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**ICT for Economic and
Social Transformation**

An Empirio -Theoretical Review of Indian Initiatives

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ICT for Economic and Social Transformation: An Empirical - Theoretical Review of Indian Initiatives

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Abstract

The central issue dealt in the paper is that connectivity matters for social and economic development of marginal and less developed economies. Connected wrong ways connectivity might widen the gap between developed and less developed economies. This is the flip side that occurs when connectivity itself is seen as solution of the complex developmental issues.

ICT is the digital device that makes information accessible in real time across the globe. It is the latest of network technologies. It is argued that as in the cases of earlier network technologies, the ICT adopter economies would prosper, while other languishing as laggards. Theoretical clarity notwithstanding, the faith on ICT as a tool to access to information and development led many experts to suggest that marginal economies may actually skip industrialisation and straight away enter ICT era for development

The paper weaves an argument distinguishing the implications of access to information for developed economies and marginal economies. It is suggested that Distinction between advanced and marginal economy is – in case of former there is demand for information, which in case of latter, is need (as opposed to demand) of information for triggering development. The causality, therefore, could be reverse in the two cases. It is, therefore, argued that for marginal economies access to information has to be coupled with the development programme, otherwise the possibility of connectivity being counter productive, the flip side can be ruled out.

The paper examines the Indian initiatives in this regards, and observes that most of the Indian initiatives are stand-alone ICT access and, therefore, susceptible to become counter productive.

Key Words

ICT4D, Network Technology and Development; ICT Initiatives in India; Access to Information and Economic Development; Knowledge as Processed Information; Information and Cognition.

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The Technology

A group of interrelated technologies (electronic devices) for accessing, processing and disseminating information is called ICT or Information and Communication Technologies (Duncombe and Heeks, 1999). It is a system of electronic network activated through a complex hardware and software systems linked by a vast array of technical protocols (Mansell and Silverstone, 1996). It is a technology that embodies convergence of electronics, computing and communication (Drew and Foster, 1994). ICTs integrate different forms of communication technologies (voice, video, audio, text and data), and allow accessing, storing, processing, sharing, displaying, protecting, and managing information (Chowdhury, 2000).

The Economy

The phrase 'economic and social transformation' presumes that the economy in question suffers from anomalies requiring corrections or corrective measures for alleviating it from the present state. In the present context it will mean setting up a process that will place this economy in the path of transformation. Extreme case would be a marginal economy struck by poverty, illiteracy, lack of health and education infrastructure, lack of general infrastructure like roads, electricity, and communication. Such an economy is largely based on traditional agriculture and artisan industry, which is the only source of employment to the people. The economy lacks diversification and does not have economically meaningful trade relations with the world outside. Not all these indicators are likely to be present in equal intensity in all economies that would be characterised as marginal economies. Here we are constructing a worst case of marginal economy that reveals all these characteristics. These indicators can broadly be divided in three groups, namely, consequences (or effects, seen in poverty, unemployment, illiteracy etc), instruments (or cause as reflected in the absence of physical, social and economic infrastructure), and superstructure (socio-politico-cultural practices) that help perpetuation of the state in which the economy is embedded. It is possible that in a country there are geographical and demographical units featuring all those indicators mentioned above. In those cases it would be easier to target a geographical unit for developmental assistance. The problem becomes more complex where marginal economy is embedded with the modern economy, and may or may not be identifiable as a separate geographical unit. It is an economy within an economy and a society within a society where there are people (of insignificant economic assets), who do not earn enough for living at subsistence level, and remain unable to access the fruit of the progress in health and educational and other physical infrastructure. Such an economy shows multi-faceted duality – as we see in the case of Indian economy, where, it is generally observed that the duality perpetuates in the absence of adequate land reforms, inadequate credit flows or aids for new ventures and also in many cases due to social stigmas as well as social disadvantages perpetrated by caste, class, religion and gender discriminations.

Digital Divide and ICT for Social and Economic Transformation

Can ICT help fighting underdevelopment, poverty, and other structural anomalies that contribute to marginalisation of an economy or a segment of an economy? The answer to the question is generally 'yes', notwithstanding the problem of clarity of the relationship between ICT and development.

