

Felipe Chibás Ortiz & Efrain Pantaleón Matamoros (interviewed), Wânia Torres & Rachel Fischer (interviewers)
Science, Innovation, Communication and Ethics in the days of COVID-19 in Latin America

Abstract:

Two renowned Cuban scientists and professors who arrived in Brazil in the last decade of the last century, completed their doctorates at USP and expanded their professional achievements in the country, share in a relaxed way their knowledge and experiences about Science, Technology, Communication and Ethics in the times of COVID-19 in Latin America. One of them from the Exact Sciences area, Efrain Pantaleón Matamoros; and the other from Social Sciences, Felipe Chibás Ortiz. The views of these two Latin American researchers - who have previously written an article together on Innovation Management - now speak of these themes from the perspectives of different sciences, in an enriching way – relevant to the context of the 'new-normal' during the times of Covid-19. This article, presented as an interview, reflects on what these two experts have to say about Science, Technology, Innovation, Communication and Ethics in the days of COVID-19 in Latin America, from their unique perspectives.

Keywords: Covid-19 Pandemic, Digital Literacy, Information Ethics, Innovation Manement, Science Communication

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Introduction

Two renowned Cuban scientists and professors who arrived in Brazil in the last decade of the last century, completed their doctorates at USP and expanded their professional achievements in the country, share in a relaxed way their knowledge and experiences about Science, Technology, Communication and Ethics in the times of COVID-19 in Latin America. One of them from the Exact Sciences area, Efrain Pantaleón Matamoros; and the other from Social Sciences, Felipe Chibás Ortiz. The views of these two Latin American researchers – who have previously written an article together on Innovation Management – now speak of these themes from the perspectives of different sciences, in an enriching way. This is especially relevant to the context of the 'new-normal' during the times of Covid-19 and the role of Media and Information Literacy (MIL) and Information Ethics (IE). This article, presented as an interview, reflects on what these two experts have to say about Science, Technology, Innovation, Communication and Ethics in the days of COVID-19 in Latin America, from their unique perspectives. Then questions are presented and both Felipe and Efrain respond to these.

How is science communicated to the general public today?

Efrain Pantaleón Matamoros: Science can be summed up, as an organized set of knowledge based on the systemic practice of research. But, when we refer to communication with society, we can say that this interaction today is only based mainly on the technology consumption market. In the last century, science was focused on the elites, who had some power in knowledge, in technological consumption, as well as in the management of the future of (own) science. In this century, the increase in the consumption of technology in people's lives, may create a false expectation of the popularization of communication with science, without realizing in some way that the distance with the reflective part of the research has increased and, therefore, the lack of communication Science and Technology with society. For true communication, education focused on the reflection of science, inserted in the cultural context, is necessary. At the present time, in the war of Science, Technology and Innovation against the coronavirus, the communication and interaction of society has created an environment of recognition of the social value of research, which will allow a great channel for understanding the importance of education focused on science in society. The researchers Valério and Bazzo (2006) in their work expose on the theme expressing their view of the theme: "Our future presents itself as the fruit of what S&T can offer us. And we must recognize that human life, as we admit, could hardly be imagined without considering the presence and social significance of S&T" (Valério & Bazzo, 2006).

The great expectation after the crisis of COVID19, will be a world focused on the communication of science and technology starting with education, without excluding its dimension of the consumer market, but with a critical reflection of its application and its control by society itself. Therefore, to create real communication, society needs to empower itself with science and technology, not only for consumption, but as a social and cultural wealth of each region.

Felipe Chibás Ortiz: Science today communicates with the general public in a precarious way. There is a barrier between the public and scientists. That is why it sometimes takes so long for a scientific discovery to reach the public. There are few serious specialized vehicles for scientific dissemination, and, in newspapers and general magazines, the space dedicated to sciences is still small. The situation is even worse when we talk about Social Sciences.

On the other hand, there are also groups of scientists who are not too concerned with making their findings known to the population. They believe that they have already done their part by carrying out the research and having a good result, which was published in a magazine or book in a specific language for peers and colleagues. This type of publication does not generally receive much publicity, just as it is not accessible and understandable by most people.

