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## **“Latin America’s Educational Challenge”**

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### **Introduction**

Current challenges from India and China are forcing Latin American countries to try to understand what has gone wrong in their socio-economic development processes, since it is evident that they are losing ground to the Asian giants. Once that understanding is reached, the Latin American countries need to decide how to halt their decline in global competitiveness. We believe that the long-term solution to declining competitiveness should focus on education. Latin American children need to become better educated quickly, and the best means of achieving this goal is by making available to them a low-cost laptop with high-speed access to the Internet.

More than 100 million Latin American children ages three and up will not participate in the “knowledge economy” under current government educational programs. The average number of years of schooling in the region is only six<sup>1</sup>. This includes urban schools. In rural areas, the number of years of schooling is much lower. In addition, the quality of the education received in most of these centers of education is very poor. Most children barely end up learning how to read and write.

The official data from the different ministries of education in the region reporting enrollment in the mid-to-high 90% for primary schools and high 80% for secondary schools paint too rosy a picture. It is unlikely that the enrollment rates are as high as the ministries claim. A region with close to 500 million people, of which 50% are less than 18 years old, with six years of poor quality schooling on average and with no participation in the knowledge economy, is a more realistic description of the situation, not to mention a dramatic and worrisome one that poses gigantic challenges.

Educational programs based on brick-and-mortar buildings, with teachers assigned subject matter and age groups, cannot solve the problem. No government budget can accommodate such a burden without collapsing financially and logistically. Latin America’s entire educational system is based on curricula divided not only by subject matter, but also by age (i.e, history for third-grade of primary school, algebra for tenth-grade, etc.). Even worse, we have developed an army of teachers tailor-made for this type of environment--the teacher for third-grade history, the one for eleventh-grade physics, and the like.

Departments of education across Latin America end up building schools with 15-20 classrooms and “laboratories,” but without a budget for maintenance and no funding for equipment. Many become white elephants. Politicians use them for ribbon-cutting ceremonies. This is especially true in rural areas or in the outskirts of cities.

China and India in particular comprise the most serious challenge to the prosperity of Latin America. If we think that China is only a country producing cheap T-shirts, plastic sandals, toys or other inexpensive (read also poor quality) products, we are in for a rude awakening. China is a giant that has awakened to the market economy and is re-educating its population to meet the challenges of the knowledge economy. Haidian, a lesser-known district in Beijing, is now home to 40 universities, 138 science research institutes and 810,000 engineers<sup>2</sup>. India, also well along the market economy path, is educating its citizens to work more with ideas and concepts than with objects.

Latin America therefore needs a drastically different strategy if we are to include this great mass of hopeless children into knowledge economies. More than an educational problem, Latin America faces a mix of problems in different areas that until now were not directly connected to the field of education. In other words, the problems we face have more to do

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<sup>1</sup> The Inter-American Development Bank, “Education, Science and Technology in Latin America and the Caribbean.” 2006.

<sup>2</sup> Juan C. Enriquez, The United States of America. Crown Publishers, 2005. p. 68.

with issues of connectivity, access to computational capacity, and the costs of computing and of telecommunication, than with content or curricula.

Ironically, in today's developing countries, the ministries of telecommunications are as important, or perhaps even more important, than the ministries of education. Why? Because the former can provide the connectivity and the access to knowledge (content) that already exists abundantly on the web. With a few clicks of a laptop, with high-speed access to the Internet, individuals can access any content on the worldwide web. From this perspective, the most important words in today's educational system are Google, Yahoo, or any other search engine of similar size, quality and caliber.

We do not, however, need to destroy current systems of education in order to adopt a new one. Instead, it would be more efficient and useful to build a parallel system where the private sector and NGOs could complement government programs. By combining today's traditional educational processes with modern learning approaches such as "learning-by-doing," children would have a powerful set of tools at their disposal that would multiply their learning experience exponentially. Creative destruction in the case of Latin America's educational system does not apply. Too much has already been invested in the current systems for us to advocate eliminating them.

