and information network. This area has attracted investments of about US$30 million for the 1994-95 financial year (Mauritius Telecom 1994 Statistics). This represents an 8 percent increase over the preceding year. This financial year, a contract is on for providing 50,000 wireless telephones.

State-of-the-art networks (fiber optics and digital technology) provide instantaneous connection both locally and internationally. The business sector has access to a panoply of value added services, such as ISDN, teleconferencing, and the Internet. Mauritius Telecom recently announced that it would review its tariff structure so as to align it with international competitors.

This new surge in telecommunication development is in line with the pending liberalization and privatization schemes. Mauritius has signed the World Trade Organization's global pact for opening up domestic markets.

In 1994, Mauritius set up an Informatics Park offering competitive satellite connection to most countries. The park

has attracted several international companies, which use Mauritius as an information hub. Mauritius tops the list of African countries with the highest telephone density. The growth of mobile telephony has accelerated over the last few years as the numbers of providers has increased from one to two. This has had a cascading effect on the tariff structure and made mobile telephony a more accessible and affordable technology. Computer usage has significantly increased at various levels: 70 percent of large-scale organizations use computer systems, and the computer density stands at 4.4 personal computers per 100 people[12] (National Computer Board, Statistics 1996). Schemes such as the Computer Assistance Program for Enterprises and the MTDS promote the strategic use and application of IT in the workplace.

Mauritius has developed a National Information Infrastructure plan to provide the necessary framework for the diffusion and dissemination of an information culture and infrastructure on the island. Moves toward a new public service philosophy of providing efficient and effective information networks have brought in new ventures with the private sector. The government has increased private sector participation through schemes such as build-transfer (B-T) and revenue sharing arrangements (RSA) in major information infrastructure building and upgrading.

Mauritius' geographical location requires it to play an important role in the process of regionalism. Thus, moves are afoot to initiate Mauritius as a strategic information hub. Mauritius Telecom has taken the initiative to seek new opportunities in neighboring countries, such as Madagascar and Mozambique, in the telecommunication sector. Projects such as establishing a regional database and creating special telecommunications zones are also in the offing. Mauritius' role in such STZs could be that of a teleport or corridor of access for member countries. Although embarking Mauritius in a new process of development geared toward making it a fully functional and operational information society involves many challenges, it seems that the country is on the right track.

Sri Lanka

Romer (1993) asks: "Why has Mauritius grown much faster than India or Sri Lanka?" His answer:

Quite possibly because the country adopted a policy of supporting an export processing zone, an administrative arrangement with no geographic restrictions and no major additional investment in infrastructure. The EPZ in Mauritius offered foreign entrepreneurs unrestricted, tax-free imports of machinery and materials, a 10-year income tax holiday, centralized government wage setting, and implicit assurance that labor unrest would not be tolerated. Also important: no restrictions were placed on the ownership of investments or the repatriation of profits. (Romer 1993, paras. 1-2).

These incentives brought in entrepreneurs with ideas about the textiles business, and they made the island a garment-producing center. That know-how was what "allowed Mauritius to grow faster than Sri Lanka, where investment in education was higher" (Romer 1993). "Sri Lanka might invest heavily in education, but it has remained somewhat isolated from economically important ideas in use in the industrial countries. As a result, its potential for development has hardly been exploited." Romer says that it is important for small countries to encourage the production of ideas.

The World Bank (1996b) clarifies that "Sri Lanka could have achieved the growth rates of its East Asian neighbors had it not been for a history of ethnic conflict, political unrest, and stop-and-go economic policies, often associated with election cycles" (para. 4). Ahmed and Ranjan (1995) explain that the country's weak economic performance also largely reflects: weak economic management, poor management of public spending, mixed performance in exchange-rate management, prolonged trade protection, weak financial policies, continued distortion of agricultural policies, and inflexible labor markets, as well as problems with the quality of the labor force.

Sri Lanka remains a low-income country compared with Malaysia and Mauritius both of which are upper middle income. Although the country has achieved remarkable success in human development, the World Bank (1996b) says the country's long-term growth rate in per capita terms has averaged an annual 2.5 percent since 1960. From 1977 onwards, the

country has sought to increase the role of markets and the private sector, but the reform program faltered because of the civil conflict. The economy strengthened in the early 1990s, and the real per capita GDP increased at an average rate of 4.3 during 1989-94. The government's medium-term goal is to sustain economic growth of 7 percent by 1998. Garments account for half of the country's exports while tea accounts for another 20 percent—a clear case for further diversification. Since 1950, the World Bank Group has lent Sri Lanka US$1.9 billion for 84 projects.