This was more evident with the COVID-19 pandemic, when a set of research and procedures were revealed, which should be put into practice urgently and that most of the population did not know.

In my view, the role of scientific dissemination and the integration of universities with communities should be enhanced, starting within them, but also with more partnerships with the mainstream media and publishers, as well as with the government. High investment must be devoted to this and not just when an epidemic arises. This communication would have an educational character and would result in the prevention of many diseases.

Should the fight against COVID-19 be led by medical scientists or should there be a multidisciplinary approach?

Efrain Pantaleón Matamoros: The engines of the development of science go from human curiosity to wars, the latter committed to the concrete results of the supremacy of the economic and military powers. These dogmas can open new frontiers of knowledge, which in the long run will generate value and better quality of life for human beings. The war against COVID-19 is the new challenge for the sciences, both in its management and in the new products and services to be created. The concept of multidisciplinary can be understood as the work of teams with different disciplines, but there is no intention to establish integrative relationships between different thematic areas. Scientific production recognizes it as a multidisciplinary administration, when different specialties issue a unique point of view, based on their specific knowledge. According to the concept, it has a great practical sense that health personnel and, especially, specialists in epidemiology have strategic management. Because they are the specialists who, according to their own interdisciplinarity, allow them to have an overview of the crisis.

But, considering the tactical and operational requirements in the war against COVID-19, in which the battle for the development of new services or products is fought, then teams need to have a transdisciplinary focus. According to Iribary (2003), transdisciplinarity occurs when a dialogue is promoted between different thematic areas, so that the challenge can be shared and, with this, new equations and solutions to the problem are generated.

We will only have a way to beat an enemy like COVID-19, and it is in the creation of a new product or service coming from the interaction of knowledge, in which, the coordinating team does not necessarily need to have a medical or epidemiological vision, but rather, with a different vision and knowledge. The new equipment, treatments and technologies to be applied are the result of transdisciplinary interaction. Today, I am coordinating a transdisciplinary team, starting the challenge with the solitude of the medical and epidemiological areas, but integrating knowledge from the areas of mechanics, mainly in the concepts of predictive maintenance and the area of information technology, incorporating artificial intelligence knowledge and the principle of IOT. Therefore, I believe that new problems can only be solved with different ways of seeing the same challenge, and hence the differential in the result against the coronavirus.

Felipe Chibás Ortiz: Yes, it must be coordinated by medical scientists, but with the presence of professionals from all areas involved. For example, to combat COVID-19 one of the most recommended measures is social isolation. This, in turn, creates problems that affect people's psychological health, such as stress, anxiety, insomnia, among others, which will need psychologists and therapists for their solution. The understanding of social impacts, which generates any disease in the medium and long term, and especially a pandemic like this, requires other professionals such as sociologists, philosophers, communication specialists, nutritionists, physiotherapists, economists, among others.

From the plagues described in the Bible that affected Ancient Egypt, we know that a pandemic generates not only economic and financial impacts on industry and agriculture, but also political, on international, technological, religious, cultural and environmental relations, etc. So sometimes solutions that work in one country do not work in another.

It is necessary to invest in a data-based approach to develop treatments and vaccines for the virus, which implies having artificial intelligence specialists and data scientists. For this reason, the biologist, Marcos Buckeridge, director of the Biosciences Institute, a member of the Institute of Advanced Studies, University of São Paulo, questions the limited availability of raw data about the epidemic in Brazil.

People are staying at home more due to the pandemic. Resulting in the higher use of the internet, water and electricity, so they spend more. However, in general they receive lower wages, unemployment increases and people take more refuge in their religious beliefs, but they are restricted in going to church due

to lockdown, and of course, the pandemic has a political dimension as well with its inherent tensions. All of this creates socio-psychological problems. We also have international conflicts from countries like China and the United States that accuse each other of not having handled COVID-19 well. All of this must be managed with knowledge that goes beyond the biological area and enters Philosophy, Geopolitics, negotiation, strategic planning, artificial intelligence, etc.

