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Industry 5.0 and industry 4.0 comparative definitions

Indústria 5.0 e definições comparativas da indústria 4.0

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Abstract
The paper summarises and clarifies definitions of new and future industry development so-called INDUSTRY 4.0 e 5.0. There is a little confusion and a narrative influence from cultural and market leaders to evangelize scholars and less informed people. An increase in digitalization, information technology, and machine learning doesn't imply a "revolution" it is something going on till the internet was open to the public. The paper summarises definitions to navigate the number of new words and definitions to avoid misunderstanding. The paper justifies itself for graduation and graduates to avoid errors following narrative fashions without an orientation. The aim of the paper is didactic and like a glossary. When academic discussions or research papers, the present paper could be used as a reference. The result also warns of the implications of the INDUSTRY5.0 definition because the more ideological side of the used the more ideal and academically irrelevant is the discussion. Depending on the aim of the research if the discussion is about human-machine development it is better in sociological or law areas.

Keywords: Industry 4.0. Industry 5.0. Information economy. Production function. Industrial revolution.

Resumo
O artigo resume e esclarece as definições de novos e futuros desenvolvimentos da indústria chamados INDÚSTRIA 4.0 e 5.0. Há um pouco de confusão e uma influência narrativa de líderes culturais e de mercado para evangelizar estudiosos e pessoas menos informadas. Um aumento na digitalização, tecnologia da informação e aprendizado de máquina não implica uma "revolução" é algo acontecendo até que a internet fosse aberta ao público. O documento resume as definições para navegar no número de novas palavras e definições para evitar mal-entendidos. O trabalho se justifica para graduação e pós-graduação para evitar erros seguindo modas narrativas sem orientação. O objetivo do artigo é didático e como um glossário. Quando discussões acadêmicas ou trabalhos de pesquisa, o presente artigo pode ser usado como referência. O resultado também alerta para as implicações da definição de INDÚSTRIA 5.0, pois quanto mais ideológico o lado usado, mais ideal e academicamente irrelevante é a

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discussão. Dependendo do objetivo da pesquisa, se a discussão for sobre desenvolvimento homem-máquina, é melhor nas áreas sociológica ou jurídica.

Palavras-chave: *Indústria 4.0. Indústria 5.0. Economia da informação. Função produção. Revolução industrial.*

1. Introduction

A new narrative for our future INDUSTRY 4.0 and INDUSTRY 5.0 ares narratifs of a new industrial era. The industrial revolution means a dramatic or disruptive change following Schumpeter's discussion of economic cycles. There are no pieces of evidence of such a new era, it is doubtful even to classify how many “disruptions” or revolutions were in the past times.

There was a narrative about the industrial revolution by English and Frenchmen. The term Industrial Revolution applied to technological change was becoming more common by the late 1830s, as in Jérôme-Adolphe Blanqui's (1837) description of “la révolution industrielle”. Marxism, used this when F. Engels wrote The Condition of the Working Class in England in 1844. Marxism discussed the industrial revolution as the one which changed the whole of civil society. Historical scholar. Historical scholar Arnold Toynbee argued that there was a proto-industrialization in parts of Europe, the Muslim world, Mughal India, and China that created the social and economic conditions thus causing a divergence of the industrial process from the artisanal production process.

To sustain there are industrial revolutions, some factors are claimed to be working at the same time: 1) high levels of agricultural productivity 2) a pool of managerial and entrepreneurial skills 3) new techniques and technology for supply chain and transport; 4) new techniques (chemicals) and technology to use of natural resources such as coal, iron, and waterfalls; 5) political stability and a legal system that supported business; 6) financial capital available to invest in a business.

Local or regional development must spread all over a nation and the system's eagerness to export industrial expertise and the willingness to import increase worldwide industrialization. So the problem is how many “revolutions” there were, and are the industrial or economic changes the object of research?

The industry itself makes no revolution in society. The social revolution is a drastic change in social development and thus is not only new products and services. But the social and economic changes are subject to people's cultural perceptions. Then an industrial revolution is only a new technique or technology revolution, and a social revolution or “revolution” for people is a broad cultural change. So we disagree with the idea that an industrial change is a “revolution”. It could be an innovation moderate or marginal or disruptive as Schumpeter thought. So only in this sense, that is an economic theory, we count four or five revolutions as economic historians try to classify for didactics.

