

14. Country Report of Peru¹

14.1 Current Status of the ICT Sector of Peru

Country Presentation

The Republic of Peru covers 1,285,216 Km² of western South America and is the world's 19th biggest country. With 31,488,628 inhabitants, the 51 percentage of these are men and the 49 percentage are women. Its population density has been estimated at 24,5 people per Km². (National Institute of Statistics and Informatics, 2016).

There are three natural regions: Coast, with the 55,9 percentage of inhabitants; the highlands, with the 29,6 percent, and the Amazon jungle with the 14,5 percentage of Peruvian population. However, the Amazon jungle is the largest by area (775,353,84 Km²), followed by the Highlands (353,988,94 Km²) and finally the Coast (150,872,82 Km²).

Figure 1. Peru



Source: Learn More from Peru: What is the location of Peru on the world map? 01.11.2015, Recovered from <https://sabermasdeperu.blogspot.pe/2015/11/cual-es-la-ubicacion-del-peru-en-el.html>

In respect of the economy in Peru, a report issued by the World Bank – WB (2017) remarks that, over the last decade, it has been one of the fastest growing economies in Latin America, with an average grow rate of 5.9 percentage within a framework of low inflation (average 2,9 percentage), due to the presence of a favourable external environment, careful macroeconomic policies and structural reforms in different areas.

However, investment in Peru has been suffering a negative effect since 2014 according to Alejandro Werner, Director of the IMF's Western Hemisphere Department - 2017 (International Monetary Fund). He declares that Peru must increase public investment, joining it with the plan of

¹ This report was written by Maria del Carmen Ferrua Allen, Professor, Universidad Femenina Del Sagrado Corazón (UNIFÉ), Peru.

economic stimulus - to be launched by the regime of the President Pedro Pablo Kuczynski – and the funds for the national reconstruction, because of the damages caused by the phenomenon El Niño Costero.

Werner says: “It is important that economic growing must go hand in hand with public policies which are aimed to reduce important gaps in infrastructure, improve the access to clean water and sanitation. Promote financial inclusion, improve the coverage of public health and continue to strengthen the educative system”. (*El Comercio Newspaper*, May 26, 2017) This way, he is in favor of the new institutional framework for investment, the reduction of administrative procedures and the new tax regime for small and medium-sized enterprises (SMEs). He noted that the compliance of the new regulations will require enhancing tax base, improving competitively, and facilitating labor regulations and associate labor costs with productivity.

Country Information on ICT/Smart Technology

In Peru, the Ministry of Transport and Communications (MTC) is responsible for developing transport systems and local communications and telecommunications infrastructure. It has an important labour on socioeconomic development since it allows national, regional and international integration, trade facilitation, poverty reduction and citizen’s wellbeing.

Through the Telecommunications Investment Fund (FITEL by its acronym in Spanish), the MTC is in charge of providing access to a group of essential telecommunications services, which provides voice and data transmission across Peru in order to achieve the connectivity of this country, being integrated through quality telecommunication services and coordinating its sustainability, especially in rural areas and social interest locations.

In May 2017, Deputy Prime President (former Minister of Transport and Communications) Martín Vizcarra announced the creation of a Vice-Ministry of Information and Communication Technology (MTICT)

According to former minister Martin Vizcarra, the spreading of digital topics and the lack of Authority in Terms of Society of Information across Peru observed in many government reports, demand a setting up of an institutionalism on ICT, which could provide PBI with \$1150 USD millions. (*La República Newspaper*, October 8, 2017)

Currently, both the Vice-Ministry of Communications – in charge of the Optical Fiber Backbone Network deployment which will increase the connectivity across Peru as well as private investment on Telecommunications – and the ICT industry in Peru have direct impact on PBI’s growing. According to the study “Information and Communication Technologies for Development (ICT4D),

undertaken by the WB, an increase of 10,0 percentage in the number of broadband connections means an increase of 1,3 percentage in a nation's economic growth. (FITEL, April 11, 2017)

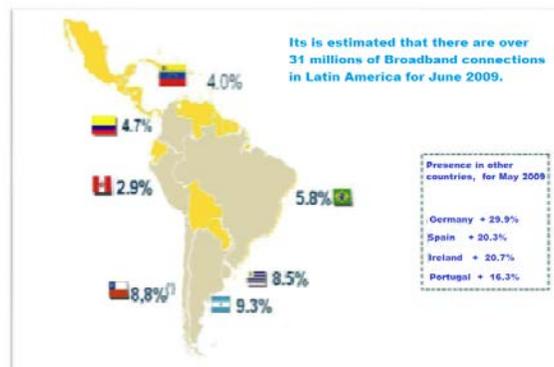
National Optical Fiber Backbone Network - RDNFO (Meaning Red Dorsal Nacional De Fibra Optica in Spanish)

One of the strategic targets of the Ministry of Transport and Communications is Digital Inclusion, through which citizens from underprivileged sectors will be able to access tele-medicine, online education, online training and online security services, among others; this will allow improving their quality of life significantly, by offering better development opportunities.