Meanwhile, education in the region has four fundamental flaws:

**We are teaching the wrong thing.** Latin America must realize that the future of its children and of the children of their children depends on accepting and embracing the fact that we live in a global economy that is dominated by technology. We can spend hours arguing if this is fair or unfair, if it is sensible or not, if this is a rational statement without soul or humanity, or if it lacks respect for culture, customs or traditions. But the global economy is here to stay and, even more important, technology is the driving force of this globalization.

What, then, must we do? First, Latin America needs to produce many more engineers, scientists and physicists, that is, people educated in disciplines capable of innovating in areas that will produce wealth in the twenty-first century. Latin American societies have been, and remain, inclined to produce experts in the humanities rather than in science and technology.<sup>3</sup>

By placing so much emphasis on the humanities, and not on science and technology, we are preparing a generation of dilettantes, *rive gauche* conversationalists and bohemians who endlessly discuss love and tragedy, war and peace, or any other existential topic of the day, but who will not produce one dollar of wealth. Of course, this is an exaggeration, but we need to bring this issue to the center of the discussion. If we are to succeed in creating innovators that generate wealth, we have an urgent need to change our cultural model.

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<sup>3</sup> The Inter-American Development Bank, "Education, Science and Technology in Latin America and the Caribbean." 2006, pgs. 31-48.

In Latin America, we are clinging to two obsolete paradigms. The first one is the “wealth creation” paradigm; the second one is the “transmission of knowledge” paradigm. Wealth creation in the twenty-first century involves intellectual property resulting from scientific and technological discoveries, innovations and related work. Latin America produces more and better commodities than it used to produce 50 years ago – better coffee, rice, cotton, bananas, flowers, soy beans, grains – thanks in great part to technological improvements in genetic engineering (imported), and fertilizers and insecticides (all imported or manufactured locally under license from abroad). Our region, however, remains poor and grows very little. In the meantime, two thirds of the world economies embrace the model of knowledge-based economies.<sup>4</sup> We Latin Americans continue our romance with coffee and banana plantations, cattle ranches, mining, and related activities as the basis for our strategic growth model. We cling to commodities as our basic “business model.” We should have shifted our national efforts a long time ago, as did two-thirds of the world economies, towards science and technology, the true twenty-first century wealth creators, via intellectual property.

We remain attached basically to one code of information, the modern alphabet, consisting of 26 symbols, plus the ten numbers from zero to nine. Until now, however, we have barely scratched the surface of a tool of knowledge transmission that has dominated the last 60 years, that of the zero and the one (0-1), called the binary or digital code. Management of this information code has been the privilege of a small minority in our region. In the developed world, it has become the norm, the code for communication of the masses.

As if this were not bad enough, we are also facing another big challenge, that of preparing our children and the children of their children for the new code of wealth creation and transmission of knowledge. As Professor Juan Enríquez from Harvard outlines in his writings on biotech and genetic discoveries, this new code will become the dominant force, the new tool, the key to empowerment. We are talking about the four letters A, T, C, and G that stand for the four molecules adenine, thiamine, cytosine and guanine that form the basis of the human genome. They are the “new alphabet” of the genetic and biotech code. Where the digital world ends, the genetic and biotech world begins<sup>5</sup>. Whoever masters these combined codes, the binary or digital, and the biotech-genetic one, will become the leading nation, region, culture or group of people. This is fundamental to understand if we want Latin America to become truly competitive.<sup>6</sup>

**We are teaching in the wrong manner.** If we were to take you to a surgery room circa 1900 and compare it to a surgery room in 2007, the only constant in the room would be the body of the patient. The physical aspect of the room, the instruments, the technologies, the processes, the attitude of the medical doctors and nurses, even the way the patient is set on

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<sup>4</sup> Enríquez, Juan, *As the Future Catches You: How Genomics & Other Forces are Changing Your Life, Work, Health & Wealth*, *Three Rivers Press*. New York. 2005.

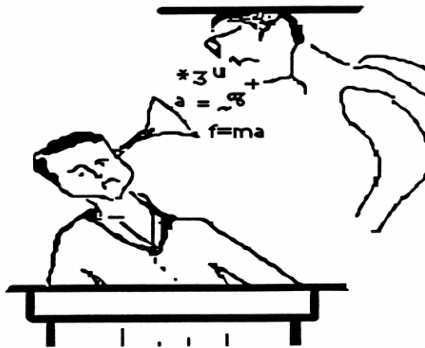
<sup>5</sup> Negroponte, Nicholas, “Introduction,” *As the Future Catches You: How Genomics & Other Forces are Changing Your Life, Work, Health and Wealth*, Enríquez, Juan. *Three Rivers Press*. New York. 2005.