However, the problem in this paper is not a historical or social classification or ideological. We are aware the production process changes from the XVIII century increased productivity. However, the great changes from the past were substantive in transportation and reduction of health risks or services united to broad citizen participation or democracy. New ways to travel and transportation carriers change our perception of space and the medical advance allow us to live more than double that of our ancestors. The social change made it possible for more vulnerable people to decide their future. The answer to the question is clear if there were revolutions from the past the industry was not the main drive.

The paper's goal is to clarify the basis of INDUSTRY 4.0 and 5.0 definitions for themselves, without “revolutions”, considering if they are trying to explain changes in industrial activity and the narrative of why we are classifying industries only using digital information technology changes. The answer summary is that in a market driven by information, or an information economy where the working amount (I’m not saying the value or the price) of information is increasing more than other variables of a “productive function” (i.e. technology, capital, labor, etc.), the industry is changing all production process following. The discussion and the results fit into an economic theory and market explanation, not a social development even if, the use of the so-called AI, could have some impacts, and it’s hard to say today, on social culture.

2. Methodology

The main objective of the paper seeks to explain clearly and simply the galaxy of definitions about new economies we are using sometimes with a less understanding of the deep meaning and connections between them.

The paper uses a qualitative dialectic approach with exploratory research having the objective to clarify economic and social due to labor changes into a “productivity function”) and the relations between INDUSTRY 4.0 and 5.0.

The methodology process used has a sequential step-by-step approach divided into three sections: a) an introduction of the information economy and production function, b) definitions and explanations of INDUSTRY 4.0 c) definitions and explanations of INDUSTRY 5.0.

A result and concluding remarks will close the paper.

3. Discussion

Information Economy and productivity function

Many scholars from different knowledge areas, including Porat's (1977) initial definition, such as M. Castells, the sociologist who wrote The information age: Economy, society and Culture (3 volumes).in 1997 T. Boyett. (2001), Negroponte (1996), Rifkin (2000), Schwartz (1999), Shapiro, and Varian. (1999), used to define information economy.

Let’s start by defining the information age economy (CASTELLS 1997), Knowledge economy, Information Economy (branch of economy studies). These are today complemented with a lot of other definitions like digital age/ economy, Industry 4.0 or 5.0, and New Economy (Not, Digital Economy, Sharing Economy, etc.).

Manuel Castells a sociologist alerted that the information economy is not mutually exclusive with industry there is much evidence of increasing use of information all over social relations.. Some countries such as Germany and Japan are increasing informatization of manufacturing processes and it seems the top of an increased movement or a "stage" or "phase" of an economy.

A more complex explanation for a so-called knowledge economy. Peter Drucker discussed the knowledge economy in the book The Effective Executive 1966 from a discussion of the difference between manual workers and knowledge workers. So the knowledge economy is a knowledge-based economy in which the production of goods and services is based principally on knowledge-intensive activities. The advance of a knowledge economy increases innovations and inventions (OCED 2001).

The key element of the value of the knowledge economy is human capital and intellectual property having their source in innovative ideas, information, and practices. (HAYES 2020) A knowledge-based economy relies on the crucial role of intangible assets within the organizations' settings in facilitating modern economic growth.

A third definition can be used in Information Economy as the Economy of information studies. Information economics or the economics of information is the branch of microeconomics that studies how information and information systems affect an economy and economic decisions. (ARROW 1984,1986,1999). Information is embodied in certain types of commodities such as computer software pharmaceuticals, and technical books. The value of the information is the recording system "on paper, in a computer, or on a compact disc. It is valuable because it can be reproduced and used by a second person with no additional cost from the first recording.

The economics of Information has studied information asymmetries (examples of this problem are selection adverse or advantageous and moral hazard) and their implications for contract theory, including market failure as a possibility, a game theory that may apply, including games with perfect information, complete information, and incomplete information.

