

Internet and the Digital Divide

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Abstract: The Internet provides less benefit to the underdeveloped countries than to the developed ones. This holds true even when network access is similar in both countries. We argue that network access is not enough to reap full benefit from the Internet; therefore, simple universal access to the Internet in underdeveloped countries is not enough to close the breach of the *Digital Divide*.

Keyword: Internet, Digital Divide, Pragmatic information, Semantic information, Information sciences

Agriculture, industrialization, and informatization revolutions are with no doubt historical productivity landmarks. Tribes and societies can be divided based on the fact that they have or have not accomplished each of those landmarks. We still can find a few tribes that never learned agriculture; tribes merely dedicated to hunting and gathering. Some of these tribes can still be found deep into the Amazon. Their productivity barely covers the basic alimentary needs of the individual and that of their young children. On the other hand, the productivity of agricultural tribes covers the requirements of more children, for a longer period of time, and that of a few relatives that cannot work due to their old age or other physical impediments. And in some cases, it even extends to cover the necessities of another class of people or cast among those tribes that instead of physically working in the field they dedicate themselves to intellectual work. Intellectual work (observations, research, planning, and leadership) that derives in higher levels of overall productivity from those doing the physical labor.

Industrialized societies increased their overall productivity by several orders of magnitude in comparison to agricultural ones [16]. Societies that are now undergoing the information revolution are advancing yet at even higher orders of magnitude. Unfortunately, with those great leaps accomplished by a few societies, the breach between them and those that have not yet accomplished the prior stages is becoming larger and larger. A breach that is not only limited to productivity but also to culture and forms of social organization [3, 4].

The breach or division between the societies that are involved in the accelerated process of informatization and those who are left behind in inferior stages of productivity is

what we call the digital divide [2]. This divide is replacing the current division between the so called industrialized and not industrialized countries which had in turn replaced the breach between the developed and the underdeveloped countries. Unfortunately countries have tended to stay in the same side of the breach no matter the name. In one side we tend to find the rich countries and on the other the poor ones. But the problem is that the breach has increased through time. In 1820 the distance was 3 to 1; in 1913 11 to 1, in 1950 35 to 1, in 1973 44 to 1, and in 1992 72 to 1 [17].

There was a time when power was obtained by having the required natural resources. Then that changed to having the means to exploit those natural resources. Later those instruments evolved and the requirement was having industrialized means of production. In today's information society the most important assets are no longer material or energetic assets; not even the industrialized means of production. Today's valued assets are informational. Those who have the information, the patents, and the means to process and distribute them are the ones that hold the power [10].

Today's historians are continuously perplexed by the fact that year after year –and in some cases in considerably shorter periods of time- informatization standards are accomplished and soon become obsolete. New informatization goals are set and accomplished yearly by the top industrialized countries while the rest do not seem to even get started. A decade ago the Internet was a technology reserved for the experts on the field; today, the experts are lost inside the great masses of children, elders, and professionals who use the Internet on a daily basis. During the 90's the WorldWideWeb (WWW) connected the world together (or at least a major part of it). In 2000 the last country still missing, Eritrea, joined the rest of the world in hyperspace [9]. Since then, a large part of the population of industrialized nations and the elite from the not so developed countries have been connected together. They have been connected to chat, to exchange information, and to give instructions to one another.

It has been not more than 3 years since the speculative boom of the dot-com ended but it seems as it was very long ago when a nobody could simply have an idea to build an Internet company and tens of venture capitalists would line-up

at his/her door to finance the idea. Today, venture capitalists ask for much more than attractive web pages filled with information. Now the minimum standards include the use of practical services, e-commerce, extensive databases, and useful applications with ample accessibility and several payment modalities (like renting, pay-as-you-go, pay per transaction, etc). And most of today's winners are a combination of dot-coms and brick-and-mortar companies where the Internet is only one more vehicle for the company to connect with the customer. Internet applications to control or monitor remote vehicles, machinery, packages, or employees which are geographically dispersed and in continuous movement were the latest investment boom are going [see for example 15]. Therefore, if we examine the Internet boom in more detail, we will find that it has not been a single boom but a sequence of booms where each boom creates greater expectations, generates larger investments, and has a more profound effect on society than the prior one.

