

Human Capital Theory in the Context of Artificial Intelligence

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Abstract: The purpose of this article is to investigate the possible connections between the Human Capital Theory (TCH) and Artificial Intelligence (AI), in an attempt to understand the limits and possibilities in the contemporary world. Is it possible to glimpse some impacts, from TCH and AI, on the job market, on the qualification of the worker and on the market? It is these concerns that we intend to reflect on.

Key words: human capital theory; artificial intelligence; perspectives

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The challenge of preparing an article that contemplates the theory of human capital in an Artificial Intelligence (AI) environment, seeks new reflections on the theme and the lack of research in this area regarding the correlation between these variables. What we intend with the study is to investigate how this dialogue occurs and thus show the essence of the Human Capital Theory (TCH), in line with the tensions between Artificial Intelligence (AI). The guiding question of the research is to know how the dialogue between the Human Capital Theory (TCH) and Artificial Intelligence (AI), its limits and potentialities takes place. The methodology used to achieve the objectives of the study was content analysis, using documentary research as a data collection instrument, evidencing a qualitative research.

The study is divided into three parts. The first part entitled: contextualization of the Human Capital Theory, aims to show the reader the development and some conceptions about it, involving its principles and how education returns in this perspective. The second part: Connecting Theory of Human Capital (TCH) with Artificial Intelligence (AI), addresses possible connections between the Theory of Human Capital and Artificial Intelligence. The third part is the conclusion.

1. Contextualization of the Human Capital Theory (TCH)

The Human Capital Theory (TCH) is defined as a set of productive skills of individuals that are formed by knowledge, attitudes and skills and that produce results in a given economy (Becker, 1962; Cordeiro, 2008).

In his speech as President of the seventy-third meeting of the American Economic Association, Theodore W. Schultz brings to the world a theoretical-philosophical discussion about the role of man's knowledge in the benefit of his quality of life and profitability. It was already known by Schultz that other theorists had preceded him,

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envisioning the role that the individual has in economic growth. Adam Smith in his work "Wealth of Nations" had already mentioned the difference between a purely manual worker and a thinker, others like Alfred Marshall and still Irving Fisher are names with which Schultz realized this concern to put the individual in the process of economic development.

We realized that other theorists already saw the knowledge of man as a differential in the equation that translates the economic growth of a society and it is based on this assumption that we will seek in this work evidence about the ways in which the investment in human capital can return to the individual in an environment highly technological. The term human capital translates the concept of a set of productive skills of individuals who are formed by knowledge, attitudes and skills and which produce results in a given economy (Becker, 1962; Cordeiro, 2008).

The main characteristic of human capital is that it is part of man, thus inferring that it is non-negotiable since it cannot be dissociated from the individual and cannot be commercialized. But it is also configured as capital because it is a way to obtain future income. However, this capital can be acquired through an investment in the individual

Schultz seeks to clarify the possibility of a separation between investment and consumption education. For him, it is possible to characterize it as an investment when it is seen as a prerequisite for the future achievement of higher yields, either as greater efficiency in the labor force, or in the intellectual qualification of the individual. In this way it is understood that education as an investment is related to the search for future benefits, unlike education as consumption, which would be a simple social expense.

Another icon of the Human Capital Theory is the representative Gary S. Becker, whose work "Human Capital" empirically evaluated the aforementioned theory, and who is contemporary to Teodhore Schultz, are considered responsible for leveraging discussions about the role of human capital in society.

In addition to these factors, Gary Becker mentioned other attitudes that would provide a greater return to the individual, citing as an example: knowledge about politics, the economy and the social system, health care, physical and mental, all contribute to improving incomes and the qualification of the individual.