All these definitions are worth explaining today's economy. That could be examined by production functions or a math model that use statistic to analyze production. Even if some scholars reject the idea of an aggregate production function for all economies (DALY 1997) the most commonly used production function is a Cobb-Douglas function (COBB-DOUGLAS 2016) where for production of a single good with two factors. A matrix of the results of all production functions for all goods and services will summarise the whole production and can explain an increase or decrease during the year. This is roughly the process to calculate the national PIB. The function is:

$$Y = AL^{\beta} K^{\alpha}$$

Explanation:

Y = total production (the real value of all goods produced in a year or 365.25 days)

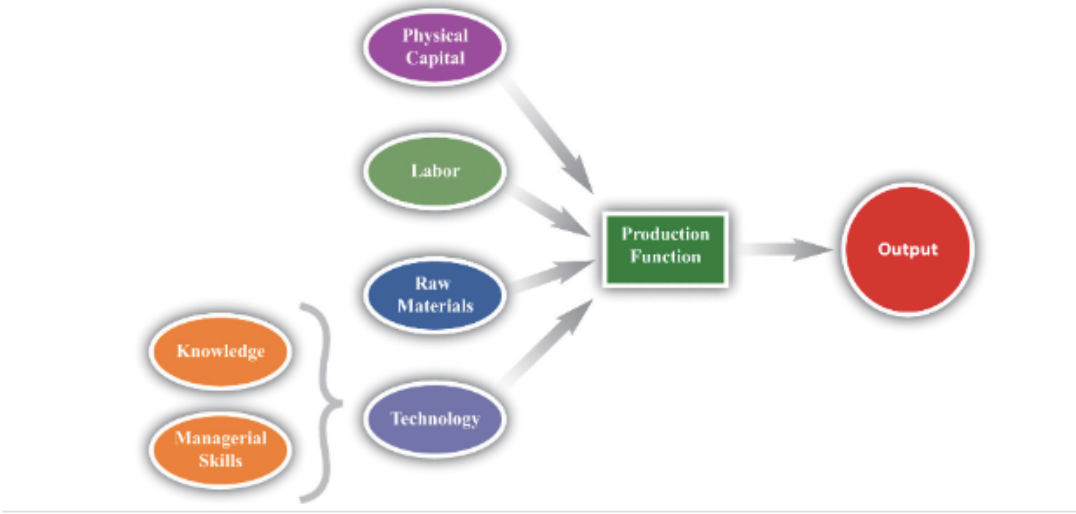
L = labor input (person-hours worked in a year or 365.25 days)

K = capital input (a measure of all machinery, equipment, and buildings; the value of capital input divided by the price of capital)[clarification needed]

A = total factor productivity

α and β are the output elasticities of capital and labor, respectively. These values are constants determined by available technology.

Figure 1 - A productivity function main elements



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A generalization of the capital input could be intangible capital and following the logic, all information could be used as an intangible production factor as well. It means the information is part of a “production function” or a variable that could be inserted in economic models as a cost. Obviously On the other side information is not a material good or human labor but a knowledge (technique or technology) and a variable cultural, geographic, and time-dependent. In other words, is a social variable that hardly interacts with economic models.

When invention and research basic process starts and develops new services and products the “Medici effect” could be investigated to understand what cultural and social variables are trigging innovation. Subsequently, an opportunity arises to develop sustainable services and products for new markets or that perform marginal innovations. These steps model is not sequential but depends on social and cultural aspects present in one configuration at a time. The information needs to be fixed into the innovation, and, later on, into the service or product could be quantified today only into digital processes in which the “codifying process” is written down and is the base of the innovation itself. The intellectual property alternative that includes the information about the service/ product process and invention work in a different way and not always is registered.

As well programs and information technology fir in a tight “registration” mostly because of the concurrency, network, and speed of the digital invention process that sometimes avoid properly registering how the digital economy is working. And now it is also affected by AI and another potential source of coding written not by humans but by automated programs. In the end, statistics could be used to show the differences of a production function with more or less injection of capital as information, from a classic production function. As was said is not easy to accept there is an overall change in the economy and, mainly a disruptive change that can be called “revolution”

It is difficult not to mention which perspective, of the three above, is used in the research of new Industry definition because all discussion must be related to a

scientific model. As we will see it seems not exactly this the case. According to Aveni (2023), it seems INDUSTRY 5.0 today is more an ideological than a scientific definition and theoretical advance.