<sup>6</sup> Many of the figures given here are found in Juan Enríquez’s books already quoted and of Nicholas Negroponte’s writings in his articles in *WIRED* magazine and in his book *Being Digital*, *Vintage Books*. 1996.

the operating table, would not be recognizable. It would baffle a doctor from 1900 to enter a surgery room of 2007.

By contrast, if I were to take you to a classroom circa 1900 and compare it to a classroom of 2007 in our region, the only change might be – and only in the wealthiest and most advanced schools – the blackboard, which could have become a screen where a video projector beams some slides from a Powerpoint presentation. This only happens in the most advanced and wealthy schools in the region. If we talk about rural areas or public schools, then a classroom of 2007 might appear very similar to a classroom of 1900.

This similarity applies not only to the physical aspect of the room. The teacher-student relationship, the way the students sit, the way the teacher remains god-like relative to his or her class, the passive attitude of the students, all would be remarkably similar to the classroom of 1900. The student, bored or uninterested in the topic at hand, is fed abstract formulas of knowledge that he does not understand (see figure below).<sup>7</sup>



The methodology of teaching, where we divide students by age and subject, rather than by knowledge and speed of learning, is as familiar in 2007 as it was in 1900. This is true despite all the changes in life, learning and technology that have occurred in the more than 100 years that have elapsed. Education, however, has not taken advantage of these changes.

The MIT Media Lab basically advocates, for developing and developed nations equally, a “learning-by-doing” philosophy of education, something that in the technical jargon is called the constructivist approach to learning. It differentiates teaching from learning. This philosophy is more important than content. Children use the laptop and the Internet to learn about specific projects that a facilitator (we do not call them teachers anymore) has given them as part of the learning experience. The importance of this methodology for Latin America is enormous. It serves as a buffer between the lack of knowledge of today’s teachers in the region, and their fear of accepting new technologies. Teachers as well as students will benefit from this new way of learning. Much of our approach consists of re-programming the educational bureaucracy so that teachers do not have to be the recipients

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<sup>7</sup> We use this example abundantly in our presentations at the Media Lab because of the graphic and explicit message of the degree to which other disciplines have surpassed education by embracing technologies of the digital age in its basis teaching methodologies.

of so much knowledge, but instead can be the facilitators of a student's learning experience.

Every time we give a talk about the projects of the Media Lab or of the OLPC, the "One Laptop per Child" initiative, we are asked, for example: "What type of programs have you developed for Algebra 101 for the computer?" We reply that we try to create "innovators" rather than develop a new application for Algebra 101, which many people have already created and is easily found on the web. Our approach relates more to the way we learn than to the subject that we teach. The computer provides a unique opportunity to create and maintain a creative attitude toward learning. And this applies as much to Latin America as to the developed world. In reality, what we are producing is an equal opportunity of access to knowledge for a poor child in a *favela* in Rio de Janeiro, as well as for a privileged child in New York, Berlin or Tokyo.

We advocate the learning environment of the kindergarten, where children learned by playing. We simplify the concept and call it "learning-by-doing," a life-long acquired attitude. It recognizes that the best way to acquire information and deliver it to the brain is by using the senses. Moreover, the computer provides a life-long sensory opportunity to learn in a fun environment, thereby enhancing the learning experience.

The computer also provides interesting fringe benefits by having the child engage in a two-way relationship: by becoming the "master" of this small relationship with the computer, the child's memory footprint is deeper and longer. The attention span of the child significantly increases (watch a child playing Nintendo and you will understand what we mean).<sup>8</sup> But most important, the natural curiosity and the creativity of a child are significantly promoted. We detected these characteristics at the Media Lab when we developed the Lego Robotics game called MindStorms with the Lego Corporation of Denmark. We used the Lego computer program for children, developed by Seymour Papert in the 1980s, which was recently enhanced with additional features and applications. A five-year-old child was able to perform complex programming sequences that in normal life are only possible once a person learns linear programming, a subject taught during the first year of college. In our case, it was acquired by intuitive methods, by doing it. Rather than being a boring, nerdy toy with limited sales, MindStorms became one of the best-selling products of the Lego Corporation.