2. Connecting Human Capital Theory (TCH) with Artificial Intelligence (AI)

Especially since the 1950s, there was a proliferation of reflections and understandings about Artificial Intelligence, the result of the unfolding of the productions and discourses of the researchers hebert Simon, Allen Newell and John Mc Carthy. These precursors of artificial intelligence sought to correlate the theme with other areas of knowledge such as philosophy. The term artificial intelligence was coined, for the first time, by McCarthy, at the Dartmouth Conference in 1956 in England, when several researchers met for the purpose of evaluating and providing the ability to solve problems (General problem solver) from the system of algorithm-oriented information. In short, algorithm means a sequence of systematized steps for solving problems. For this author philosophy permeates the discussion to some extent.

With the evolution of Artificial Intelligence and inspired by a game (from the Victorian era in England) of guessing sex, just by listening to people without seeing them, a test is created to identify the approach of the machine with the human being: the "Turin". In the author's conception the ideal arrangement is to have a teleprinter communicating between the two rooms. Alternatively, the questions and answers can be repeated by an intermediary. The object of the game for the third player (B) is to help the interrogator. The best strategy for her is

probably to give real answers. She can add things like I'm the woman, don't listen to him! To her responses, but it will be worth nothing as the man can make similar observations. Now we ask the question: "What will happen when a machine takes part of A in this game? Will the interrogator erroneously decide as often when the game is played like this, as he does when the game is played between a man and a woman? These questions replace our original, can machines think?" (Turin, 1950, p. 434) (Our translation).

Centering the development of Artificial Intelligence (AI) on fundamental values (one of them the human being and his intangible capital) is unlikely in a monopolistic environment with a global character. What is perceived, in the final analysis, is the search for the stage after capitalism: Imperialism.

In this process, technological dominance is imperative to the detriment of other countries. This "globalism", a new stage of globalization, is based on the supremacy of a country or institution that will always be linked to its country of origin.

Another aspect that deserves consideration, in the contemporary world, are the types of applications of artificial intelligence. How to consider the applicability of something that does not yet have a definition? What would Artificial Intelligence (AI) be, since intelligence is human (inherent to TCH) and artificial is made by humans? The discussion of artificial intelligence is polysemic and meets other intelligences, namely: emotional intelligence (senses), divine intelligence (human creativity) and artificial intelligence (robotics and computing).

The applicabilities of Artificial Intelligence (AI) are shown in the data in table 1 with their respective meanings.

Types	Meaning
Large-scale Machine Learning.	A major focus of this branch of research would be to make existing algorithms capable of working with extremely large databases.
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Reinforcement Learning	Focuses on decision making for AI applications and is a technology that will help programs of this type to improve the actions they perform in the real world
Robotics	Developed through advances in machine perception, including computer vision, strength and tactile perception, much of which will be driven by Machine Learning
Computer vision	This is the most prominent area of the aforementioned perception of machines.
Natural Language Processing.	Also framed in the perception of machines, it is another area that shows great advances. Often accompanied by automatic speech recognition, it is fast becoming a commodity for languages with large data sets.
Sistemas Colaborativos.	Collaborative Systems. In it, models and algorithms are researched in order to help develop autonomous systems that can work collaboratively with other systems and with humans. This research depends on the development of formal systems of collaboration and studies the capacities necessary for the systems to become efficient partners.
Crowdsourcinge and human computing	As human skills are superior to those of automated systems to perform many tasks, this line of research investigates methods to improve computer systems using human intelligence to solve problems that computers alone cannot solve well.
Computational dimension of Artificial Intelligence	Including its incentive structures, especially in the economic and social field, through Game Theory and Algorithmic Social Choice.
Internet of Things (IoT)	A wide range of devices could be interconnected to collect and share sensory information.
Field of Neuromorphic Computing	Computing. This new computational structure would seek to improve the efficiency of hardware and the robustness of computational systems.

Table 1 Types of Artificial Intelligence Application in the Contemporary (Dissertation)

Source: Adapted from Gonçalves, 2019, p. 39

In addition, several other disturbing and thought-provoking aspects highlight the need to spread the understanding of Artificial Intelligence and contribute as additional justifications for this research, such as: a) lack of clarity in the concept; b) misinterpretation and use of the term Artificial Intelligence; c) absence of articles dealing with the term in the proper dimension of what may be Artificial Intelligence; d) lack of articulation between creativity and intellectual property; e) absence of perception of Artificial Intelligence as complexity, among others.