Health and research professionals, involved in combating these diseases must have a transdisciplinary look, as Morin (1983) would say. That is, not only have a multiple look from your science or interdisciplinary, but you can travel (with the prefix trans) between various disciplines and scientific views. For example, an epidemiologist or virologist today, must know not only about the treatment of the virus in humans, but needs to be trained in statistics, virology, epidemiology, ecology, among other disciplines and knowledge that are not necessarily part of the biological field. Also when a nurse or doctor attends to an infected patient, he must be aware that he is not just a number, but a human life, with feelings and thoughts that directly influence his chances of overcoming or not the disease. If the patient is not well psychologically, their immune defences decrease and vice versa.

It is not by chance that the World Health Organization is coordinated today by Mr. Tedros Adhanom Ghebreyesus, who has a background in biology and a more comprehensive doctorate in Health Sciences.

Do you believe that the fight against Coronavirus has brought new ethical questions to scientists? Why?

Efrain Pantaleón Matamoros: Yes! Today in the fight against COVID19, both the use of treatments or established procedures is necessary, as well as conducting research in real time. This way of working has a problem in the procedures and times of the research, provided for in resolution 466/12 of the National Health Council (Brazil, 2013), which govern the ethics committees. New technologies can cause loss of privacy for people, but they can achieve extraordinary results. Should individual privacy of potential transmitters of a disease prevail when they cannot be identified as required by current resolutions, putting at risk and worsening public health? Our team, faced with this problem and we chose to obey the current rules, and we took the steps to be approved by the ethics committee before the start of the collective collections. Because of this, and due to the readiness required, they need time for the procedure to be approved. Before conducting your research, every scientist must understand the future risks it may cause, this is a look that the ethics committee can add to its work.

The preferred approach is to include ethics, for ethics is a reflection to be incorporated from the research design stage, to understand its implications for present and future society. As scientists we work mainly in the present time, whereas ethics specialises with concerns and questions regarding the future and implications of bad decisions made in the past. This brings some noise in communications between disciplines, but we all need to see science and technology in relation to the future society, and not only now that we are researching or solving a problem like the COVID-19.

Felipe Chibás Ortiz: Yes, today 'old' ethical dilemmas have been updated or reappeared. For example, the one commented by Habermas (2020) regarding which patient should be saved by a medical team, when there is not enough equipment: an elderly person, a child, or a young person? Whether or not they should be used in humans in record time and without previous tests on animals, drugs or vaccines that could potentially be the solution to contain the pandemic, but that would take a long time to reach the population and be used on a large scale accordingly. with traditional scientific procedures and protocols to place them on the market? To what extent can a single country or company take ownership of the solution, vaccine or drug discovered to treat a disease that affects the population of all countries, making special use of it? Is it appropriate to sell this solution, vaccine or medication at a high cost?

Following Noam Chomsky (2020), the extent to which by COVID-19 we can get carried away by authoritarianism and allow governments to exercise excessive control over our lives. Slavoj Žižek (2020), a philosopher of Polish origin, also questions the extent to which governments have the right to control citizens under the guise of fighting an epidemic, using smart cameras in buildings and public transport, with temperature

sensors for this. in the subway cars, which indicate the change in people's behaviour when they are probably infected, as is the case in China, for example?

All these questions have been raised by concrete attitudes from countries and governments, which have confiscated respirators that were going to a third country, when the plane landed to refuel.

For this reason, the definition of ethics proposed by Atlan (1989) is interesting, which highlights the role of non-rational and intuitive elements, as well as the need for a case-by-case analysis to define whether the behaviour adopted by the person, organization and country is or not. ethical. He understands ethics as the principle that guides, directs, and regulates behaviours in people's lived reality and does not have its origin in rational knowledge, of a philosophical or scientific type. It refers to a project, to a desire, much more than to knowledge and is expressed in this set of desires, needs, conscious and unconscious representations, and can only be the object of reflection after having imposed itself as a set of rules and behaviours experienced. He addressed the subject because of the problems faced by Bioethics, since new situations arose, previously unthinkable, because of the application of new technologies in human beings. An example is that the fact of being a mother, which has always involved two different functions, ovarian and uterine, both performed by the same woman; the mother at the same time provided the oocyte and the uterus for pregnancy. Technologically, it was possible to dissociate these two functions. An embryo can develop in a woman's womb different from the one from which the egg originated. The woman who becomes pregnant and gives birth is different from the one who provided the oocyte with its genetic material. So, who is the mother? This question did not exist before. This type of research continues to be carried out today. According to Atlan (1989), each situation must be analysed in the details of its application with regard to the values that exist there and as to the various possible consequences, and different applications of apparently identical techniques must be carefully distinguished.