To summarize, we want to develop the creative capacity of children. To use the common anecdote, we do not want to give a child a fish, but instead, to teach him or her how to fish. But, we do not stop there. We would also like to teach children how to build the fishing rod. The ultimate goal is to teach them what to do in case the lake in which they are fishing dries up. This is when the inventiveness part comes into play. This helps create inventors who are the creators of intellectual property, which, as we have seen, is the mother of wealth in the twenty-first century. By developing the attitude of seeking knowledge through investigation (research), and then applying that knowledge in their daily lives (development), children will not only learn how to seek information, but, most

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<sup>8</sup> See abundant material on this topic by looking at the work of Chief Scientist, Seymour Papert, MIT Media Lab. [www.media.mit.edu](http://www.media.mit.edu).

importantly, they will absorb the scientific trial-and-error attitude that leads to inventions (intellectual property) and, therefore, to the potential for creating wealth. This process, combined with the normal teaching environment of learning Algebra 101, for example, can reduce the knowledge and economic gap with other nations such as China and India, which are dedicating substantial resources to teaching science and technology. It constitutes a leapfrog attempt with minimum resources in order to catch up with regions of the world considerably more advanced or with better economic resources at their disposal.



**We are educating in the wrong order of priorities.** Until now, education has been the privilege of a few. Only the elites had true access to a good education in Latin America. We advocate the incorporation of the masses of marginal children of the region into meaningful participation in the knowledge society. If we pretend to include these children by building schools with several classrooms and with teachers for each subject and for each age group, we will never be able to compete in a global economy. Only by complementing the traditional approach with new and more modern technology, can we bring them up to par with competing regions.

Digital Age technologies provide us with tools that enable us to dramatically increase learning in such a manner that these children could become productive adults, rather than a heavy burden on their countries.

**We are developing this process at the wrong speed.** At a recent conference on education and development in Salvador de Bahia, Brazil, important commitments from representatives of governments and foundations from across the region were made to increase access to knowledge. The time frame under which they aspired to obtain those goals, however, was wrong. The best proposal was to reduce the number of computers-to-students ratios, from one computer for 40 children, to one computer for 20 children by 2020.

To meet the competitiveness challenge presented by of the Asian countries head on, we need to educate our children and bring them into the knowledge-based economies much faster. A more appealing, albeit ambitious, goal is to have one laptop per child by 2010! This goal may seem daunting, but, paradoxically, it is realistic under today's competitive challenges. I recommend that you access the following website presentation "Education and the Future of Technology," which gives the right emphasis on the speed of change: <http://www.flixy.com/technology-and-education.htm>.

## **Solutions, Solutions**

In the 1940s, Monsignor José Joaquín Salcedo, the founder of *Radio Sutatenza* and a well-known priest in rural Boyacá, Colombia, coined the slogan “Revolution of Hope.” His radio station helped transform the socio-economic conditions of the countryside of Colombia via technologies of the radio waves and the invention of the transistor radio. In 1948, he implemented a strategy of giving a transistor radio to each peasant so that he or she could receive educational material via *Radio Sutatenza* while the peasants were plowing the land with their oxen.