The World Bank's support for reforms in the telecommunications sector has already stimulated private investment and interest. Early 1996, the bank approved a US$15 million credit to reform and provide technical assistance to the Sri Lanka Telecommunications Authority—which became the Telecom Regulatory Commission in February 1997—for the improvement of telecommunication sector regulations and to the Public Enterprise Reform Commission for the reform of public enterprises. Sri Lanka Telecom, the country's main telephone operator, now provides only about 1.4 lines per 100 people—considered low for a country at Sri Lanka's income per capita. Because of SLT's inability to meet the demand for main telephone line service, four licensed cellular operators—Celltel, Mobitel, Lanka Cellular, and MTN—were able to entice 71,228 subscribers by the end of 1996 (*APT YearBook* 1997; *Sunday Observer*, May 18, 1997).

The TRC has recommended a full liberalization of all telecommunication sectors while allowing SLT to run the international call services as a monopoly until 2000. (*Daily News*, May 4, 1997). Somasiri (1996) states that a consortium of financial consultants has advised the government on restructuring the telecommunication sector to solve the problem of inadequate funds so "Sri Lanka could join the countries having a satisfactory teledensity ratio" (p. 26). He says the SLT, being a 100 percent government organization, had no additional funds forthcoming by way of capital investments. In 1996, the government issued licenses to Telia Lanka and Lanka Bell to provide islandwide basic telephone services based on digital wireless local loop technology. The two companies are expected to bring in US$250 million by 2000 and provide 200,000 telephones within two years.. At the end of 1996, Sri Lanka had 527 WILL subscribers. The country also has four mobile opera-

tors providing paging services, four operators providing data communication services and one operator providing radio trunk services. Despite these developments, the ITU projections for Sri Lanka's telecommunication structure are bleak (TABLE 6).

Induruwa (1996) says that Sri Lanka had made no serious attempt to provide a regular data communication service until 1990. In 1995. The country started witnessing a rapid growth in the information services industry. Within about a year, half a dozen Internet service providers were offering their services, in addition to two cybercafes. Induruwa points out that while India had more than a decade's experience of achieving high-performance computing ability, Sri Lanka had never acquired supercomputing power. Induruwa argues: "If Sri Lanka is to attain a commanding position in the international IT scene, then it is necessary to create an environment, at least on par with the economies it competes with, to quickly strengthen its IT workforce and arm them with suitable skills. Today it has come to a point that this is not simply achievable without suitable data communication infrastructure." He has, therefore, urged the telecommunication operators to provide high-speed backbone channels in the country as a high priority. Sri Lanka should come up with a telecommunication policy, he says, to encourage operators to offer cost effective state-of-the-art data communication services. Covering the whole country.[13]

The Sri Lanka Central Bank, however, paints a rosy picture in its 1996 annual report, which says that the telecommunication sector is the most dynamic and fast growing of all economic infrastructure sectors. The SLT reconstituted itself as a government-owned limited liability company in September 1996. It completed its second telecommunication development program (1990-1997) one year ahead with funds from the World Bank, the Asian Development Bank, Japan's OECF, and a Finnish export credit company. The SLT is operating within a master plan extending to 2015. It's now on to its third telecommunication development program (1996-2000) with a planned investment of US$136 million (*Sunday Observer*, May 18, 1997).

SLT is in the process of transferring circuits from satellite to cable to take advantage of lower costs (*APT YearBook* 1997). Sri Lanka has access to the analogue-type cable SEA-ME-WE

1, and the digital cable SEA-ME-WE 2, the world's longest, commissioned in mid-1994. SEA-ME-WE 3 cable, scheduled to come on line in December 1998, will also have a landing station in Sri Lanka.[14] The new cable, which uses SDH multiplexing technology, will be eight to 16 times faster in transmission speed. It will be particularly suitable for broadband services and very-high-capacity leased lines. Sri Lanka may find it advantageous to link with the new SA-FE cable to reach southern Africa as well. With such cable connections, the country should be able to lower international call charges and compete more effectively in the global telecommunication market.

The chairman of Sri Lanka's latest Internet service provider, Pan Lanka Networking, gave the following answer to a journalist who asked: "Sri Lanka is a poor country. Already we have [six] Internet services in our country. So how could you, in such a background, think that you could be of great service?"

