

Utilizing ICT for Sustainable Development in Developing Countries

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Abstract

The global economy is increasingly becoming dependent on ICT systems, while developing countries are critically operating under lack of e-readiness, newly evolved constraints, open competition, and unsteady sustainability policies. Infrastructure, content and human capacity are rapidly expanding through increased participation of private sector investment, though not with enough benefits to the marginal communities in rural regions. Information management technology plays a critical role in facilitating the flow of information, knowledge, and lessons learned among different communication tiers within the society. However, the infrastructure needs to be designed to meet the requirements for mass dissemination of useful information to the community.

The increasing international interest in the potential of ICT as a tool for fostering sustainable human development has been reflected in a series of activities, and accelerated by a number of events, like the G8 2000 meet in Tokyo, WSSD Johannesburg Summit in 2002, and WSIS Geneva Summit in 2003. These series of international conferences, attended by experts from developed countries, have become interactive and open dialogue platforms for discussing the differences in access and use of the information technologies in developed and developing countries.

Though the focus and attention to this issue have not been underestimated globally, the efforts and measures have not yet been harmonized by the volume of actual resources dedicated to abridge the existing differences. A concerted effort to overcome the digital divide needs to be undertaken. The digital divide should not be treated as a single parameter within itself; rather it is a product of other more entrenched divides, social and economic. Information technology should be taken as the premier strategic instrument to address these fundamental demarcations by forming an integrated, multi-spurred approach by incorporating information-driven changes within and across developing countries and regions. ICT can potently serve as an inter-active, specifically designed and mutually supportive element in diversified socio-economic development efforts.

Developing countries and especially the least developed countries (LDCs), have yet to attain measurable socio-economic benefits out of ICT. Development of this sector has often been hindered by a combination of outdated infrastructure, relatively high telecommunication costs, inappropriate technology policies, absence of skilled professionals and the intricate culture of information interchange. With these views and practices, many of these nations could not able to be the forerunner in the global market and compete with their more fortunate neighbors.

Due to the uneven and scanty penetration of fixed telephone and the availability of computer in rural and other disadvantaged regions, information is not readily available there except through mono-directional media. Radio, TV and print media are widely used as the means of sharing information. They are not interactive and the information provided is driven by the publisher, rather than by the end user. The Internet has the potential to change this paradigm entirely.

However, the sustainable development processes should accommodate the advancement of equitable and environmentally sustainable policies with strengthened economic, political, and socio-cultural capabilities of people to support the democratic evolution and economic liberalization. The development strategies should comprise of human resource development; gender equity; infrastructure development/up-gradation; e-governance; private sector entrepreneurship enhancement; and environment awareness, focusing utilization of information technologies for the advancement of the marginal communities.

Keywords: G8, WSSD, WSIS, sustainable development, ICT.

Introduction

Sustainable development depends on the actions of individuals from every sector of society, and on our ability to learn from one another's efforts and experiences (PCSD, 1997). It should also build on its previous success stories to educate people on sustainable development.

The concept of sustainable development comprises of cross-sectoral entities and from the policy viewpoint, its parameters are interdependent of each other, like environmental, economic, political, and social sustainability. Sustainable development can only be achieved if development efforts be circled around these main aspects of sustainability.

Parameters of sustainable development

Environmental sustainability should be able to ensure optimum utilization of natural resources for the benefit of the community with increased productivity, adaptability, and by maintaining bio-diversity with sustainable population dynamics. Environmentally unsustainable economic development, combined with unbalanced population growth, will create tremendous strains on the global society.

Economic sustainability applies to the policy level initiations at the national level, leading to broad based economic growth and development over a long term context, including micro- and macroeconomic structural adjustment, efficient mobilization of resources at the sectoral level, equitable access to resources, and increased productivity of marginal communities.

Political sustainability requires social consensus about acceptable ways of resolving conflicts, the rights and responsibilities of common people, including appropriate role of the government, with participatory, open, transparent, accountable and efficient decision making.

Social sustainability demands continued social progress, with improved income generation and equitable distribution, with gross investment in basic health and education sectors, emphasizing active participation of the stakeholders.

Role of ICT in sustainable development processes

Information and Communication Technologies (ICTs) is one of the many strategic and practical instruments available to address the fundamental underlying divisions, including culture and education, government openness and receptiveness, and technical and financial capacity within the social system.