What do you do in practice to combat COVID-19? How are the applications you develop to help fight Coronavirus?

Efrain Pantaleón Matamoros: The application developed by the transdisciplinary team of the School of Sciences and Technology, and the Faculty of Health Sciences of the Federal University of Rio Grande do Norte aims to assist in the fight against COVID-19. The name of the application is ELIAS - Laboratory Epidemiology with Artificial Intelligence in Health - and aims to systematize information to help preventive decision-making by users, without having to fill the clinical care services. The tool to be made available to society's attendance needed to obtain its approval by the Research Ethics Committee, as well as the software registration at the National Institute of Intellectual Property (INPI).

The operation begins by registering users, requesting an email account, to avoid citizen identification and to preserve their privacy. In the registration process it is necessary to accept the participation terms considering the different profiles. After the acceptance of the terms of consent and free informed consent (ICF), the values of vital signs such as: body temperature, respiratory rate and pulse are requested. This assessment can be done following the simple guidelines that accompany the questionnaire and with the aid of a watch and thermometer. Then, the user answers yes or no to other questions about the occurrence of pathologies such as: dry cough, body aches, diarrhoea, congested nose, difficulty in feeling odours and flavours, fatigue, nausea, and sore throat. When sending to the database, the system will analyse the symptoms, the evolution of the condition and the similarities with other problems, such as colds and flu, and assist in the user's decision to seek health units or not based on the recommendations made available by the Ministry of Health. Health. The comparison of user data can also alert the responsible health unit about a growing increase in symptoms among residents. The analysis can be directed by region, city or even by a single Address Code (CEP). The methodology is based on the use of artificial intelligence and data mining in the identification of individuals with or potential carriers of different diseases. Another part of the job is to automatically and intelligently geolocate infected areas in the regions.

The development of ELIAS had a team of 21 participants, among them graduates from the Bachelor of Science and Technology, doctors, epidemiologists, physicists, engineers and economist.

Felipe Chibás Ortiz: The application that our Thot-CRIARCOM team is developing together with Mr. Altón Grizzle (2019) from UNESCO and developers from several countries that use Artificial Intelligence, led by me and data scientist, Mileidy Castro, has the main objective of evaluating whether or not cities are close to this framework supported by UNESCO (2020). In a nutshell it can be said that MIL cities or Media and Information Literacy Cities are those that try to develop using or not using new technologies, the critical and creative thinking of their citizens, governments, universities, companies and start-ups, in an ethical and sustainable way, respecting diversity and ecology (Chibás Ortiz, 2019).

We are in the middle of an information war that can also cause death or save lives. That is why the MIL approach to combat COVID-19 is so important, whether they follow past guidelines. For example, if the authorities or any influencer pass on erroneous or politicized information, which has no scientific basis, this can confuse people, especially the poorest and least educated population, causing them to fail to take appropriate measures. to protect themselves, such as physical isolation and the use of masks, and consequently to have more people infected and potentially more deaths. The MIL approach teaches, among other things, people and organizations to develop critical thinking through education and recognize fake news. This limits the spread of lies and misinformation on a large scale. This approach also emphasizes the citizen participation of the inhabitants of society organized in networks to build health strategies and fight diseases and pandemics. That is why the application we developed is so important because it also feeds on this information network, as well as on the databases of City Halls and companies and start-ups in cities.

As we know, the UN outlined 17 objectives to guarantee the development of humanity until 2030. One of these objectives, number 11, refers to making cities and communities sustainable. The application is inspired by it and the thinking of cities in networks by the Spanish communicologist Manuel Castells (1983), even though we are not talking only about smart cities and without connections between people, institutions and social groups, even if they are not digital.