'Digital Divide' is the popularly used phrase associating underdevelopment and lack of access to ICT and information. Digital divide is the divide between information 'haves' and 'have-nots'. Concern is that 'the poor are excluded from much of the world's information and no one has even begun to outline a solution to the problem. Nevertheless, others believe that ICTs can be mechanisms that enable developing countries to 'leapfrog' stages of development.' (Wresch, 1996:58). In the UN Millennium Report, Kofi Annan proposes that ICT offers an unprecedented opportunity for less developed countries to 'leapfrog earlier stages of development' (Annan, 2000). Linking access to information as source of knowledge and knowledge as power, similar views on the potentiality of ICT for access to information (to information have-nots) were also expressed by the Chairman of the United Nations ICT Task Force (Figueres, 2003) and the Head of the infoDev programme of the World Bank (Lanvin, 2003). In 1996, Wresch wrote that "This perspective is in line with Barlow's (1998) commentary that Africa (discussed as a unit) should skip industrialism entirely and leap directly into the information era. This conclusion is shared by Hudson (2001) who says the potential for 'leapfrogging' lies in the use of wireless terrestrial and satellite technologies. Chowdhury (2000) presents the position taken by realists that in an increasingly global village, ICTs have the potential of helping the poor to acquire literacy, marketable skills and so on. Braga (1998) builds a case that concludes that the countries that are better positioned to thrive in the new economy are those that can rely on: widespread access to communication networks; the existence of an educated labour-force and consumers; and the availability of institutions that promote knowledge creation and dissemination.

This is the process of expanding human capabilities and access to opportunities in social, economic and political arenas and therefore the overall improvement in the quality of life. (UNDP 2002: Kenya Human Development Report: 2001:2).

The World Bank (2000) argues that the right mix of national and supranational policies and programmes can enable some countries to move from being victims to beneficiaries, but only if networking development moves up the hierarchy of development priorities. This World Bank Report argues that the impact of the networking revolution on the developing world can be realised, only if the most effective policies and programmes implemented. It, however, observes that the networking revolution will remain predominantly a developed world phenomenon. Nevertheless, the impacts of new networking in the developing world will be significant, even though the mechanisms and manifestations will differ. The authors of the Report found that there were a magnitude of threats and opportunities that co-exist for developing countries as a consequence of the networking revolution. There are also basic policies and programmes needed to prepare for these threats and opportunities, even though these policies and programmes will often be challenging, unpalatable and complex to implement. Some of the ways new networking will accelerate development include: improved economic efficiency and competitiveness; more efficient and effective education; healthcare and public administration; opportunities to exploit low factor costs in international markets; opportunities to increase social capital; and opportunities to bypass failing domestic institutions.

Mansell & Wehn (1998:115) suggest that not all development problems can be addressed simultaneously in the face of competing claims on scarce resources. However, the poor

countries that take action on both technological and human resource challenges will be better positioned to benefit from ICT applications and reduce the impact of exclusion from the information economy. In addition, the authors warn that emphasis should not only be on expansion of telecommunication systems ('access' to links in information highways), but must also consider development needs, affordability and skills development.

How Does ICT Contribute to Economic Development?

ICT is important because information is important for economic development. What ICT does is making information available in real time across the globe through a few clicks using networked computer systems. By definition, therefore, in a two-actor economy both the actors have to have access to ICT to make it functional. In an 'n' actor economy, therefore, the best impact of ICT can be derived if and only if all 'n' actors are connected. This is the simple argument that necessitates 'universal access' to ICT for realisation of the best benefits from this new network technology. This is reflected in the study by Rolloer and Waverman (2001), where their result had shown a strong relation between investment in ICT infrastructure and productivity growth, 'especially when a critical mass of telecommunications infrastructure is present. Interestingly, the critical mass appears to be at a level of telecommunications infrastructure that is near universal service.' More the spread of connectivity more is the expected benefits.

What are the ways the ICT contributes to economic development? We are particularly interested, in the context of the present study, to seek answer to the question if ICT will work the same way in the underdeveloped economies, as it supposedly does in the developed economies.

ICT and Information for Economic Man

It was Hayek (1937) who first attempted articulation of role of information in coordination among large number of economic actors for decision-making. Individual entrepreneur seeks information on relative scarcity of various resources (human and physical) to make the investment plan and to choose the best allocation of resources from the available alternatives. Intensity of the act of seeking information increases in a scenario where economic variables are continuously changing. The enterprises have to make appropriate organisational arrangements for accessing the information for continuously tracking the changes, and also for processing the accessed information for coordination of economic actors and making decision on mobilisation and allocation of resources. An enterprise, therefore, incurs cost for collection, communication and use of information, and also incurs cost for organisation of all these activities associated with information. For a more rigorous understanding of role of information in economic actions the altruistic role of an auctioneer has been replaced by treating information as an economic asset (Machlup, 1962), and then investigating how this asset contributes to creation of economic wealth. "Better information leads to better decision, on account of both better individual judgment and better coordination of different individual decisions. Better decisions lead, in turn, to better use of resources, and hence to higher social welfare" (Casson, 1997). This is the perspective from decision theory that looks at an economic man as 'man the decision maker' (Marshchak, 1974). This is different from the neoclassical understanding that ignores the informational problems of the market system and also the role of firm as intermedator, where intermediation does not mean only production but, as the informational perspective of economy would suggest, 'the essence of intermediation is the organization of trade instead' (Casson, 1997). "This type of

intermediation is effected by market-making firms. Trade requires people to make contact with each other, to communicate their wants, and explain what they offer in return, to negotiate a price and to monitor the fulfilment of their contracts. The cost of these activities can be reduced through intermediation. Intermediation is thus a value adding activity; indeed, it is one of the most important sources of added value in the entire economy” (Casson, 1997).