ICT and the Internet are becoming powerful tools in socio-economic development, in the struggle against poverty, and in providing developing countries with an unprecedented opportunity to deal far more effectively with development problems like environment management, disaster prevention, food security, basic healthcare and education. Countries that have given priority to invest in ICT as a tool for their development are improving their capacity and advancing ahead of others with better economic growth and improved human welfare.

Excellent external communications practices are essential if an organization is to achieve success in helping decision-makers in government, local authorities, and industry to develop and adopt policies and practices that are supportive of sustainable development (IISD, 2001).

In most of the developing countries, government plays a critical role in the management and regulation of telecommunication services, which are often held as a monopoly. The advent of the Internet and its applications, was initially seen by many policy initiators as an addendum to its telecom sector. While the majority of telecommunication services terminate at the subscriber's end with a circuit capable of transmitting voice calls only, the Internet applications are much broader, which allow multi-to-multi point interchange of all types of data, including voice, text, video, and graphics, including e-commerce, e-government, distance education, advertisement, etc. Hence, Internet applications call for different policy and strategic approaches. The creation and development of the Internet and ICT sector which, once liberalized, has spurred healthy competition and income generation in many countries, and also requires incentive, supportive environment and larger independence from the telecom sector.

The key areas of policy, economics, governance, education and health are all crucial to sustainable development and all depend on a certain level of infrastructure to operate properly. The extent to which the prospect of these key areas of development can be realized, are largely dependent on a country's ICT capacity as well as innovation in its applications. With or without the assistance of the global community, a commitment to openness, transparency, democratic consensus and participation of community as a whole are vital resources to making change and moving toward sustainable human development.

Information about people's online skills tells us to what extent they are able to use the medium in ways of most interest to them and in ways that are most useful to their particular needs. The ability to find different types of information online allows people to use the medium to their maximum benefit (Wilson, E.J., 2000).

As the need for information exists at all levels of society and in all sectors of life, ICT has become a crosscutting development concern. Community people (including rural farmers), decision-makers, academic institutes and health centers, are among a wide range of individuals and development partners which have specific information needs. The scope of these needs calls for an information readiness; the capacity to obtain, use, generate, and disseminate information and knowledge to enhance community development and national development goals.

Readiness is the degree to which a community is prepared to participate in the Networked World. It is gauged by assessing a community's relative advancement in the areas that are most critical for ICT adoption and the most important applications of ICTs. When considered

together in the context of a strategic planning dialogue, an assessment based on these elements provides a robust portrayal of a community's Readiness (Harvard, 200?).

As President of the 2001 G8 Summit, the Government of Italy has initiated a series of consultations, within the framework of the Task Force on the Global Digital Divide Initiative, to identify effective and practical ways to foster sustainable development by bridging the gap between developed and developing nations in their use of information and its underlying technologies (Accascina, G., 2001).

The context of developing world is increasingly growing in diverse and complex dimensions. At the high end of the spectrum there are a few countries in Asia and the Americas who have been transformed themselves by rapid economic growth and made substantial investments in people's health and education. At the lower end, are those countries whose economic growth have stagnated, poverty has deepened, and disease and hunger continue to grow. Even among relatively prosperous developing countries, a large percentage of the population lives in poverty. Asia, for example, has been home to the world's fastest growing economies, and at the same time 75 per cent of the world's poor live in this region. And the gap between rich and poor is growing fast. About 1.3 billion people in developing countries are living in absolute poverty, defined as living on less than USD1 a day.

In developing countries, a considerable difference exists between urban and rural areas in the context of cost and availability of telecommunication services and accessing the Internet. Usually revenue levels are positive in urban areas, given the higher user density, but they are often negative in rural areas, which are scarcely populated and at the same time physical networks are more expensive to install and maintain. Moreover, user capacity to pay for services is weaker in rural areas and it is difficult for service providers to recover investment costs. Furthermore, without widespread telecommunication services in remote communities, information and economic exchanges are limited with scanty social services and constricted opportunities. For these reasons, extending data communication services to rural areas, guaranteeing sustainability throws a significant challenge to the development actors.