Now we have about 100,000 personal computers in Sri Lanka. It has large-scale industries approximating 3,600, most of them under the Sri Lanka Board of Investment. There are approximately 7.500 small-and medium-scale industries. There are 28 commercial banks—both state and private. There are 1,600 registered export and import companies. There are 17 electronic and printed media stations and channels.[15] There are 11 universities. Then there are numerous intermediate and higher educational institutes—both technical and non-technical. We have a valuable tourist industry, and we also have a strong network of foreign overseas agencies, such as AFP, Reuters, etc. So all these demand cost-effective faster and better service. For example, suppose you want to send a Telex message on an A4 paper to USA. This will cost you Rs. 275, and it will take 180 seconds. If you use a Fax machine for the same purpose, you will spend Rs. 150, and it will take 60 seconds and also the availability of an IDD facility is a "must." On the other hand, if you use the Internet, it will cost you for the same A4 type paper message only Rs. 5 and will take only 30 seconds. Now what does all this mean? Time and money! (*Daily News*, March 30, 1997)

Summary

The economic and infrastructure assessment of the three countries—Malaysia, Mauritius, and Sri Lanka—clearly shows that Malaysia is in the best position to be a winner in the third communication revolution. Mauritius is taking advantage of its small population and land. It is racing ahead to be a winner. Sri Lanka, which took the bullock-cart approach (Gunaratne 1997), has belatedly awakened to its plight. It's scrambling its way to get on a bicycle unable to find the money for a racing car. However, its literate population is most likely to emulate Malaysia's vision and prove that it will achieve it targets sooner than the present projections indicate.

Conclusion

This essay argues that developing countries have no alternative but to brace up to join the communication revolution, and compete in the world material economy. Countries should assess the views of both the utopians and the dystopians when making decisions on how best to enter the information superhighway. Open access and universal service should take high priority in their infrastructure development plans. Countries can learn much from Malaysia's vision as well as Mauritius' Middle Way, which exemplifies what Schumacher (1973) calls the right path of development. Sri Lanka, though a laggard in informatization, has the potential to turn the tables in its favor because of its highly literate population, who could insist on instituting computer literacy and installing islandwide high-speed backbone channels vital for informatization.

The communication revolution offers opportunities not only for small countries with the right indicators on Kuo's (1993, 1994) model, but also for "fertile spots," like Bangalore, in big countries to leapfrog into "cyberspatial heights" thereby producing multiplier effects. Small countries within regions, like Maldives and Sri Lanka, which score well in the people dimension, can team up to achieve economies of scale in building their infrastructure. The indicators of the old paradigm of modernization have re-emerged with revisions as the new paradigm of informatization.

The state-of-the-art digital fiber-optic cables spanning the oceans, like SA-FE and SEA-ME-WE, offer countries like Ma-

laysia, Maldives and Sri Lanka opportunities to competitively lower their international telecommunication tariffs. Countries should install such fiber-optic networks to cover their territorial boundaries as well to achieve the goal of providing affordable universal service for their citizens.

The concept of global cellular communication using intermediate-circular-orbit and low-earth-orbit satellites offer a glimmer of hope for rural communities in developing countries. Four mobile satellite network operators are developing such systems to offer a global system by 2000—Globalstar, Odyssey, Iridium, and Inmarsat ICO (*The APT YearBook* 1997). The current cost of such global cellular phones are beyond the reach of rural folks in the Third World. However, when and if the prices come down, rural folks could hope to reach "cyberspatial heights" as well.

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Notes

[1] The world is now going through the third communication revolution resulting from the convergence of communication satellites, computers and digitization. Digitization converts all information—text, sound and pictures—into a binary code that can promptly travel through a global network of computers linked by telephones, fiber optics and satellites. The first two communication revolutions were the evolution of writing and the invention of printing. "Written language ended the power monopoly of the elders who preserved and passed on the oral sagas and poems that contained the accumulated knowledge of preliterate tribes ... [Printing] challenged the church's monopoly of information, its monopoly of truth, and changed the world for ever" (Stevenson 1994, 262). The third revolution might shift the national and global power structure in ways yet to be seen. The Commission on Freedom of the Press (1947) titled the third chapter of its report "The communication revolution," which, it said, was "far from completed" (p. 31). That revolution, which brought in computers, satellites, etc., as the century progressed,

will continue on to the next millennium.