The application developed using Artificial Intelligence, based on the MIL Cities framework, has 13 indicators and 260 metrics to evaluate cities that wish to be considered MIL cities, and tries to evaluate cities and also university cities, showing what they should modify for be considered Media and Information Literacy cities or with media and information literacy, that is, cities that, through education and training of critical and creative thinking skills, form citizens, start-ups, companies and institutions that use technologies but respect diversity (of thinking) , cultural and ethnic, gender, age, religion, disabled, immigrants, etc.), ecology in a sustainable and ethical way, combating among other problems fake news and post-truths.

In the Health indicator, the application evaluates metrics such as: whether there is a secure record integrating the history with all the socio-demographic, health and statistical information of all citizens; whether citizens and their associations are actively involved in comprehensive health planning based on data collection; whether there is an efficient epidemic detection system at airports and an intelligent sanitary waste management network; whether there is a unified and integrated intelligent communication system and channel between government institutions, health organizations, social service research and the community; if there is a strategic anti-crisis plan for the health of the city, etc.

The metrics of the health indicator, facilitate the fight against the pandemic and focus on health with a preventive perspective and not only in an emergency way after the crisis broke out, as is done today. We will have other epidemics and new pandemics and we need to prepare in advance. The situation generated by COVID-1 made it clear that there was no real integrated network of researchers, research and care centres with knowledge about epidemics at national, regional and international levels, which would allow a previously planned and rapid response to the new Coronavirus. This network should also involve the ministries of health and science, technology and innovation from all countries, as well as several international organizations such as WHO, PAHO, UN. UNICEF, UNESCO, among others. This would have prevented many deaths and extreme measures like lockdown.

Is fighting Coronavirus different in Latin American countries compared to other latitudes? What are the particularities of our continent that make a difference in the fight against this pandemic?

Efrain Pantaleón Matamoros: In Brazil, it is exceedingly difficult to hear news from other places than Europe or the United States, to be informed we must resort to information from contacts, friends, family in other latitudes. Latin America with its peculiarities is treating the coronavirus based on science, although we have the same problems of lack of tests, each one looks for strategies for flattening the disease transmission curves. Quarantine everywhere was supported by scientific decisions. There is an opening for medical collaboration from Cuba to Peru, Mexico, Argentina and Antillan countries. The challenge for the world is great and only collaboration can win the war against COVID-19.

Felipe Chibás Ortiz: Latin American countries in general are not a single bloc, as they have different histories and cultures. They are in fact a complex mosaic that still have some factors in common and that differentiate it from the fight against the pandemic in other latitudes.

We have countries and cultures in which touching, hugging, and being expressive are highly valued; individual freedom at the expense of the social good; great challenges to achieve economic development and technological pockets that live with great social inequality, poverty, hunger; problems in our public education and health systems. In general, we always tend to think out of the box and to be very creative.

In other latitudes we have greater social discipline, a greater tendency to follow rules, to respect governments. So, for example, in China, Singapore and South Korea it was possible to implement rigid control measures without protests, with web cameras, temperature sensors using Artificial Intelligence, which in our countries can be the focus of debate and questions, because it is considered elements that diminish individual rights and freedoms. The stronger health and education systems also help in this regard. In Europe, in countries like Germany and France, in addition to other education and culture maintained systematically, there is a greater presence of state aid for businesses and citizens, assuming the costs of electricity and water, as well as various subsidies.

For example, when physical isolation was enacted, and I prefer to use this term to that of social isolation, given that even physically isolated in our homes, we have another contact through the remembrance of our historical-social past and in the present through digital social networks, in São Paulo and in other cities, many people did not keep to the required physical distance of 2 meters, they had parties, they went to the beach, etc.

On the other hand, it is difficult to demand physical or social isolation in our countries when there are people who need to do informal work, or they will have nothing to eat the next day; or because they live in such small spaces with many people and sometimes with little access to water or information via the web, where they could get better information.

The variables social and citizen awareness, values and ethics of the population, political regime, educational and cultural level of the population, among others, influence the results of policies, strategies, and epidemiological measures to combat the pandemic. That is why measures that work in one country like New Zealand, may not work in other countries. Our Latin American countries must consider all the knowledge accumulated by other countries in combating the pandemic, but they must customize these experiences and, if necessary, undertake new ones that adapt to our specific circumstances.