A number of developing countries have also made significant progress on the economic front. Some now produce consumer goods that rival those of the industrial world. Overall, per capita gross domestic product (GDP) in developing countries nearly tripled between 1960 and 1993 (from \$330 in the 1960s to \$823 in 1993). Developing countries also now account for about 25 percent of world merchandise trade (CIDA, 2001).

To eradicate poverty and strengthen the new growth strategies, sustainable development goals are need to be incorporated at the outset. Initially efforts should be given to facilitate the processes of establishing national sustainable strategies and action plans with specific targets (short, medium and long-term). The strategies and action plans should include the codification of sustainable development in legislative accouterments and designation of specific gears to carry out certain activities. Balance need to be created between demand and supply, market competition and promotion, and strategies and action plans. Emphasis should be given to utilize newly evolved ICT strategies to promote sustainable development.

The Internet empowers each and every user of the community with the capacity to communicate directly to any other user, as it is commonly done by email, or to archive and disseminate information to be viewed by users, as in the WWW. Several other functions can also be accomplished such as secured financial transactions to facilitate trade (e-commerce)

or even telephony to make less expensive long distance voice communication (VoIP) rendering the Internet, a breakthrough tool to foster socio-economic development.

Internet and ICT usage in developing countries are likely to expand as a bottom-up process responding to the lower level demand and to operate in an increasingly information-based environment. This process needs to forward by short-cutting cumbersome procedures for the acquisition, generation and dissemination of information, provide easy link to people, and to make government more transparent, even if initially at a modest pace.

Methodology

The concept of sustainable development is not any more at the nascent state, with the involvement of international community as it was in the early stages of its definition (its meaning, scope and limitations). The late 1980s and the early 1990s were devoted to promoting the political acceptance of the concept with the UN organizations (including the development partners) forming a critical landmark in the process. The new millennium has brought new challenges with new resolutions, with the Johannesburg Millennium Summit and many other extraordinary events.

Opportunities for implementing sustainable development action plans and policies vary considerably among countries and regions. The industrialized countries adapt technological innovation, and usually their economic structures offer the fewest possibilities for redirection, while the developing countries, do not have massive commitments to traditional industrial structures and largely depend on alternate development routes. But their technology capacities remain low and many of them face other environmental challenges associated with chronic poverty. The developing countries have been plunged into a stagnant development pace within the iniquitous cycle of underdevelopment.

A few pragmatic steps need to be initiated at the national echelon to promote development activities and are meant to be the key to sustainability:

1. to promote ICT related education at the community level and to encourage demand driven appropriate applications;
2. to identify and support small and medium sized communication networks that can benefit from low cost, low speed connectivity (such as health, education, and environment networks) and rural communities can benefit from locally generated databases on agricultural and consumer commodities;
3. to identify the source of funding to put the wireless network into operation with necessary hardware, start-up costs and initial satellite lease for remote connectivity;
4. to identify and work with stakeholders at community level (including SMEs) and at national level (including government, NGOs and business community);
5. to identify key technical experts within the communities who can provide technical expertise at the local level with expatriate support, if needed;
6. to liaise with Telecom authorities within each country to ensure that pro-development policies exist at rural level allowing easy and accessible satellite landing and frequency usage permits, and work together to establish Internet eXchange (IX), VoIP Exchange and other ICT facilities by sharing common resources;

7. to prioritize investing in research and development activities on adaptive technologies for sustainable development;
8. to incorporate sustainable development into the national policies integrating the economic, social, political, environmental, and cultural aspects of development; and
9. to develop country wide projects in modular form with usage of ICT as an integral part and to make use of aid funding more effectively.

A few methodologies have been illustrated in the following paragraphs, which may be used to enhance sustainability, globally, especially focusing the developing countries.

Capacity development for decision makers

This is a prime factor in the preparatory stage. Senior level government officials, chief executives of industry and leaders of civil society associations often belong to a generation which has had little exposure to the culture of information technology. As a result, they have been found to be slow in adopting new technologies, for their routine communication tools. Seldom the decision-makers use the web or email, and are unreachable other than through official and time-consuming channels. Hence policies generated at this level are quite often formulated without real experience of how IT has influenced all sectors of the economy and society. They need to be encouraged to participate in seminars, workshops and training, in which they can be thoroughly familiarized with the use of IT in the development context.

