

Robotization to renew our economy in a post pandemic period

By Frederic Cohen

Current scientific research faces many challenges: environmental imperatives, growth needs and the globalization of trade call for new technologies that are developing very rapidly.

To accompany these transformations, public research must focus its efforts around concrete projects that benefit the greatest number, involving the population in the reflection on its real needs, as well as the means to be implemented to satisfy them. The objective of this document is to present projects with a global impact that stimulate the participation of all actors in society. Methods discussed in consultation should encourage strategic partnerships at all political levels of cooperation.

The COVID-19 crisis has shown the importance of health systems in the resilience of our society. The rapid transmission of the virus has revealed certain weaknesses inherent in the nature of the populations covering the territory. With muscle and nervous fatigue, the wear of the joints has been evident and a related prevention is now necessary. This must be exercised at the cognitive level and be placed in correspondence with existing equipment.

An application process of control over the climate, air and sea, confines the vectors of the disease and limits the pandemic. The urban environment has the particularity of providing accesses that can be controlled rationally. The interaction between transport tools dedicated to energy and the means allocated to human mobility must be implemented in synergy in order to save both human and material resources.

The speed of exchanges also leads to bringing research organizations closer together towards a structure that facilitates participation at international level. Employment linked to services is opening up to new networks that are developing transversally and the implementation of public policies must be discussed by as many people as possible up to the local level, in a supervised and participatory manner.

1. General concepts of robotics

1.1 Robotics Epistemology

Robotics is the study of artificial systems that imitate or replace man in an active task. The word "robot" comes from Slavic languages and represents *work*. It was first used by Czechoslovak writer Karel Capek in his play *R.U.R. (Rossum's Universal Robots)* written in 1920.

It is a branch of automation, which also includes cybernetics and includes mechanics, electronics and computer science, but also covers language sciences, networks and work organization.

The biomimicry fundamental to this discipline leads robotics to take an interest in the different fields of health. The history of science links the invention of electricity to the study of animal electrophysiology by Luigi Galvani, an Italian physician and physicist around 1770.

Then, the famous coils of Hermann Von Helmholtz who first presents electromagnetic induction around 1847 in order to explain the transmission of the bio-signal along nerves in living beings, are an important development for robotics. This work is more generally part of research on the human perception of colors as well as music and is based on mathematical methods applied in physics and chemistry.

Macy's lectures in 1947 that took place in New York gave a particular turning point to cybernetics, which allowed the development of current neuroscience and at the same time of artificial intelligence.

Thus the scientific fundamentals of researchers studying robotics are very pronounced and also diverse. They must ensure reliable and high-quality technological development. The societal scope of their work allows for powerful collective progress.

1.2 Scale Analysis and Integration

Robotic systems can be studied at different scales. Their complexity often allows a layered observation of elements that resemble and combine to form a set comparable to the elements constituting it. Thus their study can be done on the mode of analysis, which breaks down the system to the simplest level, or of integration that makes a larger device.

At the hardware level, the most fundamental elements of a robot are those that make up electronic boards: resistors, capacitors, coils and wiring. Logic gates such as transistors or operational amplifiers form a more complex set of these elements. A classification by function follows for these combined components. A power supply must be present to allow the automation of the physical system. The existence of the microcontroller allows the programming of instructions. Peripheral ports that adapt, for example, programmable logic controllers allow the networking of the most advanced machines. Generally, a robotic system is modeled in the form of a sensor-computer-effector.

The software is similar in character. The compiler contained in a programming environment transforms the source code, evolved and understandable by a human being, into a machine language or assembler that is at the lowest level by combinations of bits. A program is built in stages and takes place sequentially. We start by defining the functions as well as the variables that come into play. Then we describe an algorithm in pseudo-code by the process of intervention of functions and variables that we classify as routine. In the same way, the architecture of a software shows the order in which these routines appear or are called, which constitutes the whole program.

Work automation requires a particular approach that may or may not involve a particular material but implements all the tools and methods that facilitate the organization of work. It therefore requires an in-depth study of the functions applied around a production line.

In order to determine the direction that a company should take, the survey is a very common method in sociology that makes it possible to know the opinion of a population and to adapt a strategy to its situation. A questionnaire based on open or closed questions and addressed to targeted categories of people makes it possible to compile statistics that will be matched on production volumes.

Cybersecurity is an issue of robotization that covers two aspects. Firstly, the content of information must reach its precise destination in full. Secondly, the conditions for the confidentiality of the exchange must be ensured. A typical interference technique is to broadcast a significant amount of information when only some of it is of real interest. The others are only used as a diversion. Thus, the message is always contained in an envelope. In wave we talk about noise, a signal and its carrier. At the hardware level, in a data packet, jam bits are used to encode the signal. A major challenge in the tracing of communications is to succeed in relating the computer blockchain with the frequencies of radio waves in wireless technology by an adequate digital sequencing.

Thus the separation of tasks in electronics and computer science tends to fade in the minds of roboticists. It is the most complete architecture of a system that concerns them and whose automation of an assisted function requires their involvement. However, the volume of work requires that some segmentation be maintained. There are therefore different specialties among roboticists: mechatronics, artificial intelligence, telecommunications.