The key motivation to develop the National Optical Fiber Backbone Network (RDNFO, by its Spanish initials) was the demand for broadband services in the interior of the country, mainly in Peru's highland and jungle areas.

In May 2011, Manuel Cipriano, General Director of Authorizations in Telecommunications for MTC-PERU remarked, in his article "Peru's ICT context" ("*El Panorama de las TIC en el Peru*"), that the density of broadband in Peru was 2,9 percentage.

Figure 2. Peru ICT



Source: CISCO Broadband Barometer, June 2009. In "Broadband: Modern and powerful Economic Development Tool". rge Cuba-MTC (Cipriano, 2011, pp. 8-9)

Internet access in houses with a computer was 19,2 percentage, in houses with Internet connections was 9,7 percentage; meanwhile, according to one member of each family involved in the survey, this access was 43,2 percentage via public internet cabins. (Cipriano, 2011, p.10).

In 2011, optical fiber networks were located mainly along the coast, with some branches in part of the highlands (Junín, Puno, Ancash and Cajamarca), which basically reached the regional capitals. On the other hand, access to (privately owned) optical fiber transport was a barrier to the

development of the country’s telecommunications and, above all, to widespread use of broadband services. (Valle Chicama, 2016)

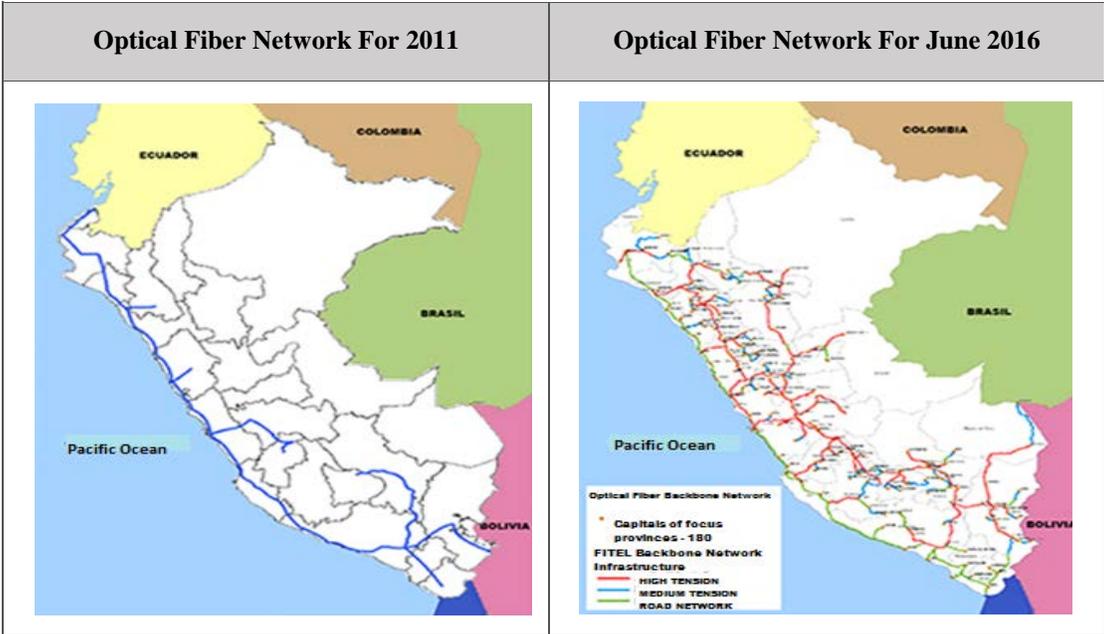
In this context, Law N° 29904 was enacted, Act for Broadband Promotion and National Optical Fiber Backbone Network Construction, in 2012, which declares the Backbone Network’s construction as of public concern and national interest. (Valle Chicama, 2016)

The National Optical Fiber Backbone Network will have an optical fiber extension of 13,500 km and will interconnect 180 province capitals; the service to be provided in the concession is a Bearer Service. (Valle Chicama, 2016)

The project awarded by PROINVERSION (Agency for the Promotion of Private Investment) to the Mexican consortium TV Azteca – Tendai then known as Azteca Comunicaciones Peru S.A.C. has a 20-year network funding, amounting to US\$333 million. The concession contract was signed on June 17, 2014, from which every deadline stipulated in the Schedule; remarked below, start with a period of two years to present the Backbone Network. The RDNFO will have international connections with Bolivia, Brazil, Chile and Ecuador. (Valle Chicama, 2016)

The network deployment efforts started on December 18, 2014 and it is expected to be finished in June 2016. The rate intended for the Bearer Service is US\$27 per megabit per second, value added tax included. (Valle Chicama, 2016)

Table 1. Optical Fiber Network



Source: http://www.mtc.gob.pe/logros_red_dorsal.html

By April 2017, Javier Morales Fhon, a consultant on projects associated with public policies as well as telecommunications regulatory consultancy and ICT's, among other issues, conducting an evaluation of RDNFO, he affirms Azteca has met the deadline programmed for the network's delivery. Projects to expand the backbone network to districts of each province were tendered as such network was being built. In this way, FITEL (Telecommunications Investment Fund) designed a number of regional projects for transport and access, to complement the RDNFO with more than 30 000 kilometers of additional optic fiber.