A thorough understanding of information management is critical in the networked economy, to attracting support for appropriate policies in government departments, as well as in the public sector companies, and others. Often, individuals with ITC skills and a vision of how their country can leverage on ICTs become “champions”, agents of change within their working environments.

Capacity building for ICT professionals

The next important characteristics, is to raise the capacity of the ICT professionals themselves. Professionals in developing countries who are linked to information and content must remain abreast of the new technology to perform their duties in an increasingly more technical environment. Since, most of the SMEs nowadays rely heavily on commerce, communication, and management relations based on computer technology, improvement of these services require skill development of necessary personnel specialized in the complexities of networks and data management.

Skilled professionals within institutions of higher education need to be developed to save costly foreign engineering services for primary matters and it has to be ensured that ICT infrastructure can be built, operated, maintained and upgraded locally. Professional training can be conducted not only to meet domestic demands, but also to secure potential foreign exchange. The tertiary level education system should accommodate international standards syllabi on hardware and software engineering in their academic curriculum.

Inclusion of IT components in secondary training

It is of primary importance that some amount of ICT syllabus be integrated into general education beginning at the latest at the secondary level and if possible, may be at the earlier stage. Three components can be included;

- Basic computing applications, including word processing, spreadsheet, graphics, etc;
- Elements to support the school curriculum, in a computer lab format; and
- Basic use of Internet tools like, email, web, chat, information research and content generation.

Today most of the governments recognize the need to launch ICTs training in schools, beginning at the latest with the secondary level. However, some developing countries could not reach this target, due to financial constraints on the procurement of equipment, the training of trainers and the cost of Internet connectivity. It is recommended that developing countries should include ICT training in every secondary school, with the assistance of the international community wherever possible, through coordinated efforts of the Government ministries, non-government agencies, development partners, local and district schools, and local communities.

Formation of virtual network

The human network is always the critical link in any information distribution and acquisition system. Top-down, supply driven approaches do not work in the long term unless there is a substantial demand at the user end. When the human network at the community level is convened and empowered, it determines the information and content needs and at the same time assists in determining the costs, appropriateness, relevancy and necessity of the content. Demand driven information networks are still not so much popular in developing countries, though new user driven initiatives are emerging in many parts of the world. However, there is a growing trend of communities increasingly demanding access to information to improve their livelihoods. Technology can improvise as a valuable tool to minimize isolation and marginalization of communities by increasing opportunities, a key precept of human development.

Infrastructure development

Without infrastructure, IT can do very little and rarely at the local level. But with an investment in infrastructure, simple applications can have big impacts at all levels. Infrastructure costs decrease while effectiveness is enhanced when developing countries learn from what has been done elsewhere, and adopt the most current approaches to using IT, thus leapfrogging less effective, even counterproductive, technologies.

Informatics constitutes a significant strategic component of the ICT movement in local, regional and international levels, with investments in ICT infrastructure, including implementation of integrated action plan, human resources deployment and applications.

Collaboration

The partnership should be developed with other agencies toward the achievement of the business objectives and strategies, for effective and efficient information management (IM), including support to Knowledge Management (KM) initiatives.

The following components may be focused to make ICT an inter-dynamic and supportive element in institutional and socio-economic development efforts:

- Coordination of ICT policy within the country, if possible, across countries and regions (dynamic ICT policy);
- National level assessment of the current ICT status, problems, opportunities and drifts (e-readiness assessment);
- Information access and availability of technical capacity (needs and resources assessment);
- Multi-level skill building (capacity improvement);
- Government information systems designed for efficiency, transparency and equitable access, including access to social services (e-governance); and
- ICT applications and contributions for poverty alleviation (basic social agenda in developing countries).

Formation of national body

The creation of a National Information Technology Council (NITC) in each country is essential at the primary stage. The council (or a regulatory authority), with regulatory powers and with varying degrees of independence and a clear mandate from and advisory role to the government should run for several years. It may comprise of leading personalities from government departments, business community, non-government agencies, academia, and the civil society. The council, through formulation of a National Information and Communication Technology Policy, should chart a path for the development of the country's ICTs and Internet sector, incorporating mandate of sustainable development.

Multi-level human capacity building

While there is a consensus that emphasis should be given to information and communication, rather than technology per se, but it is important to understand what technology can do in facilitating the management of information to extricate the most development merit out of it.