Developing countries have been mere passive spectators of the development of the Internet; or as they are called in Internet terms, lurkers. Developing countries have hardly contributed to the technology on which the Internet is based; but more importantly, their contribution in useful information, in sites, and in economical processes (e-commerce) is almost null. And unfortunately, those same activities are what make the Internet an important factor of productivity. At the extreme, their main contribution has been in the number of users but when those numbers are compared to the number of users from industrialized nations, they look very small [1]. And that is even though their total population is far larger than that of the industrialized nations. The Internet is often ignored or even mocked in developing countries and when embraced it is generally in a peculiar mode of a consumer of imported "fashions" from the large world centers of production [see for example 18].

Unfortunately the prior observations seem to contradict the hope expressed by many who expect information technologies -and the Internet in particular- to reduce the breach between the rich and the poor nations who long ago lost every hope of catching up by the process of industrialization because they arrived too late. And they arrived too late simply because long before they arrived, the industrialized nations had already raised the barriers of entry to levels that became too high for the newcomers.

Communication technologies are believed to lower barriers of entry because what a decade ago used to take years now can take only months or weeks and cost a small fraction of what they use to cost. Still, in the next part we will show how the communication infrastructure, the part of the information revolution that is easily implemented, is only a part of what is needed to successfully surf the information revolution.

Many authors have developed frameworks to classify information per se. In general there are three concepts or types of information: (1) Information as form, format, structure, or syntax. In other words, information that is independent of all meaning. This is called syntactical information. (2) Information as a symbol, a representation, a map, a reference, a description, news or data about people, things, or actions. This is called semantic information. And (3) information as a signal, stimuli, or activation code to a behavior in an organism or system. This is called pragmatic information [11, 13].

In grammar, pragmatic information corresponds to an imperative sentence, an order, an instruction like "open sesame" or "love thy neighbor". Semantic information corresponds to a declarative sentence like "Ali baba entered the cave" or "That wall is blue". Syntactic information corresponds to the calligraphy, the phonetic, and the grammatical form used in, for example, the prior expressions.

From the point of view of communication or of the relation between sender and receiver, pragmatic information is a message that activates in the receiver a process or behavior expected by the sender. Semantic information is a dataset that is copied from the knowledgebase or database of the sender to that of the receiver. Syntactic information is the format used to send a message or dataset from the sender to the receiver; a format that must be understood by both -sender and receiver- for the message to arrive successfully.

Common examples of syntactic information are the silhouette of a cloud, the lines in a drawing, the form of a letter, an abstract figure, and the double spiral of the DNA. Common examples of semantic information are the name of an object, the map of a country, and the genetic code. Common examples of pragmatic information are the access code to an account through an automated teller machine (ATM) and the set of genes that can start the formation of an individual.

The Internet is filled with semantic information. Common examples are advertisements (marketing information), news, encyclopedias, catalogs, and many different pieces of data. An Internet user can take information from a webpage or an email and copy it into its own brain (read it, learn it) or s/he could copy it into a secondary storage facility like the hard drive of their PC or print it and file it in a folder. This information is generally found as a sequence of symbols (letters, icons, sounds, etc.) and when read or interpreted it increases the knowledge of the individual. Generally this knowledge refers to objects that are of interest to that individual. It may be marketing descriptions of products that are for sale, newsworthy descriptions of people or current events, encyclopedic description of almost anything under the sky, numerical or graphical descriptions of the financial behavior of a specific stock, descriptions of the climate, etcetera. They are

primarily descriptive information. Descriptive information that may stimulate on the Internet user a future act based on that knowledge. But until that act takes place, the individual is only consuming information; s/he is neither using the objects described nor executing the behaviors learned. The *Semantic Internet* is adding meaning to symbols, it is increasing the knowledge of individuals; but it is not making actions take place.

Pragmatic information is also common over the Internet. A purchase order that includes a valid credit card number is not just increasing the knowledgebase of an individual or of a database but it is activating a comprehensive delivery system of the product ordered. It may be even initiating a whole production process (of the item being ordered or of an item that will replace the shipped one in the warehouse). It is also initiating a process of fund transfer from one account (that of the purchaser) to another (that of the seller).

A marketing advertisement may be limited to providing product information to the potential buyer but it may also be activating a purchase behavior that converts the potential buyer into an actual customer. That advertisement may neglect to transmit much information about the product as long as it directs the potential buyer to the right place at the right time and with the right intentions (that of purchasing the product or service advertised). Such advertisement is a successful piece of pragmatic information. A typical example of the latter is an erotic image that brings the user attention to a place (or a webpage) where the product is located or advertised. The erotic image has little or no information regarding the product but it serves its purpose by bringing the potential buyer towards the product. While the *Semantic Internet* adds meaning to symbols, the *Pragmatic Internet* does not provide information about objects. The *Pragmatic Internet* activates (or allows activation of) processes as well as controls them; in other words, it makes practical use of already existing (and described) objects and processes.