However, the information Economy implies a subset of new economic activities that identify in reality markets into the general activities set of the classical economy tripartite of activities (primary or agriculture and mining economic activities, secondary or industry, and third or service activities economy). These markets, in our opinion not to call the economy, are the Internet of Things (IoT), Artificial Intelligence (AI) based on machine learning or deep learning, Sharing Economy, or Circular economy. The interaction and increase of all these innovation markets are what support the opinion of a “revolution” in the economy

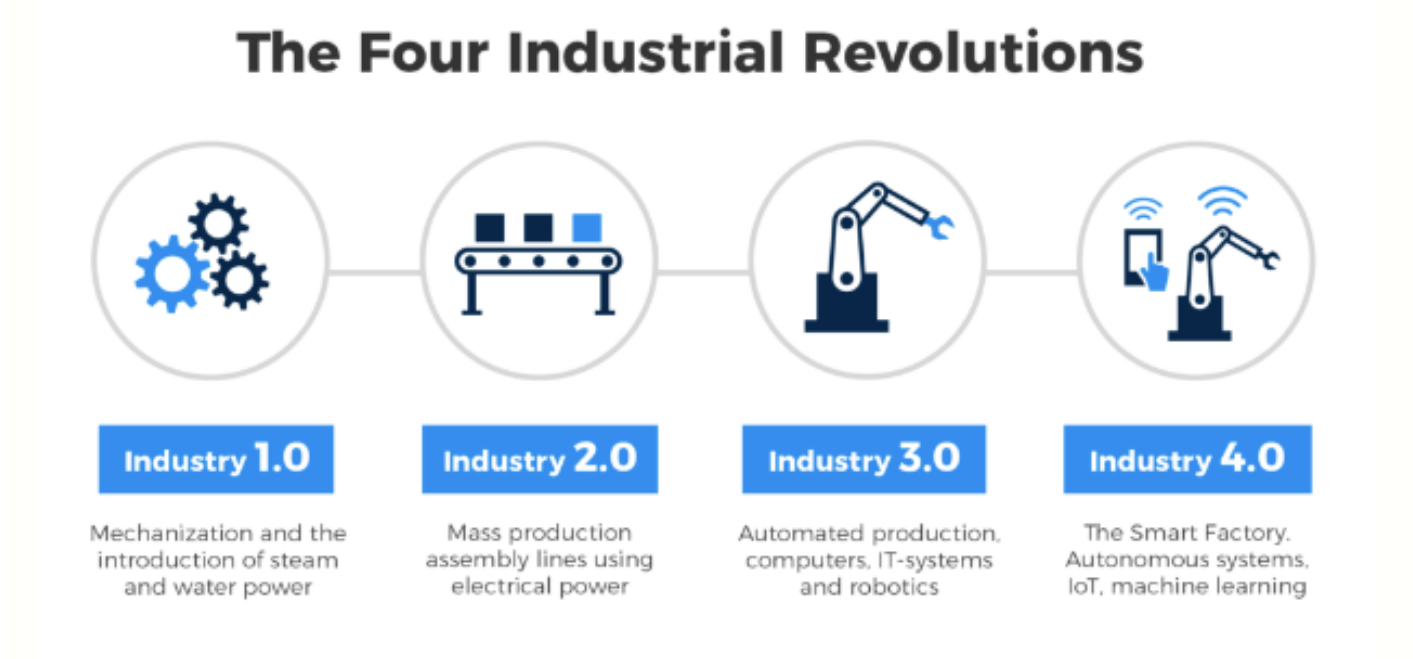
And finally the sustainable development approach. According to K. Building's first discussion (1966) and following Ellen McArthur Foundation (2020) the main focus on the following paradigm: reuse, sharing, repair, refurbishment, remanufacturing, and recycling to create a closed-loop system, reducing the use of resources inputs and the creation of waste, pollution, and carbon emissions. The goal of reducing impacts could be reached without massive use of information technology but by using less-impact environmental techniques and technical knowledge focused on low impacts on the environment

Industry 4.0

Introduced by Klaus Schwab[2], founder, and executive chairman of the World Economic Forum which defined industry fourth era as at combine hardware, software, and biology (cyber-physical systems), and emphasizes advances in communication and connectivity, marked by breakthroughs in emerging technologies in fields such as robotics, artificial intelligence, nanotechnology, quantum computing, biotechnology, the internet of things, the industrial internet of things, decentralized consensus, fifth-generation wireless technologies, 3D printing, and fully autonomous vehicles.