For present and future generations to be equipped to live in a progressive information based environment, ICTs must be introduced early in the school curriculum and as a component of continuing education. It is also necessary that human capacity building in the use and management of information be fostered at all levels of the society.

A special synthesis of UN trend on human development is produced in the next table:

YEAR	THEME	MAIN FOCUS
2003	Millennium Development Goals: A compact among nations to end human poverty	Balance and stability in the world will require the commitment of all nations, rich and poor, and a global development compact to extend the wealth of possibilities to all people.
2002	Deepening democracy in a fragmented world	Sustained poverty reduction requires equitable growth-but it also requires that poor people have political power. And the best way to achieve that in a manner consistent with human development objectives is by building strong and deep forms of democratic governance at all levels of society.
2001	Making new technologies work for human development	Technology networks are transforming the traditional map of development, expanding people's horizons and creating the potential to realize in a decade progress that required generations in the past.

2000	Human rights and human development	Human Development Report 2000 looks at human rights as an intrinsic part of development and shows how human rights bring principles of accountability and social justice to the process of human development.
1999	Globalization with a Human Face	Report argues that globalization is not new, but that the present era of globalization, driven by competitive global markets, is outpacing the governance of markets and the repercussions on people.
1998	Consumption for Human Development	After a century of vast material expansion, will leaders and people have the vision to seek and achieve more equitable and more human advance in the 21st century?
1997	Human Development to Eradicate Poverty	Eradicating poverty was the most important message of the Human Development Report 1997.
1996	Economic growth and human development	The quality of growth is as important as its quantity for poverty reduction, human development and sustainability.
1995	Gender and human development	The report analyses the progress made in reducing gender disparities in the past few decades and highlights the wide and persistent gap between women's expanding capabilities and limited opportunities.
1994	New dimensions of human security	The report introduces a new concept of human security which equates security with people rather than territories, with development rather than arms.

Table-1: Decade of UNDP focus on human development

Subsequently, the World Bank focus on global development has been summarized in the following table (for sake of simplicity, only theme of the year has been included):

Year	Theme
1978	annual report providing a comprehensive assessment of the global development issues
1979	contains analytical framework, the principal issues of development policy at the domestic and international levels
1980	Adjustment and growth in the 1980s/ Poverty and Human Development
1981	National and International Adjustment
1982	International Development Trend/ Agriculture and Development
1983	World Economic Recession and Prospects for Recovery/ Management in Development
1984	Recovery or relapse in the world economy/ Population Change and Development
1985	International Capital and Economic Development
1986	The Hesitant Recovery and Prospects for Sustained Growth/ Trade and Pricing Policies in World Agriculture
1987	Barriers to Adjustment and Growth in the World Economy/ Industrialization and Foreign Trade

1988	Opportunities and Risks in Managing World Economy/ Public Finance in Development
1989	Financial Systems and Development
1990	Poverty
1991	The Challenge of Development
1992	Development and the Environment
1993	Investing in Health
1994	Infrastructure for Development
1995	Workers in an Integrating World
1996	From Plan to Market
1997	The State in a Changing World
1998/99	Knowledge for Development
2000/01	Attacking Poverty
2002	Building Institutions for Markets
2003*	Sustainable Development in a Dynamic World

Table-2: Decade of World Bank focus on global development

* The world trend is towards the (information dynamics)

Establish government information systems

One of the most important and sensitive areas for the application of ICTs is the improvement of government services. These are the types of interaction categorized by service recipient and their acronyms within the government systems: G2C (Government to Consumer); G2G (Government to Government); G2B (Government to Business); and G2E (Government to Employee).

Information and communication technologies applications and interventions for poverty alleviation

[c] In addition to the economic dimensions of poverty, a sustainable human development definition includes being deprived of the information and access needed to participate in and benefit from the activities and services of the society at large. There are a variety of levels (global, national and local) as well as ways in which ICTs can increase people's participation in society and access to opportunities, and thus contribute to poverty alleviation.