The *Pragmatic Internet* requires the prior existence of people, organizations, or systems ready to obey an order or activation signal that is transmissible over a telecommunication network. A purchase order with a valid credit card number cannot accomplish its objective if the receiver cannot deliver the requested product under the conditions specified (for example in a given time frame) or if there are no credible financial institutions capable of transferring the funds issued in payment to the account of the seller.

In that respect, the public service of the judicial system is critical. A weak, forgiving, or inefficient judicial system does not offer the trust required by individuals or corporations to open themselves to new or innovative businesses. There is

very little inherent trust between parties transacting over the Internet because the delivery of funds generally takes place at a different moment than the delivery of the goods. Parties transacting over the Internet require some way of assuring the enforcement of agreements. The judicial system needs to provide just and timely solutions to such disagreement. The Internet is reducing the time it takes to do many things but if the judicial system is going to operate at a totally different pace then users will not agree to transact over the Internet [for a more comprehensive discussion of this point see for example 5]

The prior discussions bring us to conclude that users from places where the public and private industrial and service infrastructure has not reached the information revolution they will hardly be able to have access to the *Pragmatic Internet* [see for example 12]. Internet users in those regions will not only be unable to activate processes that would take place in their own region but they would not be able to activate most processes that would take places in regions that do have such infrastructure. That is because while the pragmatic information can freely flow from one region to the other, those users would not have methods to control them or enforce them. For example, an international purchase order may bump into custom barriers, deficiencies in the transportation infrastructure, lack of international treaties that would assure compliance by the parties involved, etcetera [see for example 6].

The Internet is no longer in the semantic stage (or the stage of publishing descriptive information). The current importance of the Internet is based on the Internet as a medium to transmit activation or pragmatic information. What makes the Internet what it is today is the commerce that is taking place through its veins. The common name that we currently use for the *Pragmatic Internet* is e-commerce. Of course the traffic of semantic information is still higher than that of pragmatic information but the R&D as well as the gigantic financial investments are mostly directed towards the *Pragmatic Internet* [8].

Coincidentally underdeveloped and poor countries are the world regions that do not count with the infrastructure previously discussed. These countries are characterized by their deficient service and industrial infrastructure. It is generally accepted that the process of becoming a developed and industrialized country is slow and filled with obstacles. On the other hand, recent experiences have shown that implementing the *Semantic Internet* does not require long periods of time and most of the obstacles are easily surpassed. Many underdeveloped countries have been able to build the *Semantic Internet* to levels comparable to those of industrialized nations. We have seen how current technologies allow the creation of a country's communication infrastructure

from practically nonexistence to very sophisticated levels in a matter of a few years and at costs that can be afforded by even the poorest nations [see for example 14]. And when we add to this the low prices of information technology we find that the *Semantic Internet* is now serving not only the rich but also very poor sectors of the world population [7].

Previously we discussed how the *Pragmatic Internet* requires a highly developed industrial and service infrastructure. We also discussed how underdeveloped countries lack such infrastructure (with the notable exception of having the communication infrastructure). We then have to conclude that while underdeveloped countries may make extensive use of the *Semantic Internet*, they will not be able to make much use of the *Pragmatic Internet*. At the most they will be able to make use of the *Pragmatic Internet* for marketing purposes; but this will still be restricted by the limited trust that users of those countries have of the Internet. A trust that is restricted by the lack of practical enforcement mechanisms that impose some correspondence between that which is advertised over the Net and that which the user finds at the physical place where it is sold. A good example of this problem is illustrated in a "Letter to the Editor" found by the authors in a third world country well known to both authors.

"Letter to the Editor: I was not able to sit at the game!

In January 6, 2002 I bought over the Internet from XYZCo.com four tickets to the baseball game between Navegantes and Cardenales that was to take place on January 11 at the University Stadium. I let them pick the seats because the site does not allow me to select the seats since they argue that they will select the best places available. I trusted them, but on the day of the game, when we arrived to the stadium we learned (the hard way) that two of the assigned seat did not exist. I had nobody to complain to and had no other course of action but leave with a bitter sensation..."

A letter that was later followed by another one where that individual claimed that after several weeks of sending complaints over emails he finally received a reply where he was notified that in not less than 90 days they would refund the purchase price. A refund that would be issued in a local currency that a month later had already devaluated by more than 30%.

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