From this perspective it is easy to see the importance of network technologies, as it developed in different phases. H. C. Lucas Jr. and Sylla (2003) have interesting argument to offer in this context. They argue, “ ... while not denying the importance of the great inventions and innovations of the industrial era, (the new interpretation) gives more emphasis to the importance of network innovations and network externalities in shaping the modern economic world.” They trace the epoch making network technologies and relate those to economic development of a country or countries where they have been adopted. “The earlier network technologies, in order of their appearance, were modern financial systems in the seventeenth and eighteenth centuries (before the industrial revolution), early transportation networks (road, canal, ocean and waterway shipping, and, most prominently, railway networks) from the late eighteenth to the late nineteenth centuries, and, finally modern transportation (highway, airway), communication (telegraph, telephone) and electrical networks which began in the late nineteenth and early twentieth centuries.” The countries that adopted these technologies advanced faster than others. Hence it was Dutch Republic, as early adopter of modern banking system and securities market, was the most advanced country in seventeenth and eighteenth centuries. Britain adopted and extended the Dutch system to develop a network that helped mobilisation and allocation of capital for industrial revolution and went on to develop early transportation network, the hallmark of which was development of railway network. It is to be noted that construction of costly railway network was possible because of the financial network, which was already in place. British economy, therefore, could advance faster than the Dutch economy in the late eighteenth and nineteenth centuries. The United States adopted and extended the British financial systems and transportation network to catch up with Britain and to march ahead with the development of the third wave of network technology, the communication network with telegraph and telephone through mid nineteenth and early twentieth centuries (Lucas Jr. and Sylla, 2003; Sylla, 1998, 1999, 2002, 2003). IT or ICT is the latest network technology that is revolutionising the social and economic activities across the world. Lucas Jr. and Sylla (2003) argue that the countries or individual enterprises that failed to adopt the network technologies as it advanced from time to time, “were left to catch-up later, or left in the dust. Inequality widened”.

The economic man - man the decision maker – who accesses information from various sources, processes information for making decisions on mobilisation and allocation of resources and coordination of complex economic activities, concludes complex transactions at minimum cost, is similar to the ‘entrepreneur’ that plays most critical role in the Schumpeterian theory of Capitalist Development. Network technologies, therefore, are integral parts of the process of enterprise and entrepreneurship led process of development. In other words developmental process would be hindered in the absence of adequate infrastructure of network technologies.

Underdevelopment, Information and ICT

Alternately, it is access to information that creates economic man who leads the process of development. To elaborate the argument let us define an economy that does not incur any transaction cost because it has very little economic exchanges, and also it has very little

demand for information, since it is neither an expanding economy nor it has any growing commercial activities. Let us call it a marginal economy, because it is not the case of slower process of economic development; it is a case where development dynamics or impetus is absent. In terms of information perspective unlike entrepreneurship-led economic development where accessing and processing information are intended acts of the economic actors, in a marginal economy information works like air, its access is non-exclusive; it has the same meaning to everybody. A marginal community accesses and uses the same information in the same sense. Individual's cognitive ability is subsumed in the cognitive ability of the community. Here, in terms of the information content, community is not the sum of individuals; community is equal to each individual who is again equal to each other. All the individuals in the community hold the same information, they make the same sense out of it and, therefore, the sum of the individuals' information intensity (knowledge pool) is equal to one individual's information intensity, which is again equal to the information intensity of the whole community.

What we are proposing can be presented symbolically, as follows.

1. Extent of cognitive limitation is different for different individuals.
2. Nature and extent of limitedness depend on types and extent of education, exposure to the outer world, and also the environment within which an individual lives.
3. Since knowledge is processed information, or information after sense was made of it by individuals, we can write $KS \geq \sum ki$, $i = 1 \dots\dots n$. Where, KS is the total knowledge pool of the society, ki is the knowledge of the i th individual. Total knowledge pool is either greater or at least equal to the sum of the knowledge of all individuals in the society.
4. As described above a marginal economy is homogeneous in cognitive limitations of its individual members. So in a marginal economy, $KM = \sum ki = ki$, $i = 1 \dots\dots n$. Where, KM is the total knowledge pool of a marginal economy, ki is the knowledge of the i th individual. Here total knowledge pool is equal to the sum of the knowledge of all individuals, which is equal to the knowledge of one individual.