Regional networks would be implemented by other operators offering services to final users. According to Morales, these 21 regional projects were programmed for 2015 – 2017, with a total investment of more than 1 800 million of dollars. By this time, eight (08) projects have been tendered, one (01) to Telefonica, four (04) to Gilat Peru and three (03) to Andean Telecommunications Networks; the remaining ones, five (05) were in promotion stage, four (04) were viable and the others (04) were in evaluation. Moreover, once the RDNFO started operating, it has allowed the reduction of wholesale rates. (Morales, March 10, 2017)

However, after a year of activities by the RDNFO, all telecommunications operators in Peru (such as Movistar, Claro, Entel and Bitel, among others) have serious concerns about the amount they have to pay in order to receive data through the Backbone: US\$ 23 per 'megabyte', a comprehensive price five years ago when this infrastructure was designed, but now it is not attractive at all, noted Carlos Huaman Tomecich, CEO DN Consultores. According to him, the 'megabyte' price in the market is currently between US\$10 00 dollars and it is estimated by volume (if the operator has more customers, it has a reduction for each 'megabyte'). This amount is flexible, as in the case of the RDNFO. In that sense, concession companies of the eight (08) regional networks delivered by the Peruvian State had delayed its start of operations (until June 2017) pending improving this and other noticed problems to achieve the implementation. (Hurtado de Mendoza, 2017)

After completion of these projects, more than 30 000 kilometres of optic fiber will be deployed so that it will allow to connect 1 529 district's capitals through a high – speed, capacity and reliability telecommunications network, benefiting around 6 thousand of localities; 3,8 million of Peruvians and more than 11 thousand of public entities (among education institutions, health centres and polices stations). These projects are considered as one of the country development pillars in the next years, regarding competitiveness as well as economic and social inclusion. In addition, they will allow the expansion and development of the State's services as well as promoting and motivating the use – advantage of the ICT's.

ICT's Impact on the Development of Peru

In 2015, a study published by Apoyo Consultoria (a leading consultancy firm in business consulting) made an evaluation about the impact of many technological and social - political trends on the economic and social development of Peru. It was founded that RDNFO project of MTC had connected 6.1 million of Peruvians; the number of Peruvian people using smartphones reached the 17,2 percentage with an aim of 58,7 percentage for 2020. Similarly, it planned that 5 million of Peruvian would be using technologies of electronic money, fomented by the Banks Association in Peru (ASBANC in its Spanish acronym), an organization representing the private financial institutions in Peru.

The study also showed that only 10,0 percentage for the public spending on cloud computing represents an increase of the 0,75 percentage in the national GNP, which impacts considerably on the national development.

Figure 3. National Dorsal Fiber Optic Network Project



Source: SlideShare (April 11, 2013). National Dorsal Fiber Optic Network Project: Universal South Coverage. Published in Technology. Recovered from <https://es.slideshare.net/FitelPeru/fitel-ica-banda-ancha-3>

Finally, Apoyo Consultoria suggested the need to implement a number of future actions, grouped in three pillars: promoting the institutionalism in the ICT's use within the Peruvian State, through important institutions which have a direct political support; defining and increasing the relevant public policies, such as the broadband, cloud computing, use of ICT's in MYPES policies as well as giving priority to the confidence citizen and the company in technology through policies and actions of training and protection regarding cyber security. (Torres, 2015)

On June 2015, a Peruvian delegation headed by Bernardo Muñoz – Commercial Counsellor of the Peruvian Embassy in Spain, attended as a guest country the fifth edition of the Business and Networking Forum for the Market of the Information Technologies and Spanish – Language Communication, Business TIC 2015.

Figure 4. El Eco Nomista



elEconomista
América.com | Perú 

In such event, Mr. Muñoz noted that Peru has an ICT sector which has increased at an annual rate of 8,5 percentage, since 2010, launched by the GNP increase closed to 6,0 percentage in 2002 – 2013 period, according to the information given by the Peruvian Government and the Chamber of Commerce in Lima.

In the Forum, Peru was presented as a relevant export country of technological services, such as call centres and the business process outsourcing for the software, video games, animation and architecture 3D development, among others. Similarly, it was said that Peruvian ICT SME's were investing close to 240 million of euros per year in infrastructure developments as well as the electronic trade had achieved a 250,0 percentage of development concerning to 2014. However, it was concluded that “a significant foreign capital is still needed for the investment in I+D+I (Research + Development + Innovation)”, because when compared Peru to the rest of the Pacific Alliance partners (Mexico, Chile and Colombia) some deficiencies were observed, such as the networks implementation, the cloud use or the sales online. Therefore, a gap between supply and demand of professionals specialized in ICT's networks was close to 37,0 percentage of the Peruvian Market.