2 The Four Dragons are Hong Kong, Singapore, South Korea and Taiwan. Hong Kong has a population of 6.3 million and an area of 1,040 sq. kms; Singapore a population of 3.4 million and an area of 632.6 sq. kms.; South Korea a population of 45.5 million and an area of 98,480 sq. kms.; and Taiwan a population of 21.5 million and an area of 35,980 sq. kms. (*World Factbook* 1996). Strictly speaking, Mauritius is smaller in population than any of the Dragons though bigger in area than Singapore; and Malaysia is comparable to Taiwan in population but far bigger in area than any of the Dragons.

3 These three countries belong to the 14-member Indian Ocean Rim Association of Regional Cooperation formed on 16 March 1997 in Mauritius "to promote the sustained growth and balanced development of the region and of the member states, and to create common ground for regional economic cooperation." The other members are Australia, India, Kenya, Oman, Singapore, South Africa, Indonesia, Madagascar, Mozambique, Tanzania and Yemen. The IORARC, therefore, overlaps some countries in the South Asian Association for Regional Cooperation (SAARC), Association of South East Asian Nations (ASEAN) and Asia-Pacific Economic Cooperation (APEC) regional groups.

4 Stevenson (1994) provides a good summary of the old paradigm (pp. 233-234).

5 We selected the SAARC countries for the background analysis because we presumed that the three countries highlighted in this paper can play a big role as hubs in the SAARC region within the expanded IORARC framework. Moreover, other researchers (see Wang 1994) have already analyzed the informatization potential in ASEAN and APEC countries with little attention paid to SAARC countries. Mauritius is ethnically related closely to SAARC countries with 68 percent of the people identified as Indo-Mauritian (*World Factbook* 1996).

6 Barnett, Jacobson, Choi, & Sun-Miller (1996) explain the dependency theory and its relationship to Wallerstein's (1976) world system theory.

7 The World Bank (1995), however, reports an average annual real growth rate of 6 percent for Mauritius.

8 The *Asian Communication Handbook* (Goonasekera & Holaday 1993) lists the following student numbers for Malaysia: 79,651 (universities), 41,695 (pre-universities), 18,846 (vocational), and 5,510 (technical). It provides the following student numbers for Sri Lanka: 29,781 (universities), technical (21,418), Buddhist pirivenas (39,925), and private (83,568). Thus defining tertiary-level education poses a dilemma.

9 One must, however, be cautious about the estimated number of computers. For instance, although ITU (1997) provides a figure

of 20,000 computers for Sri Lanka, the *Daily News*, a Colombo newspaper, estimated the number at 60,000 (March 17, 1996), and later at 100,000 (March 30, 1997). These two figures produce a computer density of 0.3 to 0.5 per 100 people.

[10] Singhal & Rogers (1989) have done a lengthy analysis of the pros and cons of high-technology development in India.

[11] Astro transmits for a regional audience within the footprint of MEASAT 1 and 2—covering India, Malaysia, Indonesia, Vietnam, the Philippines, Taiwan and Eastern Australia. Access to Astro, controlled through scrambled signals, is by subscription—US$34 per month plus US$672 for equipment. The government-run Radio and Television Malaysia operates TV1 and TV2, as well as 21 radio stations throughout the country. TV3, started in 1984, is a private commercial station that broadcasts nationally. Through a subsidiary, TV3 also operates MegaTV, a cable pay TV comprising five channels that provides programs from satellite feed. TV3 has acquired a regional TV channel that will use Indonesia's Palapa satellite to transmit its programs regionally. Another TV station operates in the Klang Valley, serving mainly Kuala Lumpur, Kelang, Shah Alam, and nearby areas.

[12] TABLE 8 provides the ITU figure for 1995: 3.19 computers per 100 people.

[13] Inditel, a London-based infrastructure provider, has approached Sri Lanka with a proposal to establish a fiber-optic trunk network—a basic submarine cable from Trincomalee to Mannar connecting the towns along the eastern, southern and western coasts, and an optional landline cable connecting Colombo, Kandy, Anuradhapura, Mannar and Trincomalee. This design has omitted the war-torn Northern Province.

[14] The $700 million Southeast Asia-Middle East-Western Europe 2 cable system spans some 18,900km from Singapore across the Indian Ocean and the Mediterranean to Marseilles. It allows for more than 60,000 simultaneous conversations. The $1.2 billion SEA-ME.WE 3 will span 30,000km.

[15] Dharmadasa (1993) provides a general view of the communication scene of Sri Lanka.

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