Researchers and policy makers, reflecting upon experiences from various 'access to information' programmes, realise that what remains between information and social and economic development, is the arrangement for making information useable (Burlow, 1998). Education and exposure to the world outside the community enhance the cognitive ability of individuals, and can make information, which is made accessible through ICT, usable.

The journey from marginal economy to developed economy, therefore, is also a journey from community centric economic decision to the emergence of individualised economic decision. This results to proliferation of individual enterprises. Economic activities become multi-dimensional; as becomes demand for information succinctly individualised where individuals are no longer receiver of information. They actively seek privileged access to information, pay price for exclusivity. With the proliferation of individual enterprises the economy becomes more outward looking and multi-dimensional. There would be gradual increase of exports and imports in the economy. Such economic changes would accompany changes in social relations and practices.

Evidences and Flip Side

Individualisation of economic and social activities is the singular most important effect of ICTisation of a marginal economy. With the already existing unequal asset base individual

with higher asset net worth are likely to gain from ICT access resulting widening social and economic gaps unless ICTisation is coupled with measures to strengthen economic opportunities and empowerment of the people at the bottom of economic and social pyramid. Evidences from large number of ICTisation programme also indicate the similar views. Castells (1999) observed that the network technology allows linkages with everything that is valuable according to dominant values and interests, while disconnecting everything that is not valuable, or becomes devalued. The system has a concurrent capacity to include and exclude people based upon a capacity to network, and this is where the poor in developing countries suffer from exclusion. The general characteristic of network technology is that it makes adopters richer and non-adopters laggards (Barabasi, 2002).

The studies available are quite ambivalent about the achievements of the various ICT access programmes around the developing world. At the local level, while there is no shortage of anecdotal evidence - valuable in its own right - to demonstrate the positive influence of ICTs on community welfare, beyond anecdote there is a scarcity of systematic evidence regarding the beneficial impact of ICTs on economic, social and cultural development, particularly in rural and remote areas and in deprived urban areas (Barbet et al, 2001). 'There are very few substantive critical appraisals or evaluations dealing with rural ICT access and its impact on sustainable development' (TeleCommunication Development Group, 2000). 'The bottom line is that ... ICT does not exist as an external variable to be injected from the outside to bring about certain results. Rather, it is woven in a complex manner in social systems and processes. And, from a policy standpoint, the goal of using ICT with marginalized groups is not to overcome a digital divide, but rather to further a process of social inclusion. To accomplish this, it is necessary to "focus on the transformation, not the technology"(Jarobe, 2001)' also (Warschauer, 2002).

Mansell & Wehn (1998) argue that ICTisation programmes must consider development needs, affordability and skills development along with the connectivity. They also point out that 'one person – one telephone – one Internet access point' model that is predominant in the West, will not be feasible for resource poor less developed economies. Adebkola (1998) suggested that the 'infocommunes' are the ways to deal with the problem of the weak ICT infrastructure base the developing world. Butcher (1998) and Benjamin (2000, 2001) share the efficacy of the same strategy. All reviews, both empirical and theoretical, unanimously indicate that ICT as a tool alone cannot be expected to either alleviate poverty or remove social anomalies. Awareness, education, skill development, and creating relevant information content are essential ingredient to make ICT perform its expected role (Brown, 2001). To make any visible impact the Telecenter programme has to be coupled with other social and economic development programmes that create opportunities for livelihood (Hudson, 2001).

Ernburg (1998a) differentiates between need and demand for telecentres. He argues that there is very little demand (as opposed to need) for telecentres in rural areas as economic demand requires people to have both money and to perceive a benefit for themselves in the telecentre. In a critical note Colle and Roman (1998) observed that the potential contribution of ICTs to rural development is an assumption or a belief and it is yet to be proved. In many telecentre projects, it is assumed that providing the ICT equipment will automatically mean that useful information will be made available to those who want it.

Anderson (1999) argues that access merely will not help if the focus is not on people, organisation, and processes. We shall be repeating the same mistake of the past practices of technology transfer that ignored these issues. Heeks (1999), Chowdhury (2000), and Brown (2001) raise questions if ICT can address the problem of poverty, the visible face of less developed economies. Samiullah & Rao (2000) and O'Farrell (2001) are positive about the

use of ICT for poverty alleviation if it is appropriately used for capacity and skill building, access by women and participation of private sector and NGOs. The World Bank study (2000) observed that the ICTs are likely to help less developed countries in improving economic efficiency and competitiveness, education; healthcare and public administration; increase social capital; and efficient functioning of domestic institutions. Briefly, it is generally believed that through access to ICT development related issues like, poverty alleviation, literacy, gender discrimination, health support system, and the problem of governance (which is considered as major hindrance in executing many developmental programmes for remote, rural and backward areas in less developed economies) (UNDP, 2000 and 2001; Chowdhury, 2000a; Dymond & Oestmann, 2002).