In order to solve these deficiencies, the Peruvian Government has set up the Peruvian Digital Agenda since more than a decade. It is the “Plan for the Development of the Information Society in Peru”, which was developed under the Multi - Sectoral Commission for the Development of the Information Society (CODESI, in its Spanish acronym) meaning a joint effort of permanent consensus between the Government, the Private and Academic sector as well as the civil society.

According to Bernardo Muñoz, this will allow the sustained – structured development of the Information Society in the country. (El Economista.America.com|Peru, June 12, 2015)

The Infiltration of the ICT's in Households

On June 2017, the National Statistics Institute and Information (INEI, in its Spanish acronym) presented the Technical Report N° 2 corresponding to the “Statistics of the Information and Communication Technologies” in Peru according to the results obtained from the quarterly National Household Survey (ENAHU, in its Spanish acronym).

Evolution of the Access to the ICT's in Households

Table 2. Peru: Households According to the Ownership of ICT Condition
Trimester: January – February – March 2016 And 2017

Ownership of ICT Condition	(Percentage)		Percentage points change
	Jan-Feb-Mar 2016 P/	Jan-Feb-Mar 2017 P/	
At least one ICT	91,7	93,0	1,3 *
None	8,3	7,0	-1,3 *

* There is an important difference, with a level of 90 % confidence.

** The difference is highly significant, with a 95% confidence level.

*** The difference is very highly significant, with a confidence level of 99%.

P/ Preliminary.

In the first trimester of 2016, it was founded that 92 interviewed households out of 100 had at least one ICT's. The following year, in the same quarter, this number had increased, in 93 households an information and communication technology, was present.

Households Access to Land Line and Mobile Telephony

At the national level, in the first quarter of 2017, 29,9 percentage of households has access to fixed telephony versus 31,6 percentage of 2016, being Lima Metropolitana which reports 53,4 percentage of the cases related to 57,5 percentage of 2016, followed by 28,2 percentage in 2017 versus 29,6 percentage in 2016 according to the rest of the urban population respectively. As well as 0,9 percentage in 2017, in comparison with 1,3 percentage in 2016 for the rural area. Apparently, this reduction takes account the major access to the mobile telephony.

At national level, an increase of 1,5 percentage related to households which have a member using a phone is observed. In this way, it appreciates the major increase is on the rural area with 3,7 percentage by being from 76,8 percentage in 2016 to 80,5 percentage in 2017. In the urban area, 1,5 percentage was increased, by being from 92,3 percentage in 2016 versus 93,8 percentage in

2017. However, Lima Metropolitana decreased in 0,8 percentage (from 93,5 percentage to 92,7 percentage).

Table 3. Peru: Households with Land Line Telephony According to the Residence Area
Trimester: January-February-March 2016 and 2017

(Percentage)

Residence Area	Jan-Feb-Mar 2016 P/	Ene-Feb-Mar 2017 P/	Percentage Points Change
Total	31,6	29,9	-1,7
Lima Metropolitana	57,5	53,4	-4,1
Urban Area 1/	29,6	28,2	-1,4
Rural Area	1,3	0,9	-0,4

1/ Lima Metropolitana is not included.

P/ Preliminary.

Table 4. Peru: Households with Mobile Telephony According to the Residence Area
Trimester: January-February-March 2016 and 2017

(Percentage)

Residence Area	Jan-Feb-Mar 2016 P/	Jan-Feb-Mar 2017 P/	Percentage Points Change
Total	89,0	90,5	1,5 ***
Lima Metropolitana	93,5	92,7	-0,8
Urban Area 1/	92,3	93,8	1,5 ***
Rural Area	76,8	80,5	3,7 ***

* There is a significant difference, with a confidence level of 90%.

** The difference is highly significant, with a 95% confidence level.

*** The difference is very highly significant, with a confidence level of 99%.

1 / It includes without level and initial education.

P / Preliminary.

Household Access to a Computer, Internet and Cable TV

Within the first trimester, only 38 had at least one computer in 100 households; and 94,0 percentage of whom declared that it is for the household, academic, professional or study activities' exclusive use; and 5,7 percentage for the household and work's use and only 0,3 percentage use it exclusively at work.

Table 5. Peru: Households with at Least One Computer, According to the Use Trimester: January-February-March 2016 and 2017

(Percentage)

Computer Use	Jan-Feb-Mar 2016 P/	Jan-Feb-Mar 2017 P/	Percentage Point Change
Total	100,0	100,0	
For the Household's Exclusive use	92,8	94,0	1,2
To Use Exclusively at Work	0,7	0,3	-0,4
To Use at Work and at Home	6,6	5,7	-0,9

P/ Preliminary.