How is the fight against COVID-19 in Cuba going?

Efrain Pantaleón Matamoros: COVID-19 can be considered a challenge for all countries, and a great test for the Cuban medical health system. The fight against the disease in Cuba is no different from other countries, but this challenge is enhanced by the fragility of the economy, by problems of internal efficiency, but without failing to mention the great blockade that has been imposed by the United States, which limits and their development a lot. However, the system with all its economic difficulties is demonstrating that the vision of preventive medicine has a great advantage for epidemiological control. Cuba has a strategy to monitor not only suspects and confirmed, but works to control asymptomatic cases, which has generated a great result. Although due to its fragile economy, and the Cuban culture itself, the population does not maintain an ideal social isolation, as

everyone needs to be in line almost daily for the purchase of food and other items, but this confirms the efficiency and effectiveness of monitoring and control asymptomatic cases as a way of preventing community transmission.

In order to have control of the crisis, countries need to know in their entire population, the cases that may be with the disease or potential patients, and not those that are already, knowing this population, the system is under control. Unlike other Latin American countries, Cuba has a social organization, criticized by some, but with surprising results for large-scale social problems. The software strategy that I am coordinating for massive epidemiological management with artificial intelligence, tries to accomplish what today Cuba is doing face-to-face with its health system. The Cuban experience in medicine is one of the greatest contributions to global health systems, where the results point to the efficiency and effectiveness of massive and preventive public health.

Felipe Chibás Ortiz. Cuba has a strong investment in the education system and health system, with emphasis on preventive epidemiological policies with special treatment for at-risk populations, such as the elderly and pregnant women, with programs such as the family doctor (one doctor for each block)), which today are imitated around the world.

In Cuba, measures have been taken such as: physical or social isolation, paralysis of trade considered non-essential and public and private transport, control of asymptomatic people with COVID-19, through medical professionals and students visiting at the door the island's inhabitants to prevent or detect cases of the disease. The detected cases are immediately isolated and all persons with whom the infected person was in contact are verified. The COVID-19 test applies to all of them. Cuban doctors have been paying attention in other countries to combat the pandemic, such as China, Italy, South Africa, Spain, among others, and are proposed for the Nobel Peace Prize.

What do you think would be the main challenge for scientists today?

Efrain Pantaleón Matamoros. Identifying a single challenge is very difficult, we could mention several such as: the concept of industry 4.0 and its implications; STI policies as a basis for the sovereignty of emerging countries; investments in science teaching and anti-science discourse linked to the science versus religion clash. To keep the focus on innovation, in particular I believe that the concept of Industry 4.0 and its implications in the coming years will have importance in its debates for my area of expertise.

The theme of Industry 4.0 is related to the concept that works as the 4th industrial revolution that covers the principles of robotics, augmented reality, Big Data, Cybersecurity, cloud computing, 3D printing, integrated systems and Internet of things in the production process, with the controversial term "Smart factories". Although industrial automation processes have been going on since the middle of the last century, the use of artificial intelligence in decision making makes all the difference in this new stage of production processes and this term of Industry 4.0 is used for the first time at the Hannover Fair in 2011 , and according to Kagermann et al (2013), a year later the project was presented to the German Federal Government for its implementation and leveraging the country as a market leader in advanced solutions for the new industry. An industry with the capacity for its productive self-management to predict process failures and adapt to changing requirements. The same philosophy arrives in the area of health, the tool which is proposing a team with whom I work with Pantaleón et al (2020), goes in this line of epidemiology 4.0 using Artificial Intelligence and data analysis, it is possible to predict the epidemic outbreaks in a predictive way, with future use of associated sensors for perfect knowledge of the regions, but we have to think about privacy and ethics to be complied with at this time.

Felipe Chibás Ortiz. Undoubtedly, the fight against COVID-19 and other pandemics that will come must be carried out in a strategic, ethical, sustainable, and preventive manner with a transdisciplinary perspective. Research and use artificial intelligence, machine learning, data mining the Internet of Things and other new technologies, but without forgetting the social variables, this is the challenge. Also, considerations are needed on how to implement health and education strategies and policies that use science, technology, and innovation

to implement them. But this must also be done in a participatory, inclusive, ethical and sustainable way, with the participation of governments, private companies, start-ups, artists, universities and research centres.