Marcelle (2000) draws attention to the lack of locally produced information content, targeted towards the general and specific interests and information needs of diverse target groups, in local languages on the Internet. As Stoll notes (2002) 'saying that 100% of primary schools are connected to the Internet does not necessarily mean that all children are in a position to access it. In fact, this situation may coexist with an actual reduction of the use of Internet facilities compared to the time when only 30% of the schools were connected'.

Addo-Dankwa (2002) gives examples of a project in Ghana on ICT to support small and medium scale farmers to increase their revenues and improve their farming practices by making it possible for them to access information on regional market developments and international agricultural know how. Hazan (2002) cites the example from the remote parts of Middle East and North Africa Region where local traditional artisans attempted to reverse their declining fortune by using Virtual Souk, an e-commerce initiative that has created opportunities for these artisans, who can now access high-income markets.

Some recent studies, as reported and reviewed by Indjikian and Siegel (2005), are Udo and Edoho (2000) on innovative use of ICT in Egypt, India, Chile, Singapore, Tunisia, and Gambia. Masten and Kandoole (2002) studied government initiatives and public private partnership in successful dissemination of ICT use in rural areas. Lal on India (2002), Moodley South Africa (2002) and Humphrey et al on Bangladesh, Kenya and South Africa (2003) examined the B2B application assessing comparative advantages, the roadblocks and policy issues. Qiang et al (2004) study on Asian countries shows that there is expanding divide between developed countries and developing countries of Asia in ICT adoption. They observe that high initial investment and operational cost along with low level of human capital is the reason behind many developing countries in Asia lagging behind their developed counterpart in ICT adoption. These countries also yet to reach the threshold level that is required to capitalise on the benefit of network technologies.

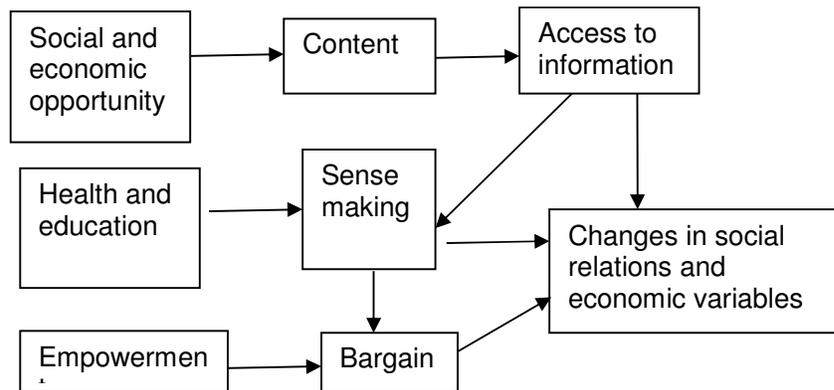
In their article Butt et al (2008) write, "The early Internet dream that held e-commerce as the saviour of the artisan producer has not come to fruition, even though there have been well-promoted individual success stories. Instead, the rise of ICTs has brought unprecedented consolidation in markets." "While there will always be success stories among the poor, there is no doubt that ICTs are, overall, increasing the gap between wealthy and poor business, countries and regions".

Butt et al (2008) observe, "There are indications that ultimately, specialization and focus on the non ICT path of society remain critical for successful ICT4D projects". This is regarding the capacity of the economy of the BOP to make use of the opportunities that is expected to be created by the access to ICT, and social and economic complexities that are associated with it. Butt et al suggest, "Policy makers have to take stock of their true situation and resources available to them rather than following one-size-fits-all blueprints for ICT-enabled development".

A six-country study (Nath and Calindi 2009) identifies economic opportunities available to the target region/community and literacy status of the people as the most important factors for making connectivity work for the marginal economies. The study shows that with more economic opportunities being created and also with 100% literacy, Vietnam is the case for the success of individual oriented connectivity. On the other hand in economies like Bhutan, although literacy rate is very high, lack of economic opportunities necessitates a community based programme for connectivity. In case of Tombouctou, lack of economic opportunities coupled with low level of literacy makes a case of community-based programme.

Evidences and learning from large number of experiments can be summarised as : “....that unless the issue of poverty takes centre stage, new rich enclaves will arise and leave poverty largely untouched, and that State action can help determine the extent to which ICT benefits are broadly shared.” (Proenza, 2002:6). It is not access to ICT and information that triggers development, it is economic and social development that that necessitates connectivity. And economic opportunities, access to education and empowerment together create the condition for making connectivity useable. Graphical view of the learning is presented below.