1.3 Areas of technology application

Robotics nowadays extends to all aspects of life, at the personal level in home automation as in the industrial field of assisted manufacturing. Its widespread diffusion and the multiplication of equipment today make known a phenomenon of ubiquitous computing.

It is found in different fields: medical, military, communication. As a whole, robotization confers power, control and security in the tasks to which it is assigned.

For the medical studies, robotics provides a modeling of life that helps to better understand its functioning and supports fundamental research in the expression of knowledge. It has a particular role in the demonstration of movement and behavior at the musculoskeletal level, as in mental health, and finds multiple applications for rehabilitation assistance.

In education, *machine learning* brings an adaptive pedagogy that makes supervised training accessible. The insights provided by artificial intelligence allow learners to become aware of their pace and confidence. Logic is stimulated and the imperatives of operability bring the learning of the discipline.

In services and industry, very long-distance communications are facilitated and teleworking allows a globalized development that brings prosperity to the whole world. The manufacture acquires a refined precision and a constancy in mass production. Mining and steel are becoming more secure and powerful. The regulation that accompanies it harmonizes the normalization and the standardization that it engages. Diplomacy and e-commerce are experiencing a new development. Cybersecurity must adapt to ensure the guarantee of oral, visual and non-verbal exchanges.

For the military, the robotization of the elements allows the integrated control of mechanized systems. Thus, the appeal to men is reduced and the loss of human life is reduced too. The accuracy and regularity of the activities allows an optimized current deployment. Territorial coverage is ensured by the calculation of the tracking devices and the power of execution of the strikes is multiplied. Its long-distance use prevents operators from being on the front lines. The responsiveness of the devices frees staff from their continuous monitoring activities.

2. The collaborative industry of the future in a globalized ecosystem

2.1 International financing regulated by political will

Current research funding is essentially part of the “Large Loan”. These funds are used to finance national research programs established in partnership with foreign funding. The objective of these contributions is to create a monetary primer that makes it possible to engage in public service activities that will find their profitability in the medium or long term.

The evaluation of these results by the [International Monetary Fund \(IMF\)](#) allows it to use its special drawing rights, i.e. it can inject liquidity into the World Bank, which redistributes these funds to the national banks.

Political commitment, the will of states and citizen participation define the criteria for allocating these funds [1]. The partnership between government agencies at the international level is fundamental in the implementation of projects that are proposed for development. The G20 meetings are special circumstances that allow these exchanges to be deepened.

It is possible to support institutional research by subsidizing associations or public enterprises that find their financing from various funds, in particular at regional or local level or through state aid. In particular, activities related to higher and technological education can find relays outside the university by maintaining a partnership with companies. Openness and transparency are the primary drivers of innovation. It has been proposed that the ECB should provide an income base for every European citizen, complementing the multi-faceted activities linked to development in the territory [2,3].

2.2. Participatory teleworking is developing

The globalization of trade is leading to a rethinking of the organization of today's work. E-commerce is making considerable progress. People are getting closer to their consumption and defining new uses. Their involvement in trade is expanding and is better taken into account. The [International Labor Organization](#) and the [United Nations Industrial Development Organization](#) have experienced increased development during the COVID-19 crisis and have initiated in these circumstances a new public campaign calling for participation [4].

To further facilitate global trade, consumer platforms are being set up to discuss products, their delivery and billing [5]. Scientific computing becomes necessary to analyze the data that take into account these numerous and complex exchanges. Direct marketing established on databases configured according to different set criteria by management software is being improved. Cookies make it possible to compile statistics which, given the large volumes exchanged, provide the possibility of adapting the commercial offer to demand.

The same applies to virtual discussion groups concerning the implementation of public policies [6] at the local, regional or global level. These will have to develop and will have to be accompanied by a flexible managerial structure allowing its operation, the analysis and the evaluation of the discussions that commit to progress. Service jobs are growing and diversifying during the digital revolution.

Industrial partnerships will also use teleconsultation to look for new development solutions in design and calculation in production studies departments. Given countries' capabilities, it is difficult to obtain leadership or even autarky from their industries in the volume of world trade. Nevertheless, the existence of production sites using multi-skilled work, diversifying jobs and increasing turnovers, makes it possible to develop the skills necessary for participation in the world.

Thus a regulation taking into account discrete events and giving a frequency representation of states must be established more efficiently. Some key points of the production and logistics system are to be remembered mainly. The factory, roads and warehouses have routine landmarks. The automation that is practiced there [7] includes sensors and scanners of barcodes or QR codes. They count the passage of products and shape an industrial computer using formulas that reflect both production and consumption. This provides better control over the efficiency of the entire distribution chain, which tends to cancel out any waste or money laundering.

Population planning at the heart of this whole process is the predominant societal issue in international discussions. [The United Nations Population Fund](#) aims to support the efforts of governments in this direction. The example of the Erasmus system has been recalled in international exchanges and the network of embassies is a continuation. Incentive policies in this area must become more transparent and promote openness in order to achieve greater inclusiveness. This condition has been expressed by several Member States in the Objectives of Sustainable Development.

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