



Foundations of Scientific Thought in the Age of Knowledge and Its Practical Implications in Research

Cesar Alonso Bohórquez Meleán, Priscila Isabel Ávila, Martha Elena Galvis, Adriana Cecilia Alcaraz

Humanities and Education Research Center (CIHE), Dean of Research and Postgraduate, University Dr. Rafael Bellosó Chacín URBE, Maracaibo, Venezuela

Email address:

cesar81174@gmail.com (Cesar Alonso Bohórquez Meleán), prisavt527@hotmail.com (Priscila Isabel Ávila), marthaalenagalvis@hotmail.com (Martha Elena Galvis), adrianaalcarazh@gmail.com (Adriana Cecilia Alcaraz)

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Abstract: The searches for creative and holistic solutions favorable to the resolution of complex problems that underlie an interconnected world governed by Information and Communication Technologies (ICT) have stimulated the emergence of approaches with an emphasis on the integration of knowledge that represents scientific thought in the age of knowledge. This article aims to analyze the foundations of scientific thought in the age of knowledge and its practical implications in research. It is based on the integrationist epistemological approaches to research (Connectivism, System and Complex Thought) proposed according to the theoretical criteria of Bohórquez (2020), Bohórquez, Cabarcas and Ávila (2020), Martínez (2012), Fidias (2012), Corbetta (2010), Bernal (2010), Hurtado (2010), Barreras (2010), Siemens (2004) among others. It represents the product of a qualitative - interpretive investigation of documentary review, guided by methods and techniques inherent to documentary analysis and hermeneutics. The results warn that, in the era of knowledge, an integrationist scientific thought has been configured, based on the resignification of the concept of social science, which assigns a holistic character to research. It is concluded that the adoption of this thought has originated a set of practical implications in the research processes and methods that currently has the support of the world scientific community, among them the following stand out: 1. Plurality of methods, 2. Complementarity of methods, 3. Synergistic work (cooperation, collaboration) between researchers, scientific communities and research centers; and, 4. Organization of the investigative work in plans, programs and projects.

Keywords: Knowledge, Scientific Thought, Holistic Research, Globalization

1. Introduction

The challenges of an interconnected global society governed by I and Communication Technologies (ICTs) have stimulated the evolution of scientific thinking regarding research methods and their impact on the human development of peoples. During the last century, the resignification of the concept of social sciences became notable after man became aware of the complexity of research processes, discovering that these do not occur in a linear way and are adaptable to any context, but on the contrary, imply a reflective and dynamic process that seeks to respond to the changes that arise day by day in their

environment.

This is how educational institutions and research centers, given the complexity of the global environment, have set their sights on a holistic research model that allows breaking with scientific dogmatism and guaranteeing the relevance of research processes, for which it is essential to promote a more inclusive research practice - cooperative, where the synergy between researchers represents a fundamental element to adapt to the knowledge society. However, there are still vestiges of a radical academic trend that resists these changes by imposing recipes to approach

research from a reductionist perspective, decontextualized and lacking social relevance. It is an individualistic research model that serves the interests of particular people and systems [3, 9].

However, in the knowledge society, an integrationist trend that complements disciplinary research emerges, with increasing force, where "research carried out individually has no reason to exist" (P. 53) [3, 9]. This trend has impacted scientific thought in the knowledge society, appearing practical implications in research.

Thus, understanding the foundations of scientific thought in the knowledge society involves studying the evolution of the concept of social science, analyzing issues such as the crisis of Western modernity, modern scientific thought and its foundations in order to understand the reasons that stimulated the emergence of epistemological approaches with an emphasis on the integration of knowledge, in order to configure creative and holistic solutions for problem solving. So, this article aims to analyze the foundations of scientific thought in the knowledge society and its research practices.

Table 1. Evolution of the concept of social science.

Evolution of the concept of social science				
Rationalist period of scientific knowledge (1941 – 1970). Positivists vs. Hermeneutics:		Humanist period (1970 – 2010). Logical positivism versus rationalism		Evolutionary period, (2010 with a projection to 2030). Integrationist Epistemologies
positivists	Postulates. All science, to be considered As such, it must accommodate to the paradigm of the natural sciences (methodological monism, physical-mathematical method and prediction of results and generation of laws). representatives Hume, Comte, Bacon, James, Mill.	Logical positivism (Vienna circle)	Postulates In science all knowledge it must be subjected to logical and experimental verification. The language of science must be universal. Main representatives: Carnap, Schick and Wittgenstein	Scientific revolutions. Thomas Kuhn. Emphasis on scientific paradigms. The program methodology research. Imre Lakatos. Competitions between programs research. The anarchy of the method. Paul Feyerabend.
			Postulates: Proposes falsification and not check for the validity of The science. Science is built by the deductive method and is validated with criticism. Science is hypothetical-conjectural knowledge. Representative: K. Popper.	
hermeneutics	Postulates They raise autonomy of the social sciences with respect to the natural sciences. Emphasize intersubjectivity as opposed to objectivity. They propose the method of understanding as opposed to explanation. representatives Dilthey, Droysen, Weber, Windelband, Rickert, Croce, and Collingwood.	Critical rationalism	Science must be at the service of society and not of a system. Knowledge must be emancipatory and not instrumental reason. Main managers: Horkheimer, Ornament, Habermas, Apel, Marcuse, and Fromm.	To create knowledge, there is only method in science. complex thinking and knowledge integration. Edgar Morin. proposes to think about reality as a complex entity and multidimensional. Knowledge scientific is a way to know the reality, but not The only one.