I would like to use that same phrase and call it now the “Revolution of Hope, 21<sup>st</sup> Century.” This is not as unrealistic as it may seem at first. Led by Nicholas Negroponte, founder and director of the MIT Media Lab, a new foundation was created called the One Laptop per Child Foundation or OLPC. Its main product is the laptop, but in reality, the foundation is an educational project, not a computer-manufacturing project. But in order to make education accessible to the masses, the vicious circle of high-cost, limited access to knowledge needed to be broken. Nobody in the computer-manufacturing industry was interested in manufacturing this laptop, because they did not want to cannibalize their own high-cost, high-yield products. However, OLPC attracted visionary, powerful and important founders/investors such as Google, AMD, News Corporation, Brightstar, RedHat, Nortel, eBay and Marvell. Together, they have pledged US\$ 40 million to the project. Quanta, the largest laptop manufacturer worldwide, with factories in mainland China, is manufacturing the laptop. As of December 2007, it will have the capacity to manufacture one million of these laptops per month. Other institutions, such as Citibank and British Telecom, are donating their services and assistance in the areas of transfers of funds and telecom infrastructure build up. So far, as of April 2007, more than 5,000 laptops have been produced and distributed to software developers and to several countries that have signed a Memo of Understanding (MoU). They include Brazil, Argentina, Uruguay, Nigeria, Thailand and Libya. Countries in the process of signing a MoU are Mexico, the Central American countries and Peru, among others. Entities such as the United Nations and the Inter-American Development Bank (IADB) have officially endorsed the project. As can be seen, this is not a computer project; it is a movement, the true “Revolution of Hope, 21<sup>st</sup> Century.”

The technical characteristics of the laptop are impressive. In-house developments in screen design have produced a drastic reduction in energy consumption, to the point in which the laptop only consumes two watts of energy, compared with more than 30-40 watts for a regular laptop. A dual screen (with sunlight reflection and backlit possibilities), gives a 200 DPI resolution, significantly better than most of the commercially-available laptops. It has three USB 2.0 ports, power-saving features, 512 megabytes of flash memory, and a Linux operating system. Recent additions in D memory and a new slot allow it to accommodate a stripped-down version of the Windows operating system. The design allows it to be used either as a laptop, a tablet, a game station, or as an electronic book. It is strong and water-and-sand-resistant, so that liquid spills, mud or sand cannot affect the keyboard. When used with sunlight, the screen turns to black and white with super-high-resolution. When used with backlight, it has full-color, high-resolution viewing capabilities. It has a very good video camera, good quality speakers and a built-in microphone. It will have a pedal

lever at the AC plug-in module or a pull-string, so as to be able to crank up the batteries manually via kinetic energy, in case there is no electricity available. This will be of significant help in countries where there are constant blackouts or where there is limited access to electricity. In rural Latin America, as well as in some regions in Africa and South East Asia, this becomes a vital asset.

The laptop will use WI-FI mesh, a system by which each laptop will become a receptor and at the same time a relaying entity, as the basic telecommunication system. As already mentioned, it will use an open-source philosophy for both the operating systems and the applications. Add-on modules are not only possible but encouraged, and OLPC is inviting programmers to contribute ideas, programs and applications to various programs.

At a recent four-day symposium held at the Media Lab headquarters in Cambridge, Massachusetts, attended by more than 80 participants from governments and institutions from 25 countries, hardware, software and applications were demonstrated in great detail and met with an enthusiastic and positive response.

Now that the laptop has proven itself, it will lead to a revolution on an order of magnitude equal to, or even superior to, the one produced by the transistor radio.

Our version of this revolution is predicated upon several premises:

### **Use of Laptops**

A laptop is the best tool because it has a very small footprint, few or no cables, portability, and consumes little power, yet is a strong device that resists liquid spills, sand and mud. The laptop will provide a sense of ownership (our concept does not assume that the equipment belongs to the school but that the student will own it).



How can we achieve all these objectives in developing countries such as those in Latin America? The sad truth is that governments do not have the capacity to tackle these challenges by themselves. We have advocated for the creation of not-for-profit foundations, to be a three-legged structure called the “Love Triangle of Development,” composed of the public sector, the private sector and the non-governmental organizations (NGOs) involved in education. We ask each sector to do what it can do best. We ask governments to create the right environment and legislation under which a project like this

can flourish. We ask the private sector to collaborate with governments to launch these projects efficiently and with accountability. We ask the NGOs to guarantee the continuity of the project and to institutionalize it. Once this is all in place, we can put in motion the implementation of the revolution, based on:

1. **Saturation of Connectivity via High-Speed Broadband Internet, using Wi-Fi and Wi-Fi Mesh.** This is what we call “viral telecommunications.” It is a bottom-up approach, something that can minimize the use of “hot spots” and maximize the relay capacity of the “mesh” outlined previously. Thus, a school in Latin America will not have to install multiple “access points” or “hot spots,” thereby saving on energy and installation costs.
2. **Saturation of Computational Capacity at Individual Level, Providing Each Child with a Laptop.** The laptop will be owned by the child. It will be taken to his or her home where the rest of the family can benefit from it. If there are sufficient numbers of laptops in the vicinity, such as in a densely populated *favela* or *barrio*, the mesh will become even more relevant and the school “access point” will serve not only the school but the entire neighborhood. The aspiration of the project is that in five years there would be between 40 million to 70 million, or even 100 million laptops distributed in the region. The factory in China involved is geared to produce 12 million laptops in 2008, and 20-30 million by 2009.
3. **Application of the “Learning-by-Doing” Educational Philosophy, Advocated by the MIT Media Lab.** This is a philosophy that encourages team efforts and individual access to information via high-speed Internet access. A facilitator will present a project to a group of children and the children respond with writing (prose or poetry), images, sounds (musicals), cartoons and even theatrical performances. All sorts of sensory expressions are possible with the different applications already in existence or being developed utilizing the open-source methodology. This follows the Wiki model for access to knowledge or for the creation of content.

What are the obstacles to overcome? Perhaps the three most important ones are:

1. **High costs of telecommunication.** It is well known that Latin America has one of the highest costs of telecommunications in the world. It varies in each country, but in general, they are much higher than in North America, Europe and many Asian countries. Our response to this problem is: a) massive usage of Wi-Fi and Wi-Fi mesh and “viral telecommunications” systems, which, by reducing the numbers of “hot spots” and by using each laptop as a transmitter-receptor, would increase the efficiency of the system exponentially; b) having the upper socio-economic classes subsidize the cost of telecommunications to schools and to rural areas by creating a surcharge to corporations and high-income neighborhoods.
2. **Re-education of school teachers:** Ministries of Education have become engulfed in litigation from teachers’ unions, one of the most powerful pressure groups in Latin American countries. These legal and political battles take precious time and energy from efforts to improve education. We need to transform these educators

into “promoters of change” rather than “obstacles to change.” They need to become familiar with the laptops and lose their fear of them. The educators need to understand that the laptops could become their tickets to success, not their competition. We have conducted several workshops in Mexico and Brazil with teachers from impoverished areas of those countries, with encouraging results. We therefore believe that by providing one laptop to each educator, by including them in the learning process of these digital-age technologies, the educators can become instruments of change and progress.



3. **High cost of laptops.** Our solution is to lower the cost of laptops so they become accessible to the masses.

This last point is the main focus of our efforts now. At first, there was resistance to our effort to produce an inexpensive laptop. Now, everybody is joining in this effort, if only because no one wants to be left out of this gigantic market of future users.

### **Conclusion**

It is important to recognize that education is the only long-term solution to development and competitiveness. Bottom-up approaches, rather than top-down solutions, are needed if we are to break the vicious circle of ignorance, misery and, in many cases, violence that plagues the region. Underdevelopment resides in the minds of the people. It is not the result of external forces. The World Bank, the International Monetary Fund, the Inter-American Development Bank, globalization, neo-liberalism, Uncle Sam, and now India and China, are not the villains responsible for our lack of progress. We are the architects of our own destiny and, as such, we must take responsibility for our current state of affairs. By taking this route with a project like the OLPC, we will be doing precisely that. We must think outside the box because current ways of thinking have proven inadequate for bringing the great masses of children into the knowledge economy. Individual access to knowledge is the basis for sustainable social and economic development.

A personal laptop, connected to high-speed, broadband Internet, is the best route to that goal. Alliances between governments, private-sector groups and NGOs related to education provide the best possible way of making an initiative like this into a national project and not a government one.

The challenge is gigantic. It resembles the challenge President John F. Kennedy faced when he presented to the people of the United States the idea of putting a man on the moon before the end of the 1960s, as a way to mobilize the national will and the energy of the entire nation towards a single goal. In the case of Latin America, we need to set a goal to have one laptop per child before the end of the decade if we are to become globally competitive. Otherwise, China, India, Southeast Asia and other countries will leave Latin America behind, perpetuating its position as a region of followers rather than of leaders. Our children and the children of their children would never forgive us for such a blunder.

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