Is innovation possible in the health sector?

Efrain Pantaleón Matamoros: Every day, innovation grows in the health area, revolutionizing the field of medicine with the use of technology. We see in the current trend, the application of the concept of industry 4.0 in tools such as: robotic surgery, augmented reality, telemedicine, online monitoring and patient control, etc. Another great paradigm in the evolution of Health is nanotechnology for medical treatments, in genetics, etc. All this growing potential based on the 4th Industrial Revolution allows us to favor innovation, opening up opportunities for technological entrepreneurs and universities as nuclei of this environment, a theme that we had presented in a previous work. The following quote explains it concisely: "The innovation process articulates the identification of technological opportunities with the identification of social and market opportunities. This articulation gives rise to a potential entrepreneurial opportunity. It is necessary to offer greater attention, both for the positive points ('potentialisers') and for the negative ones (obstacles) of innovation management in order not to jeopardize the implementation of large-scale innovation management in Brazilian companies.'" (Chibas, Pantaleón & Rocha, 2013). In fact, health innovation needs to be managed with strategic intent.

To potentialise this new field, we need an innovation management process, to be a structured and continuous process, that allows ways to add value and to anticipate social and technological demands and trends.

Felipe Chibás Ortiz: Yes, it is possible and necessary, for sure. Innovation in the health sector and the creation of more complete health systems with an increasingly transdisciplinary and preventive look are necessary. Even more so in times of great crises, limitations, and difficulties, such as the one caused by COVID-19, these are undoubtedly periods where creativity flourishes, the main ally of innovation. So, we have new applications there that use artificial intelligence to make predictions about the behaviour of epidemics and other diseases at the individual and societal level, mark the buildings and notify people that people and places are infected. As Ray Kurzweil (2009) predicted, today we have robots in direct care for patients with the new coronavirus. Teams of scientists are researching how to make new ventilators and artificial respirators cheaper, for example right here at USP, companies like Petrobras directing part of their supercomputers and Artificial Intelligence to combat antivirus; luxury conglomerates such as LVMH that brings together Louis Vuitton, Givenchy and Dior, redirecting their factories to produce alcohol (CAPRICHIO, 2020) gel and start-ups looking to better serve their customers so they don't leave home.

We have several proposals here in Brazil for new research centres for innovation in health, etc., which should work in networks, using artificial intelligence to work sharing information and in an integrated and strategic way with other national and international research centre groups.

If we consider information ethics as "the ethical consideration of issues arising from the information life cycle", and especially now that we are being forced to be innovative in our teaching and learning approaches due to Covid-19, it is possible to foresee new dimensions that will arise in the information ethics scenario?

Efrain Pantaleón Matamoros: One of the authors who deals with the information life cycle is Nissenbaum (2004) and summarizes informational standards such as adequacy and flow. The adequacy norms which aim at the collection of information, is that they allow in some way to reveal personal information for a certain context, that is, at the moments of COVID19 we would have all the conditions to be used this criterion but analysing the resolution CNS466 / 12 it prohibits exposing the individuals who participate in the research, although the information has a collective value. In the research I coordinate, we prevent people's registration from having identifications such as telephone number, date of birth, etc., since we understand that privacy is a right of people, and our system identifies areas and not individuals. The other informational norm that deals with the flow works with the distribution of information that organizes the different levels where it will be delivered, for

example libraries, repositories etc. So, starting from the contradictions of the norms, I believe that we will have new dimensions in the information scenario, which should be an action with society, but for it to be a real debate we need a highly literate information society and a highly critical university.

Felipe Chibás Ortiz. The situation created by the expansion between COVID-19 countries has also brought up the ethical conflict of whether I should think only of myself or I should also think of others, whether I should think only of my country or of others. In this sense, the union of the member countries of the European Community has been very clearly shaken.