[2] https://www.weforum.org/about/klaus-schwab

Figure 2 - The four industrial revolutions



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The Industry 4.0 model was first mentioned in 2011 in Germany as a proposal for the development of a new concept of German economic policy based on high-tech strategies (Mosconi, 2015). According to Vasja et al. (2016) research, the fourth technological revolution is based on the concepts and technologies that include cyber-physical systems, the Internet of Things (IoT), and the Internet of Services (IoS), as well as the Internet of Energy (IoE), the trend is leading toward the establishment of a communication channel for the continuous exchange of information about needs and individual situations in real-time, provide value-added for organizations and customers.

According to J. Schlick et al. (2014), there are, in the industry 4.0 environment, at least of these scenarios: 1) Interoperability or connecting and communicating with each other via the Internet of Things and Internet of Services. 2) Virtualization or monitoring with sensor data physical processes. 3) Decentralization or enabling factories to make decisions on their own, 4) Real-Time Capability: or reacting to the failure of a machine and rerouting products to another machine, 5) Service Orientation or use of the services of companies, CPS, and humans offered both internally and across company borders, 6) Modularity or flexible adaptation of changing requirements

World Economic Forum (WEF 2016) recommended 10 deep drives to develop and plan the future nobility of cities: improve physical integration and connectivity between transport modes, establish industry standards on data/digital infrastructure across device types, enhance day-to-day transport management through a data-based approach, promote demand-responsive shared transport, streamline regulation and management of demand-responsive solutions, introduce policies to accelerate the adoption of alternative fuel vehicles, introduce policies to accelerate the adoption of alternative fuel vehicles, consider possible technological and business model evolutions when making, leverage corporate/institutional environments to test and showcase

business, apply smart and competitive public-private financing models to fund new mobility ecosystems.

A PWC survey (2014) explains that, by 2020, European Industrial companies will invest 140 billion euros annually in industrial internet applications. On the same date, almost 80% of these companies will have digitized their value chain with an 18% increase in efficiency. Digitization of products and services portfolio is the key to sustainable corporate success.

In the report: "The industry of the future", KPMG (2106) shows that Industry 4.0 is an evolution of the industrial revolution that converges to a new model based on information technology strengths. The evolution from mechanization followed by electrification and digitalization now is turning to cyber–physical system that embedded networked ICT and interacts with physical processes. For KPMG the automotive industry leads the way using all disciplines encompass all interdisciplinary fields.

McKinsey & Company Industry 4.0[3] model factories, stressed that the industry 4.0 key to success is based on complex management of services and after-sales, resources process, asset utilization, new form of labor, inventories, quality match supply-demand, and time to market. Among other technologies, the autonomous car vehicle (ACV) can modify deeply mobility in cities. But in Industry 4.0 there are more opportunities to improve mobile. The challenge is to understand how to link Industry 4.0 to the smart cities concept to develop innovative mobility.

Industry 4.0 example application is in Smart cities and is encouraging openness and co-creation to generate opportunities in the IoT. Smart cities are improving electric trains to increase safety and reduce freight and transportation in urban areas. Metro is the more efficient and sustainable train developed. According to Deloitte (2015), projects in a Smart City are user–centered mobility, integrated and intelligent transport, pricing and payments, automation and safety, and public and private innovation.