Diagram 1: Schematic view of the transformation process



The socio-economic dimensions are placed at the left hand side of the diagram. These are the factors that require actions for social and economic transformation. The results of these actions lead to the right hand boxes through the causations placed at the middle. While the access to information itself is an action towards social and economic changes, such actions fructify through the changes in existing social and economic relations. Three boxes at the left side of the diagram suggest three different sets of actions. Social and economic opportunities are constituted of developmental programmes. These programmes have to be designed to ensure and encourage the endogenous process of economic activities and growth. These programmes also constitute the contents and create the pool of information to be accessed through the community accessed points placed at the right side of the diagram. Actions on access to health and education create human resources that would be capable of making sense from the information provided through the access points, and subsequently lead to social and economic actions resulting changes in social relations and economic variables. Action on empowerment is arguably the most important issue. It is constituted of both economic and social empowerment. Economic empowerment is to ensure relief from redundancy, where as social empowerment is to ensure relief from cast, religion, and gender-based inequalities. In short, empowerment strengthens bargaining position, and potentially can alter the social relations and economic actions.

Indian initiatives: Critical review

National Institute of Rural Development (NIRD), Hyderabad, maintains a comprehensive database on the various ICTisation programmes for rural development. The NIRD classification of the programmes is as follows:

Table1: Indian initiatives in ICT for development

ICT initiative for the development of	Number of programmes
1. Agriculture	62
2. Culture and Tourism	39
3. Disaster Management	6
4. e – Governance	86
5. e – Governance with Panchayati Raj	69
6. Education	75
7. Environment and natural Resource Management	18
8. Health and hygiene	49
9. Livelihood	37
10. Rural Water Supply and Sanitation	4
11. Women Empowerment	35
<hr/>	
Total	480

Source: NIRD website http://www.ict4rd.net.in/projects.aspx?cat_id=5 accessed on 9 January 2009

Further details of these programmes are available through the links provided to the individual projects and the executing agencies. There is no information on the volume of funding for the individual projects, although sources of funding are mentioned for each project.

According to the NIRD database there are 480 programmes or projects that can be called as part of the ICTisation initiatives. There is multiple counting of several projects. This is because a programme or project may have multiple objectives among the 11 categories mentioned in the Table 1. Out of these categories we leave out programmes under ‘Culture and tourism’ and ‘e-governance’ because most of the programmes under these heads do not directly relate to our concerns. Again, if these two categories that we propose to leave out have projects that relate to the rural development or other social and economic issues of our present concern, those would be anyway counted under the other heads. We, therefore, do not miss anything by leaving these two categories out. We are, therefore, left with total 355 programmes/projects. Many of these programmes were time-bound and have been wound up after the projected time period. The NIRD database also includes such projects. Table 2 provides the details of source of funding and year of initiation of 355 initiatives. The projects for ICT for development of the backward economies can be traced from 1990-95. There is a sharp rise in number of projects during 2001-2005 (more than 50% of the total number of projects), followed by a sharp decline during 2006-2008. Also to be noted that about one third of the projects are funded by government (both state and central government funded projects taken together). If we count the initiatives through collaborative funding with private and foreign sources, total government involvement will rise to about two-thirds of the total programmes. The other one third of the programmes is funded through private and foreign sources, including funding through various foundations.

Table 2: Source of funding of the programmes classified year of initiation-wise

Year	Govt	Pvt	Foreign	Govt & Pvt	Govt & Foreign	Foundation	Total
1990-95	4	2			2	1	9
1996-2000	19	10	8	2	4		43
2001-2005	130	70	44	8	17	10	279
2006-2008	13	3	5				21
NA	3						3
Total	169	85	57	10	23	11	355

Source: constructed from NIRD database ict4rd.

Sharp decrease in the number of projects after 2005 is an important issue indicative of the growing disillusionment of the outcome of such projects.

As evident from Table 3, about half of the programmes address the issues related to education, health and women empowerment. And among them education has the highest number of projects, followed by health. Programmes on Agriculture and Livelihood are directly related to the developmental programmes, whereas programmes under e-governance with panchayati raj address the issues related to the governance of social and economic development programmes. It is important to note that private and foreign funding have substantial presence in agriculture, health, education and women empowerment. The number is higher than government funded projects in women empowerment.

Table 3: Source of funding for programmes

Issues and sector	Govt	Private	Foreign	Govt & private	Govt & foreign	Private & foreign	Total
Agriculture	25	18	15		2	2	62
Disaster mgt.	3		3				6
e-governance with panchayati Raj	49	12	3	2	2	1	69
Education	32	21	18		2	2	75
Environment and natural resource mgt	15	2	1				18
Health	23	18		2	4	2	49
Livelihood	12	9	8	4	4		37
Rural water supply and sanitation	1	1		1	1		4
Women empowerment	7	13	9		6		35
Total	167	94	57	9	21	7	355

Source: constructed from NIRD database ict4rd.