The solutions we always adopt to communicate and educate are also questioned, having to transcend the physical limits of isolation, quarantine or in extreme cases the lockdown adopted in some European cities. This brings us to innovative and positive ways to communicate and educate us, as are the fruitful use of the technological platforms offered by Zoom, Google, YouTube, Moodle etc., but it also enhances some problems. We see fake health news emerging, understood as false information disseminated with bad intentions, in the form of videos showing false homemade solutions to cure COVID-19. Also, radical behaviours that we can frame as post-truths. These can be understood as: the limited understanding of reality, in which one only believes in one's own "truth" or reality built from the "bubble of the network of own contacts on the Internet" or relationships of the near physical universe. In this way, one does not listen to arguments and reasons from another point of view, which is simply ignored or slaughtered. We are seeing this happen every day on the web with chloroquine advocates and those who oppose it. Similarly, with those who oppose or are in favour of social isolation, denying the results of scientific research. This is worrying and requires the creation of new ways of communicating based on ethics. It also requires measures by governments, companies and start-ups and society, to create digital and physical information centres, software, and ethical control bodies to combat these circumstances. We have seen platforms like Facebook and Twitter that have removed biased information from their pages, which could confuse or misinform the population, such as those referring to blaming people with Eastern traits for "being the carriers and contaminants" of the new Coronavirus. We will have more distance education and communication using new technologies in an innovative way, but also with more ethical control and respect for diversity in a sustainable way.

The large-scale and unrestricted use of artificial intelligence in combating pandemics necessarily involves analysing the conflict of fundamental individual rights. Chinese mega-entrepreneur, founder of Alibaba, Jack Ma, said that human creativity and intelligence will never be surpassed by machines. But, on the other hand, we have the positions defended by scientist Nick Bostrom and Elón Musk, owner of Space X, according to which there is a danger that a powerful Artificial Intelligence or superintelligence could be potentially and highly dangerous for humanity. This presents us with the dilemma of how far we should develop new technologies and innovation applied to health. Posthumanism (2020), answers this question by saying that to innovate in a sustainable and ethical way in the future, in a world where the old centralisms have been lost, it will have to take into consideration nature and technology, at the same level as the human being. This will involve new geopolitics, biopolitics and world order, with greater interdependence between countries, educational institutions, laboratories, and transdisciplinary research centres, as well as a greater presence of international organizations such as UN, WHO, UNESCO, etc.

Do you consider access to quality information in relation to medical services as an essential ethical factor of society and a citizen's right in 2020?

Efrain Pantaleón Matamoros. Access to information is part of the rights established in the Universal Declaration of Human Rights, which is intricately linked to respect for rights such as health, education, privacy, among others. That is why in 2020, in the war against COVID-19, all the world systems are being tested, aiming at the responsibility of States with their populations, in the fulfilment and responsibility for human and specific health rights, which require services and products in this area are: accessible to all, available in sufficient quantity, respecting medical ethics, as suitable for regional culture and scientifically approved. The year 2020 is the preamble to changes in human relations and the new values within society.

Felipe Chibás Ortiz: Yes. But, all these factors do not yet come together in an integrated way, given that quality, safe and transparent information about health for large sectors of the population is still not guaranteed, in a transparent, updated, coordinated, planned and ethical way.

There is no success in the fight against a pandemic or other type of disease without adequate communication with the population. And today, as is known, the populations most vulnerable to pandemics and any other type of disease are the needy communities, which often also have the worst electronic equipment, live in places where access to the internet is more difficult, with less health and access to adequate water and food, as well as less access to Education.

The broad access to information in general and about health, transmitted in a transparent and objective manner must be a right of every citizen and respected by governments. The broad access to information and education, whether analogue or digital, modifies our behaviour and makes us follow better health practices, respect and value the professions directly involved in combating diseases, such as doctors and nurses, knowing what to do in a in case of urgency, do not be prejudiced against the elderly or other at-risk populations such as indigenous people, low-income people, homeless people, among other vulnerable groups.

Conclusions

The critical views of two Cuban-Brazilian scientists of excellence, who through different sciences expose convergences and divergences, show that an optimistic post-COVID 19 future in Latin America is possible. In particular, it highlights the view of Media and Information Literacy (MIL) defended by UNESCO, as well as the need for a critical, multidisciplinary and ethical approach in the sciences using artificial intelligence to face pandemics and other challenges that present themselves to today's cities.

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