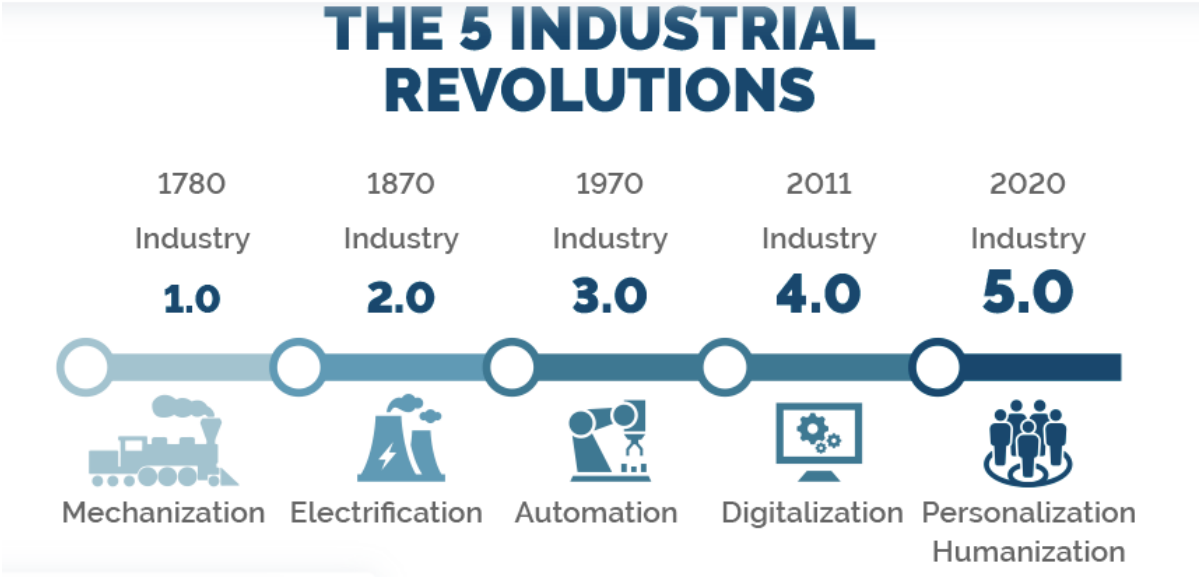
Industry 5.0

INDUSTRY 5.0 is a definition sometimes referred to as introduced by Michael Rada (2107) as the next development stage after the fourth Industrial Revolution and refers to an industry where advanced technologies are designed and employed to increase human creativity and innovation. These technologies are artificial intelligence (AI), full automation, quantum computing, and the Internet of Things (IoT).

INDUSTRY 5.0 has a vision of our future where machines and technology will work with humans. The emphasis is that INDUSTRY 5.0 enable a new level of collaboration and innovation of new solutions that combine the best of human and machine capabilities. The "new era" will be prioritizing societal requirements of a fundamental emphasis on values such as fairness, honesty, and mutual trust, as well as living together in peace and promoting a comfortable and fulfilling life free from stress, anxiety, and violence. In other words, combining INDUSTRY 4.0 with sustainable development and human rights overall is defined by organizations like ONU

[3] https://www.mckinsey.com/featured-insights/mckinsey-explainers/what-are-industry-4-0-the-fourth-industrial-revolution-and-4ir

Figure 3 - The Industrial revolutions



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It seems the INDUSTRY 5.0 definition and impacts are complicated to sustain a new “economy”. The impact of new technologies on humans must be defined as all humans and not the “humans” using digital information. It is easy to prove the sentience because all over the world exist social organization anachronisms and difficulty of cultural and social variables that needed to follow the changes (JAFFE et ali. 2003, OECD 1999, 2002).

Madsen, D.Ø.; Berg, T (2021) Exploratory bibliometrics analysis on Industry 5.0. provided an understanding of the concept of Industry 5.0. According to the authors, the first article Scopus-indexed was in 2016, and not until 2019, the publication activity started growing. Much of this debate around INDUSTRY 5.0 is happening in the scientific literature, but the definition and discussion slip over social media platforms such as LinkedIn. This proved that new concepts are increasingly taking place on social media platforms to the extent of the diffusion of the concepts using social media influencers that are less reliable but much more known by young evangelists who are seeking celebrity more than consistency. Research (AKUNDI et ali.2022) point out major themes of Industry 5.0 as a) supply chain evaluation and optimization, b) enterprise innovation and digitization, c) smart and sustainable manufacturing, d) transformation driven by IoT, AI, and e) Big Data, and Human-machine connectivity.