Table 6. Peru: Households with Access to a Computer and Internet, According to the Area of Residence Trimester: January-February-March 2016 Y 2017

(Percentage)

Area of residence	Jan-Feb-Mar 2016 P/		Jan-Feb-Mar 2017 P/		Absolute Change (Percentage points)	
	Computer	Internet	Computer	Internet	Computer	Internet
Total	37,7	31,7	38,4	33,1	0,7	1,4 ***
Lima Metropolitana	57,2	54,9	56,1	53,0	1,1	1,9 ***
Urban area 1/	43,6	31,7	44,4	35,1	0,8	3,4 ***
Rural area	5,6	1,0	6,5	1,7	0,9	0,7

* There is a significant difference, at the 90 percent confidence level.

** There is a highly significant difference, at the 95 percent confidence level.

*** There is a huge difference, at the 99 percent confidence level.

1/ Excluding Metropolitan Lima.

P/ Preliminary.

According to the area of residence, a 56,1 percentage of households living in Lima Metropolitana, within the first trimester of 2017, had at least a computer, followed by the urban area with 44,4 percentage and rural households with 6,5 percentage.

Regarding the Internet service, a 53,0 percentage of households living in Lima Metropolitana had access to this service; 35,1 percentage in the urban area and only a 1,7 percentage of households living in the rural area had access to internet services, within the 2017 trimester.

Population with Internet Access

Table 7. Peru: A Population Aged 6 and Over Which Use Internet, According to the Residence Area
Trimester: January-February-March 2016 and 2017

(Percentage of the total population aged 6 and over from each residence area)

Residence area	Jan-Feb-Mar 2016 P/	Jan-Feb-Mar 2017 P/	Percentage Point Change
Total	46,0	51,7	5,7 ***
Metropolitan Lima	66,1	71,7	5,6 ***
Urban area 1/	50,3	56,6	6,3 ***
Rural area	11,1	13,9	2,8

* There is a significant difference, at the 90 percent confidence level.

** There is a highly significant difference, at the 95 percent confidence level.

*** There is a huge difference, at the 99 percent confidence level.

1/ Excluding Metropolitan Lima.

P/ Preliminary.

Within the 2017 first trimester, a 51,7percentage of Peruvian population aged 6 and over used Internet, with an increase of 5,7percentage compared to a similar trimester of 2016, which reached a 46,0percentage of such population.

According to the residence area, the greatest increase was noticed in the urban area which had an increase of 6,3percentage, increasing from 50,3percentage in 2016 to 56,6percentage in 2017, followed by Lima Metropolitana with an increase of 5,6percentage, due to having increased from 66,1percentage in 2016 from 71,7percentage of the population aged 6 and over which used Internet in 2017. The increase in the rural area was 2,8percentage.

Male people aged 6 and over are the most frequent users of Internet in the view of 54,2percentage of the interviewed men versus 49,3percentage of women who used this service, in 2017. So, there is a gender gap of 4.9 percentage for men.

Table 8. Peru: Population Aged 6 and over Who Use Internet, According to Genre
Trimester: January-February-March 2016 Y 2017

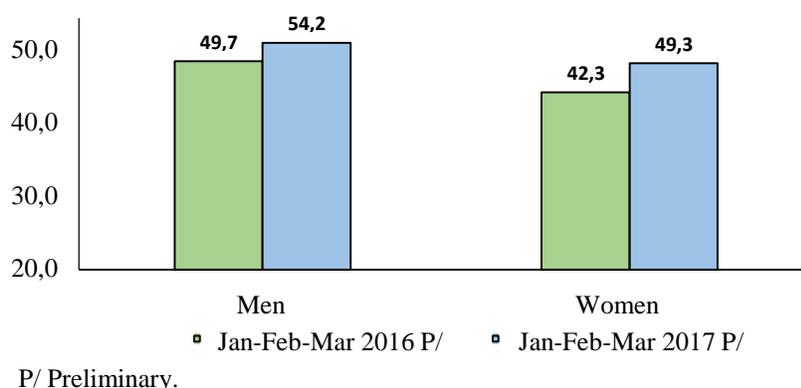


Table 9. Peru: Population Aged 6 and Above, According to Sex, Age Groups, and Type of Activity Carried Out on the Internet
Trimester: January-February-March 2017 P/

(Percentage of total internet users)

Activities	Total	Sex		Group ages	
		Male	Female	6 - 24 years	25 years or more
To communicate (e-mail, chat, etc.).	88.8	88.5	89,0	84,5	2,4
To obtain information	84.5	83,9	85,2	80,0	3,4
Entertainment activities (videogames, movies, music, etc.)	81.9	83,4	80,1	87,1	77,3

P/ Preliminary.

The 88.8 percentage of the population used the internet to communicate, using e-mail and chat, 84.5 percentage did it to obtain information, and 81.9 percentage searched for entertainment activities such as video games, films, and music.