These are the few scopes of interventions at various levels:

Type	Target population	Services	Outputs
local	village, community, district or urban belt	information on local products, commodity prices, social services, health, education and knowledge	Direct benefit of the poor community
national	Country	information on job, commodity market, investment opportunities, consumer commodities, export,	Raising GDP (poverty management)

		import, development projects	
regional	Sub-continent, countries with similar interests	information for making collaboration on similar issues and benefits, sharing of knowledge using similar platforms	Capacity building
global	Continents	information at level playing field related to sustainable development from international organizations acting in this sector	Knowledge network

Conclusions

ICT is not a universal remedy. It cannot be applied to every problem, nor is it a magic-potion; it does not itself solve problems. It is a set of development tools, which has the capacity to make the effect of a well designed, integrated schema. Information is an important component of all aspects of development, as well as most other human activities. The technology used to manage information effectively is a valuable ally in development efforts. And, effectively managed information is knowledge.

Knowledge of more than one component of the information environment is required to grip the complexity of the enabling surroundings for the practical implementations of technology. For example, the much discussed e-commerce, an application which allows financial transactions to be conducted over the Internet, requires the simultaneous presence of several components, many of which are at this time absent from most developing countries.

More complex ICT systems exists in many countries at national level, capable of carrying government information, advertising tourism and other facilities available locally, aggregating and selling agricultural/consumer products nation-wide, etc. However, a systematic interface should be established between ICT professionals developing and implementing ICTs, and government officials, academics, professionals and business people for better information management.

Other parts of the developing world face many other challenges. Despite rapid growth in several Asian countries, Asia continues to house half of the world's poor. Even its more advanced economies remain vulnerable to economic setbacks. While the extent of these challenges should not be underestimated, but it is important to keep in mind that the main story of the developing world over the past half-century has been towards the progress. Many of the main indicators of human well being, like life expectancy, maternal and child health, education, show improvement. There is good reason to believe that progress will continue over the next decade. However, it is worth noting that most of these progresses have been achieved through the efforts of developing countries themselves.

Years of collaboration with different development partners in health policy and health sector has resulted in Bangladesh being ranked 88th out of 191 countries in terms of health system performance, which is far above the country's economic ranking, or digital access index ranking, and it is undoubtedly due to the concerted efforts of Bangladesh and its development partners. Similar efforts are expected in sectors of prime development areas, like, education, ICT development, environment, food security and gender equity.

The global economy is increasingly a market economy and our systems must operate under market constraints. That means, for example, that infrastructure is expanding where it is most

convenient- usually where it is profitable and there is a large enough market for private sector investment. Conversely, it is not infiltrating areas below the minimum revenue threshold, sparsely populated regions for example. In other words, scale is also of utmost importance. Even the Grameen Bank can operate its cell-phone project in Bangladesh partly because the population density in that country makes it feasible. One way that developing countries can address that market constraint is to be more strategic about infrastructure investments. Instead of investing in land-based telecom infrastructure that is used only part of the time and often not for any productive effort (in economic terms), a country could invest in satellite links to beam down Internet connectivity to rural areas. That connectivity may prove more productive because it would be a catalyst to a number of other activities as we have seen in the local level examples. Over the Internet, voice communication would also be possible, and scale may be achieved over a multitude of communities in large rural areas, thus decreasing costs even below the levels of the originally intended land-based systems (Accascina, G., 2003).

A different kind of challenge is posed by rapid urbanization of the developing world. Urban growth rates of 6 per cent are not unusual. By the year 2015, urban dwellers will outnumber rural for the first time in history. This trend brings mixed blessings for the developing world. Cities are the motor of economic growth and can offer increased economic activity, greater employment and growing trade. However, the poor are disproportionately threatened in large cities by environmental hazards and health risk caused by pollution of air, ground and water, as well as by inadequate housing, poor sanitation, and lack of the basic service (CIDA, 1997).

Finally two recommendations can be made, as the start up of this digital governance to eradicate poverty and promote sustainable development:

- Actions should be supply driven: *creating the infrastructure*
 - to encourage investment in physical high-speed data backbones, within and across countries and regions;
 - to encourage investment in wireless and satellite networks; and
 - to encourage deregulation and liberalization.
- Policies should be demand driven: *using the infrastructure*
 - to promote environment awareness and basic amenities of livelihood;
 - to legalize ICT implementations, like the transmission of Voice over the Internet Protocol (VoIP), ease availability of fixed telephones, etc.;
 - to find and encourage sustainable mechanisms for information use in rural communities and village information centres,

and wait for a few years to take over by other parameters in the relay.

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