According to the authors (MADSEN, D.Ø. BERG, T, 2021), the overall publication trend is positive however, it is not given that INDUSTRY 5.0 will attract more popularity than INDUSTRY 4.0 concept. Most of it will depend on actors (e.g., consulting firms) and government-promoting attitudes in the business considering the long-term objectives concerning sustainability and resilience and it is not particularly attractive for example to SMEs. Research on management concepts had shown that managers are typically attracted to substantial performance improvements, e.g., cost reductions or competitive positions. So consulting firms are not very fond of INDUSTRY 5.0 but there are yuppies evangelists who counterbalance such attitude.

Strong support for INDUSTRY 5.0 was given by The European Commission which stressed the characteristics beyond producing goods and services for profit, reinforcing stockholders value and the role and the contribution of industry to society. The European Commission in 2021 led by a progressive coalition strongly emphasized sustainability and sustainable development in the business world considering that the concept is related to the UN's sustainable development goals (SDGs) and in some form, the concepts of INDUSTRY 5.0 are more philosophical, human-centered and supporting environment impact reduction. However, European Union has a conflicting vision of sustainable growth of the USA and China, and also other countries of the BRICS group like Brazil.

A positive impulse for the new form of Industry development could be government policy sustaining. The positive news for the INDUSTRY 5.0 thesis is the Europe Union endorsement claiming a new industrial' development era that fit into sustainable concept and UN development goals (SDGs). How is doing this is a bit unclear, but there are a shared framework in progress that started in 2021 and a contest with a prize in 2023. The key process to develop in Europe is a transition to a sustainable, human-centric, and resilient European Industry.

According to European Union, the Industry is a key driver in the economic and societal transitions and must lead the digital and green transitions. The EU approach "provides a vision of an industry that aims beyond efficiency and productivity as the sole goals, and reinforces the role and the contribution of industry to society". INDUSTRY 5.0 places the well-being of the worker at the center of the production process and uses new technologies to provide prosperity beyond jobs and growth while respecting the production limits of the planet.

This is a slight difference vision from the mainstream in which INDUSTRY 5.0 will develop only human-machine industrial development given to collaboration, which also implies that human well-being is a priority as well as the environment for it, but the industry progress, social progress, and environment are sometimes in conflict and the current practice is not going green but to mitigate impacts. This is not a little different and it is different to develop a circular economy or an INDUSTRY 5.0 with only environmental mitigation efforts. This last vision is the technological or ecological more light movement that believes that technology will succeed to substitute high-impact processes and use of natural resources with other inputs (OECD 1999,2002, JAFFE et ali. I 2003, ACEMOGLU et ali. 2012.).

European Union says that "INDUSTRY 4.0 lacks key design and performance dimensions that will be indispensable to make systemic transformation possible and to ensure the necessary decoupling of resource and material use from negative environmental, climate and societal impacts" (EUC 2021a pg.5). And INDUSTRY 5.0 is related to a new society. So the European narrative new element of the discussion encompasses INDUSTRY 5.0 and sustainable development and socially sustainable development.

According to EUC (2021b pag.9) Society 5.0 and Industry 5.0 are related concepts because both refer to a fundamental shift of our society and economy towards a new paradigm. The Society 5.0 concept was presented by Keidanren, Japan's most important business federation, in 2016. "Society 5.0 attempts to balance economic development with societal resolution and environmental problems. It is not restricted to the manufacturing sector but addresses larger social challenges based on the integration of physical and virtual spaces" (EUC 2021b pag.9). In this Society 5.0, advanced industry tools like IT technologies, the Internet of Things, robots, artificial intelligence, and augmented reality are used for the benefit and convenience of each citizen.