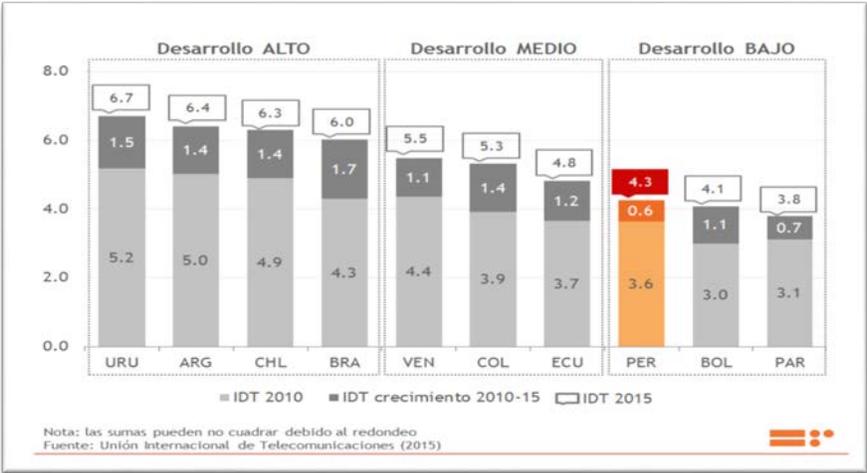
ICT's Current State in Peru

The International Telecommunication Union (ITU), which is the specialized institution of the United Nations (UN) in ICT, created last decade the ICT Development Index to monitor the its global markets evolution. The IDT considers three dimensions: access to services, use of services, and skills of users, which is useful for analysing the evolution of ICT in each country and between them.

The index has a scale from 0 to 10, and in 2015 South Korea (8.93), Denmark (8.88), and Island (8.86) were the countries with more development in ICT and with high-income economies in the world, while the last positions (out of 167 countries) corresponded to ten (10) African countries with a score between 1.17 and 1.82.

In South America, Uruguay is by far the leader country in ICT development in the sub region (6.70), followed by Argentina (6.40), Chile (6.31), and Brazil (6.03), while at a second development level is Venezuela (5.48), Colombia (5.32), and Ecuador (4.81). Below these countries, at a low development level, were two Andean countries, such as Peru and Bolivia, being Paraguay the last (3.79). (DN Consultores Strategies Telecom, 2016)

Figure 5. The Revision of the ICT Development Index



Source: Prepared by DN Consultores

The revision of the ICT Development Index components shows that the low position of Peru is mainly explained by the low rate of a fixed internet connection acquisition (situation aggravated by the low rate of ownership of a desktop at home) and mobile internet, concluding that Peru is the country in South America with fewer internet users, along with Bolivia.

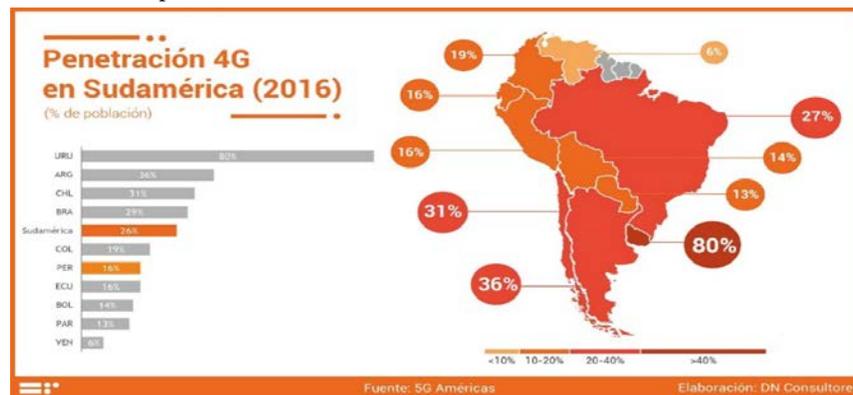
The review of the RTD components shows that Peru's low position is mainly explained by the low rate of fixed internet acquisition (situation aggravated by the low rate of PC ownership in the home) and mobile internet, all of which can be summarized in that Peru is the country in South America with less internet users, along with Bolivia.

In the analysis provided in October 2016 by DN Consultores, it is pointed out that market figures suggest that the income-effect is not enough to explain what happens in Peru, because according to figures from the World Bank, Peru is currently located in the fifth position in South America in terms of GDP per capita adjusted by purchasing power parity (PPP). By contrast, it is affected by the price-effect, since several studies show that the prices of fixed and mobile broadband in Peru are among the highest in South America.

Besides, it indicates that above the income-effect or the price-effect, there is what economists call "customs and practices," which refers to the fact that Peruvians do not use the internet among the habits incorporated into their daily life, for a number of reasons that DN Consultores does not get to develop.

However, they consider that to get out of this ICT low development is important that Peru make the decision to create a digital governing body in charge of promoting the massive use of the internet for daily life. This would complement the great effort developed by the Ministry of Transport and Communications in the National Dorsal Fibber Optic Network – (RDNFO) and Regional Networks, being the next step the promotion of digital services that can strengthen economic sustainability of the Network and the widespread growth of a popular digital citizenship.