As shown in Table 4, the about 50% of all the programmes are implemented through either state or central government agencies. Another 50% is executed through private agencies, NGOs and by foundations/trusts. It is to be noted that there are a few programmes that are executed through the involvement of educational institutes, mostly technical education institutes including premier institutes like IITs, and IIITs. Cooperatives as mode of executions of economic and social developmental programmes are generally ignored. Only 9 out of total 355 programmes have involvement of cooperatives.

Table 4: Implementing agency/organisation of the programmes

Issues and sector	Private	Govt	NGO/ Fdn	Coop	Instt	Foreign	Total
Agriculture	12	25	14	1	6	4	62
Disaster mgt.	1	2			1	2	6
e-governance with panchayati Raj	8	46	10		4	1	69
Education	22	31	10		7	5	75
Environment and natural resource mgt		11	2		5		18
Health	16	23	8	2			49
Livelihood	12	7	8	2	5	3	37
Rural water supply and sanitation		2	2				4
Women empowerment	2	7	13	4	6	3	35
Total	73	154	67	9	34	18	355

Source: constructed from NIRD database ict4rd.

Table 5 gives a summary view of the types of actions taken through these 355 programmes. We have grouped the activities in four major groups, namely, Portal, Network, Cooperative, Developmental programme. Portals are created with specific set of information (for example commodity prices, on health issues like polio, on education like reading materials for high school level science students), and they are not specific to any target group of users. Accessed is created through internet, and anybody having access to internet can use the portal for respective purposes.

Networks enable connectivity among different complementary social and economic agents/actors. For example, cotton farmers in distant Andhra villages can seek various types of information from fellow cotton farmers in other parts of the state and country regarding output and input prices, seed varieties, yield, diseases, technologies, etc.

Under the head 'Cooperative' we have kept programmes where ICT has been used for functioning of the activities of a cooperative. This is different from the category of the same name in Table 5, where cooperative is the organisational mode to execute the ICT related programme.

Developmental programmes are those where ICT is used to augment developmental programmes. For example, farmers in villages are given technology related advice on the

basis of studies on their problems. ICT is used for the studies, solution, and communication of the same.

Table 5: Types of actions taken in the initiatives

Issues and sector	Types of action				Total
	Portal	Network	Coop	Devp prog	
Agriculture	9	30	4	19	62
Disaster mgt.		6			6
e-governance with panchayati Raj	6	42	1	20	69
Education	11	28		36	75
Environment and natural resource mgt		3 12 DB		3	18
Health	5	28		16	49
Livelihood	3	23		11	37
Rural water supply and sanitation				4	4
Women empowerment		17		18	35
Total	34	189	5	127	355

Source: constructed from NIRD database ict4rd.

Portals and Networks kind of applications of ICT constitute about two-third of the total programmes, rest being specific developmental programme oriented. Most of the networks are vertical connectivity, and intended to create links between the backward and modern segments of the economy. The Table essentially tells us that if there are 35 programmes under the category called 'women empowerment' 17 of them are networks types of action and other 18 are developmental programmes.

Table 6 is constructed from the project document that provides information on the project objectives, target group and expected benefits. Wherever available project related websites have been consulted for detailed information. In terms of the objectives and expected benefits, all 355 projects have been classified in following 10 different heads. It is to be noted that one project might be providing more than one out of 10 services listed below.

1. Information: This is to capture the initiatives that make availability of information on different aspects of rural development easier. In other words to reduce the information cost. For example, market prices for products and inputs at regional and national markets is available through computer networks. It is to help farmers take decisions on crops sale, procurement, and also on technological matters. Similarly, there are dedicated initiatives for forecasting natural calamities (like information village centres of MSSRF helping fishermen planning sea fishing), education, and various developmental schemes of the governments. Some other initiatives are: a Aqua, Agmarknet, Digital Mandi, ITC e-chaupal.