Following the EU there are many elements to be connected in INDUSTRY 5.0 to reach the goals of a new developing economy, such as: a) enabling technologies such as Individualised Human-machine-interaction, Bio-inspired technologies and smart materials, Digital twins and simulation, Data transmission, storage, and analysis technologies, Artificial Intelligence, Technologies for energy efficiency, renewables, storage and autonomy and b) find solutions to challenges like Social dimension of INDUSTRY 5.0, Governmental and political dimension, interdisciplinarity, Economic dimension, scalability.

The political and missionary goal defined is no net emissions of greenhouse gases by 2050, economic growth decoupled from resource use, and no person and no place left behind. So is this the main contribution to INDUSTRY 5.0 discussion from the European Union Associated Government, or to increase the magnitude of the concept to encompass and link the sustainable development speech that generates in Europe with the 1987 Brundtland Report? We must remember that Our Common Future, Chairman's Foreword for "A global agenda for change" was what the World Commission on Environment and Development asked to formulate and discusses in the General Assembly of the United Nations.

According to Aveni (2023a, 2023b) skills, planning education, and technical tools knowledge lack in many public administration countries and also in European Union when great plans are decided and started. A gap between what “we want to do” and what “we can do” seems not to be perceived or there is overall blinded confidence about directives, plans, and financial markets to fuel the European Economy. The same could be discussed when other government are launching political campaign using some not well clear word of development goals.

4. Results

Following the “revolution” or development narrative of these two industry definitions, it seems INDUSTRY 4.0 and INDUSTRY 5.0 definitions lack of economic theoretical basis or at least one economic model. That must be proved with the productivity function all over the world.

A great emphasis of these definitions sustains the increasing importance of digitalization and information technology. The new markets, it won’t be call economies to avoid classic definition confusions, are innovations, some marginal and others disruptive in some markets. However, it seems difficult to sustain an overall impact or a “revolution” in all economy and for all.

We argue the interest in the new industry narrative and definitions is more ideological and political to strengthen the information technology market that it is a great impulse of the world economy and allow a PIB increase in the last decades. That could be seen in Europe where there is no information technology lobby like in the US which is the leading information technology market worldwide not by hardware but with great US technology firm new software.

The European attempt to use the INDUSTRY 5.0 concepts embodied with environmental and sustainable elements seems another concurrency marketing operation. We have evidence that also China is trying to follow when other countries with less technology like Brazil are not involved in the struggle because of lack of technological overall development.

The differences between INDUSTRY 4.0 and 5.0 are shifting the discussion from an embodiment of digital technology and market innovation into the industry to a human-machine collaboration. It seems very difficult to prospect unless the focus is to discuss the implications of INDUSTRY 4.0 increase of digital approach and AI models

based. The full automation and the complete machine control of production as the process that could be reached by new AI techniques or machine learning and deep learning and ancillary models, probably could not be stopped.

In our opinion, INDUSTRY 4.0 will not be develop a new era. It is a scientific proof needed. The cooperation human-machine especially in creativity is something difficult to prove and design. It is also logically difficult to understand because all software is a human creation and the so-called AI is a statistical modeling domain. There is no intelligence in machines.

5. Concluding remarks

The paper is a didactical and bibliographic research of some important definitions of the Economy and developing industry. The INDUSTRY 5.0 as a new era is a doubtful and weakly sustained definition. It could be used into a political narrative with some cares.

The result of the comparative analysis is a clear rejection of the Industrial "revolution" claimed. European Union uses the narrative mostly to embed the new industry processes into a broad sustainable development perspective. It is more a political perspective to have a join goal for all Nations in Europe.

Moreover INDUSTRY 5.0 as new human-machine cooperation could be reached only when there should be a fiscal connection between humans and machines to increase human capacity beyond the actual limits. This seems to me like a sci-fi challenge more than a new Industry era coming. And this, even when there are R&D and research with organic computing and neural-based experiments on disabled or injured people. It is fair to say it will be a global trend or that all humans in the world will be machine physical connected. The connection actual's thought devices like computers and smart phones.

Certainly, a future of human clones with machine-powered superpowers is a good narrative, but I will have some suspicion when this "fact" is influenced or subscribed by the government or firms. It would fit more in the entertainment market and sci-fiction. A human-machine connection also allows a "big brother" and it is a scaring narrative of our future. We must be sure of who is the "big brother".

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