The fact is that, following the same line of reasoning and which we advocate, Artificial Intelligence (AI) is the branch of education and psychology, involving intelligences; computing, involving innovation and technology, and economics and administration, involving management and the market. Without a clear definition for this segment of what intelligence is, what is defined is the artificial, which in turn can be technological or not. Craftsmanship is an example.

What makes the definition of Artificial Intelligence (AI) difficult is the human character of intelligence and perhaps for this reason the precursor to the Theory of multiple intelligences did not take Artificial Intelligence (AI) into account as a form of intelligence. The information contained in figure 1 shows the forms of intelligences, according to Gardner (1983).

Intelligence Types	Meaning
Spatial-visual	Understanding images and graphic productions
Logical-mathematics	Developing equations, making calculations and solving problems
Musical	Producing and understanding different types of sound
Synesthetic therapy	Coordinate and use your own body to create or solve problems
Naturalist	Identify and distinguish between different types of plants, animals and the phenomenon of nature
Intra-personal	Knowing yourself, your feelings, desires and personalities
Interpersonal	Recognize and understand other people's feelings, motivations and intentions
Verb-linguistics	Analyze information and produce works involving languages.

Table 2 Types of Multiple Intelligences According to Gardner

The Human Capital Theory (TCH) is present in the discussion of creativity and the data contained in Figure 2 establish these correlations and Artificial Intelligence (AI) manifests itself in creativity and brings in its surroundings the need for innovation to materialize it and meet the purpose for which it is intended.



Figure 2 Interaction of the 5 Cs of Creativity and 4 Types of Capital

Source: UNCTAD, 2010a, p. 4

The Human Capital Theory is based on the assumption that qualification contributes to the increase in income and employment. However, for some authors, Artificial Intelligence will bring great transformations. Based on current trends in technology advancement and adoption, I predict that, within fifteen years, artificial

intelligence will technically be able to replace between 40% and 50% of jobs in the United States. Actual job losses may end up delaying these technical capabilities for another decade, but I believe that the destruction of labor markets will be very real, very large and very soon (Lee, 2019, p. 35).

The implications of the impacts of Artificial Intelligence with the Human Capital Theory (TCH) reveal the end of employment/company and the disappearance of dozens of professions that will have to be reframed and with a highly technological bias. The countries that invest the most in Artificial Intelligence (AI), China and the USA, do so through their mega companies Google, Facebook, Amazon, Microsoft, Baidu, Alibaba and Tencent, just to name the largest.

Artificial intelligence, in the great powers and at a global level, does not go hand in hand with the Human Capital Theory, since the main consequence is social disorder,

The AI world order will combine the "winner takes it all" economy with an unprecedented concentration of wealth in the hands of some companies in China and the United States. I believe that this is the real threat posed by artificial intelligence: the tremendous social disorder and political collapse resulting from widespread unemployment and increased inequality. The turmoil in the labor markets and the turmoil in societies will occur against the backdrop of a much more individual and human crisis - a psychological loss of personal purpose (Lee, 2019, p. 37).

It is worth mentioning that the transformations promoted by Artificial Intelligence, based on the Human Capital Theory, do not happen only in processes, goods and services, but mainly: in the paradigm shift to what Lee (2019) called the four waves Artificial Intelligence (AI): Internet Artificial Intelligence; business artificial intelligence; Perceptual Artificial Intelligence with facial recognition and autonomous Artificial Intelligence through drones, cars, robots and factories.

3. Conclusion

The guiding question of the research was to know how the dialogue between the Human Capital Theory (TCH) and Artificial Intelligence (AI), its limits and potentialities occurs. What we can consider is that there is a limit to growth and technological development so that the Human Capital Theory (TCH) and Artificial Intelligence (AI) are not adversaries and go together. Artificial intelligence urgently needs a definition established by consensus of specialists in the areas involved, facilitating management and investment in intelligences: human or artificial.

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