Figure 6. The 2016 ICT Development Index

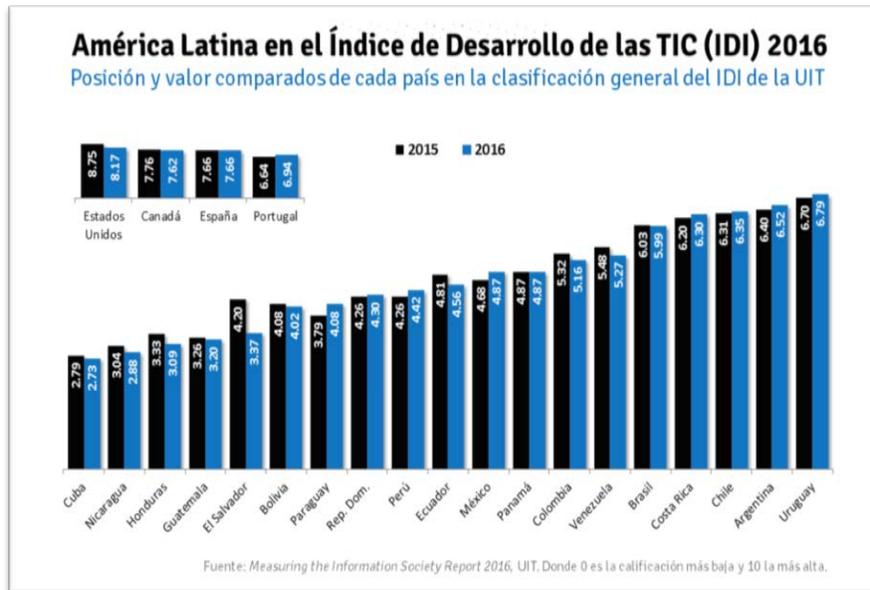


Source: DN CONSULTORES Telecom Strategies (May 20, 2017). 4G penetration in South America (2016)
 Recovered from <http://www.dnconsultores.com/graficos/penetracion-4g-sudamerica-2016/>

The 2016 ICT Development Index, presented in 2017, shows the new position reached by the 175 countries that were evaluated by the ITU, among them, Peru, which in 2015 dropped a position in the world ranking, by placing 101st place of the ITU countries. The results reflected that Peru is still behind in subscriptions to fixed telephones and homes with internet and broadband. At the level of South America, Peru was in the eighth position, surpassing only Paraguay and Bolivia. (Gestion Newspaper, January 26, 2017)

Cesar Peñaranda, Executive Director of the Institute of Economy and Business Development of the Chamber of Commerce of Lima (CCL) said that the index highlighted internet access and broadband in the Lima Metropolitan area, but the digital divide is too broad. Therefore, he said that the Peruvian government should stimulate a demand with policies of diffusion and training in rural areas and accelerate the process of learning and use of ICT in MYPES. (Gestion Newspaper, January 26, 2017)

Figure 7. Latin America in the ICT Development Index (IDI) 2016 Comparison of Position and Value of Each Country in the General Classification of IDI by UIT (Taxation Unit)



Source: Instacharts M (s.f.). Latin America in the ICT Development Index (IDI) 2016. Compared position and value of each country in the general classification of the ITU IDI. Recovered from: <http://mediatelecom.com.mx/media/pdf/Instachart-america-latina-idi-2016.png>

On July 6, 2016, the World Economic Forum (WEF) published the 2016 Global Information Technology Report, which mentioned that Finland, Switzerland, Sweden, Israel, Singapore, the Netherlands, and the United States of America are leading the world when it comes to generating economic impact of investments in Information and Communication of Technologies (ICT). These Countries are known for adopting ICTs early and demonstrating that ICTs, together with a favorable environment characterized by sound regulation, quality infrastructure and delivery skills, among other factors can provide broad benefits.

The 2016 report, “Innovar en la economía digital,” (Innovate in the digital economy) measures 139 economies in the world, revealing that countries are increasing their ability to innovate in all areas, although few have had significant successes with economic or social impact.

In the case of Peru, it reports that it continues to occupy 90th place as it has the previous year, highlighting it as a positive aspect of its good coverage of the mobile network (1), while the country with the greatest progress in the sub region was Brazil, which increased twelve positions, reaching 72nd place.

The report also points out that Peruvian development is limited due to the low quality of its educational system (129th place) and its poor quality of math and science education (136th place)

making it difficult to prepare the country to make good use of information technologies, as well as a lack of effectiveness in its legislative bodies (138th place) that delay the regulatory environment for ICT. (Baller Silja, Dutta Soumitra y Lanvin Bruno *Eds.*, s. f.).