2. Finance related information: Although there are only 11 programmes providing information on different financial and credit facilities from government and private agencies. Some programmes are: ICICI micro-banking, online transaction processing, govt. of AP, Sayam Krishi Sangam Microfinance
3. Connectivity among government departments. e-governance project of computerisation of govt. departments.
4. Application of ICT for providing services from the government department with for transparency and efficiency. Some examples are: Crisp by NIC, e-Gram Subidha, e-Seva, rural, Jana Mitra.
5. Expert advice on market, technology, remedies etc, like, e-Sagu, Rural Knowledge Centre, Tata Kishan Kendra.
6. Education and training including e-literacy, skill development etc: Programmes like - Creating Rural employment through ICT enabled enterprise development services, Vidya, content in school, e-class room, Tara Gyan, Pratham, yuva.com IT training programme, i-Shakti.
7. Mapping and management of the local resources,: e-gram subidha, swajaldhara,
8. Property records for transparency on rights and transactions, , Bhoomi, bhu rekha, bhu bharati,
9. Application of ICT in production system, dairy information system kiosk, Online integrated computerised system, SUMUL.
10. and awareness building of the target population on social issues, rights and dues. Community radio, gender resource centre, i-Shakti, Tamil Nadu women in agriculture, Disha, e-health.

Table 6: Transaction and information cost

Issues and sector	Info	Fin	Govt dept	Govt to citizen	Expert advice/ services	Edu/ trg	Res mgt.	Prop Record	ICT Appl	Aware
Agriculture	28	4	2	11	26	18	6		11	4
Disaster mgt.			1	3	2				1	2
e-governance with panchayati Raj	17	2		40	10	14	3	5	23	6
Education	14			2	6	46	1			21
Environment and natural resource mgt	1		2	2	4	1	9		2	3
Health	2			7	32	2	2		4	26
Livelihood	17	4		2	18	17			2	2
Rural water supply and sanitation							4			4
Women empowerment	2	1		1	21	23			1	17
Total	81	11	5	68	119	121	25	5	44	85

Source: Constructed from ict4rd (NIRD), and from the respective websites of the programmes.

General Observation: The Flip Side Perspective

Two important aspects of the above programmes are: a. most of them are oriented to individual access and benefits. Again, programmes are executed as fragments as opposed to the need of package suggested in the diagram 1.

There are large number of initiatives to provide expert advice for best practices. Market information through these networks is the information created through the dynamics of the global commodity circuit. Such initiatives, therefore, are instruments for linking the rural economy with the global market. Thus enters Pepsi Frito Lay and ITC to give expert advice on best practices for potato cultivation, or Monsanto for motivating farmers to shift to BT Cotton.

It is to be noted that through the application of ICT the production process, from sowing to market, is segregated and segmentised, addressed to individualised benefits, the totality of the economy is pushed aside, what is compromised is the impending disaster of the ecosystem and imperilled food security of the region. The access to ICT does not advice the farmer that potato chips for the global market may mean neither potato nor rice or wheat for the local consumption. In fact in a segregated and individualised system activated through application of ICT there is no institutional mechanism to filter individual centric information to create community centric actions. It is the most important, yet invisible, structural transformation that is being enforced through the present mode of ICTisation of the rural economy. It is also to be noted that 'cooperative' as an organisational mode for ICTisation and ICTenabled economic activities in rural areas has not found any place in the programmes examined above. This is when India has the most successful example in Amul cooperative of endogenous growth through innovative application of ICT, both in production and management.

One of the major hindrances of ICTisation of the remote and rural areas is the e-literate manpower. The programmes for IT and computer training will help quicker invasion. Similarly, programmes for e-governance, for intra-government departments or for government to citizen services augment the process of invisible structural transformation of the rural economy. In the case of computerisation of land records it has been observed, 'Land registration can be completed in a few hours, whereas earlier it took 7-15 days' (Parks, 2005). But then Benjamin (2005) found that it has resulted in dramatic changes in land markets. Butt et al (2008) observed, 'Gentrification becomes an issue and the rights of the poor are made more tenuous when ICT enables companies and politicians to collaborate on larger real estate development projects, which may be good for a region's overall economy but result in the transfer of security away from the poor to the benefit of the wealthy. After all, it is unrealistic to think that the poor will be trading on the ICT-enabled property market'.

Summary and Conclusion

While ICT based connectivity is being touted as the best opportunity to level up the marginal economies, the study takes a critical theoretical and empirical look to identify the real issues and implications of connectivity. After defining ICT and marginal economy and their developmental issues, we looked at the digital divide as it is called to indicate denial of access to information. We then elaborate the role of information and ICT for economic development of the less developed economies. We make distinctions of the roles in developed economies and underdeveloped economies to suggest that while in the case of developed economy ICT access help development, in case of less developed economies it is development that makes inroad for demand for connectivity. Evidences from large number of

experiments also suggest that if access to ICT or connectivity has to work in the marginal economies, it has follow and effectively coupled with availability of economic opportunities, access to education/literacy, and empowerment of the people at the bottom of the pyramid.

It is in this light that we have examined the Indian initiatives to uncover the fact that most of them have undesirable features that lead to flip side of connectivity, albeit, an individualised benefit approach along with fragments of developmental, educational, and empowerment programmes.

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