Richard Samans, Head of the Centre for Global Agenda and member of the Board of the World Economic Forum in Geneva, said that the digital economy is an essential part of the Fourth Industrial Revolution, innovation needs to be fostered, as a key to prosperity in the world and the emerging Fourth Industrial Revolution, the governments of the Latin American region will need to strengthen efforts to improve their regulatory and innovation environments. (Industrial Development Centre. National Society of Industries, 2016)

Indeed, Peru is behind in terms of technology because it is one of the countries with the lowest rates of innovation, as commented by Edwin Maravi Perez, Director of Java. He said that companies invest in the Peruvian market, but not in innovation; for Peru to boost technologically, it must break the cycle of being a country only producer, and show that it can create and innovate; in addition, it requires a digital literacy to work, to invest in systems specialists, not only in engineers but also in computer science experts who can contribute to medicine or any area of human knowledge. (Gestion Newspaper, September 29, 2016)

To clarify the state of the situation, the National Council of Science, Technology and Technological Innovation (CONCYTEC) as an organization to oversee the development of science, technology and technological innovation (CTI) in Peru, requested that the INEI to draw up and execute the I National Census of Research and Development in Research Centres in 2016, in order to obtain a reliable database that allows a better analysis of research and development (R & D) in Peru. The results of this census were presented in 2017.

Among the main conclusions were the following:

- In 2015, the R&D expenditure of the Research Centres surveyed was 518 Soles (US \$163 million) which represented 0.08 percentage of the GDP. This result shows that Peru remains stagnant and lagging the regions peers and advanced economies. In fact, R&D spending as a percentage of GDP of the Pacific Alliance, excluding Peru, stood at 0.38 and the Organization for Economic Cooperation and Development (OECD) at 2.38.
- It was found that universities are the ones that have spent the most in R&D. In the year 2015, university spending accounted for 46.8 percentage of total expenditure (private non-profit universities: 28.0 percentage, public universities: 15.7 percentage and private for-profit universities: 3.1 percentage). It should be noted that R&D spending by private non-profit universities accounted for about 60.0% of university expenditure and about 30,0

percentage of total expenditure.

- According to the area of knowledge, in 2015 R&D Activities were mainly extended to Natural Sciences: 32.0 percentage and Engineering and Technology: 23.0 percentage, in both cases according to total R&D expenditure. Approximately 80.0 percentage of R&D spending was funded by national funds (around 60,0 percentage with own resources and 20,0 percentage with resources from third countries.) For its part, the remaining 20.0 percentage was financed by international sources, mainly from foreign donations and competitive funds.
- In the same year, 31.8 percentage of the researchers had a doctorate degree (1,069 researchers with doctorates) a number that was lower than other countries in the region. For example, Chile and Uruguay this percentage was 39.2 percentage and 64.2 percentage respectively. While in the OECD it reached 42.8 percentage. In addition, only 27.0 percentage of the researchers were working in Engineering and Technology, this figure was lower than other countries in the region. Thus, in Chile it was 35.1 percentage and in OECD countries it was 46.0 percentage.
- The main obstacle faced by the research centres was the lack of financial resources (58.6 percentage) followed by a lack of knowledge of funds that finance R&D (29.5 percentage) and lack of coordination within the institution or with other institutions (28.4 percentage)

Finally, CONCYTEC today has available information on Science, Technology and Technological Innovation (STI) for Peru that can be classified into three categories:

- *Science and Technology*, which in turn is divided into three informative components: Research and Development (R&D) covered by the Census in mention; training of human resources for Science and Technology, information obtained by the National University Census 2010, and Scientific and Technological Services.
- *Innovation*, according to models from international experience, it is classified in sectors as manufacturing, services, farming, among others; Peru currently has data from the National Survey of Innovation in The Manufacturing Industry, executed in the term 2012 - 2014.
- *Other aspects*, as perceptions surveys of Science and Technology, gender and other gaps, and studies carried out by private entities and multilateral organisms. (CONCYTEC, 2017).

In December 2012, the Ministry of Economy and Finance (MEF), through the General Management of Investment Policies, released the document "Public Investment Policy in Science, Technology and Innovation. Priorities, 2013 - 2020" with the aim of improving the performance of the national STI (Science, Technology and Technical Innovation), system, in terms of major

efficiency in the generation, transfer and adoption of knowledge that could allow an increase of the country's productivity and competitiveness in the medium and long term.

Pursuant to Act N° 28303, the Act of Science, Technology and Technological Innovation, Peru formulates for the first time a "National Strategic Plan for Science, Technology and Innovation for Competitiveness and Human Development. STI "2006 - 2021", which was published in April 2006. Such plan recognizes the STI as a public necessity and a national interest; it is oriented towards the priorities of the economic and social development, and the attention to the demands of the Government's actors involved, the academic and research institutions and productive sectors. In addition, it prioritizes strategic areas of knowledge in which Peru can achieve leadership based on its comparative advantages: biotechnology, genomics, materials sciences, environmental sciences, information and communication technologies and clean technologies. It places the strengthening of human capacities at the highest level of importance, and the indispensable material support in infrastructure, information and equipment of investigation in STI priority areas. (CONCYTEC, s.f.)

On the other hand, CONCYTEC and the agencies of the National System of Science and Technology (SINACYT) promote the interaction of the private, public and academic sectors to help prepare the national, regional and special programs that are required to stimulate science and technology in Peru, in accordance to the long-term plans and policies of the Peruvian Government.