Source: own elaboration (2021).

2. Theoretical Foundation

2.1. Evolution of the Concept of Social Science

For Bernal (2010), understanding the evolution of the concept of social science implies analyzing the debates and conflicting ideas between positivists and hermeneutics; the defenders of logical positivism (vienna circle); rationalists and defenders of critical theory.

This analysis will put the reader in a favorable position to understand the origin and foundation of the integrationist epistemological trends that emerge in the knowledge society [3, 9]. Indeed, the foundations of modern scientific thought with its postulates of objectivity, distance between the objective and the subjective, linear causality, neutrality, formulation of general laws, specialization of knowledge, have established a marked contrast with the concepts of globalization, interdependence, uncertainty and relativism associated with the age of knowledge originating the so-called

crisis of Western modernity [3].

Positivists versus hermeneutics. The debate between defenders of positivism and hermeneutics develops around positivist reductionism and hermeneutic autonomy. While positivists Hume, Comte, Bacon, James, Mill, among others, defend the idea of implanting a universal scientific model, with a common language for all sciences (natural and social), hermeneutics, Dilthey, Droysen, Weber, Windelband, Rickert, Croce and Collingwood) advocate the autonomy of the social sciences with respect to the natural sciences; they emphasize intersubjectivity as opposed to objectivity and propose the method of understanding as opposed to explanation [3, 9].

Logical positivism, critical rationalism and critical theory. The debates between positivists and hermeneutics gave rise to a critical position regarding the epistemological extremism of both approaches. The agreements established in the Vienna circle by Carnap, Schick and Wittgenstein, make positivist radicalism more flexible, marking some differences between social research and research in natural sciences, however, they

maintain their position of implanting a universal language of the sciences, and that all knowledge must be submitted to logical and experimental verification [3, 9].

In opposition to the Vienna agreements, critical rationalism is born, represented in the ideas of Karl Popper, who proposes falsification, as opposed to verification for the validity of science. It argues that science is built through the deductive method and validated with criticism, that is, that it is conceived as hypothetical-conjectural knowledge. Lugo emerges the critical theory represented under the ideas of Horkheimer, Adorno, Habermas, Apel, Marcuse and Fromm, who defend a more social and less instrumental concept of science, affirming that science must be at the service of society and not of a system; that knowledge must be emancipatory and not instrumental reason. [3, 9].

Integrationist epistemologies. The debates between rationalists and humanists contributed to the scientific heritage a more holistic concept of science giving rise to the so-called integrationist epistemologies, among which stand out the scientific revolutions of Thomas Kuhn, who emphasizes scientific paradigms and their expiration; the research program methodology of Imre Lakatos, who refers to the competencies between research programs; the anarchy of the method raised by Paul Feyerabend, who establishes that to create knowledge, there is no single method in science; the complex thought and the integration of knowledge of Edgar Morin, who proposes to think of reality as a complex and multidimensional entity [7]. All these epistemological approaches conceive scientific knowledge as a way of knowing reality, but not the only one [3, 9].

2.2. Theoretical Approaches That Support the Integration of Knowledge for the Search for Creative and Holistic Solutions Favorable to Problem Solving

These approaches favor the integration of sciences; They complement disciplinary research by assigning it a cooperative character. They raise the need to articulate the research processes to scientific programs, plans and projects, where the individual researcher "has no reason to exist" (Bernal 2010: 53). The approach and selection of research approaches will depend on the characteristics of the topic, the problem and objective of the research to be carried out, or the hypothesis to be tested. Thus, the integrationist approach demands a rigorous knowledge of the different research approaches by the people responsible for carrying out research processes with the purpose of making well-founded decisions for that purpose [3]. They stand out from them.

2.2.1. Concordism

It represents a criterion aimed at identifying concordance between scientific and religious truth (dogmas), and collectivism, which consists of looking for common points or points that can be shared between the different disciplines [3].

2.2.2. Multidisciplinarity

It refers to the dialogue between the sciences in which each discipline remains within its approach, methods, categories

and specialty, "with no more commitment than the presentation of its point of view on a subject" (p. 52), in an exhibition of knowledge [3].

2.2.3. Connectivism

Its representative, George Siemens, proposes connectivism as a learning theory for the digital age. This theory is linked to all aspects of life, since it offers guidance on issues related to personal knowledge management in relation to organizational knowledge management and the design of learning environments [11]. It represents the integration of principles explored by the theories of chaos, networks, complexity and self-organization that are analyzed below in order to understand their contributions [4, 5].

2.2.4. Systems Theory

It represents a specific dimension of the General Systems Theory (GST) raised by the German Ludwig von Bertalanffy between the years 1950 - 1968.

Its basic assumptions highlight that there is a clear trend towards the integration of various natural and social sciences; that integration seems to be heading towards a systems theory; systems theory can provide a broader way of studying non-physical fields of scientific knowledge related to the social sciences [4].

In this sense, it is considered that systems theory can unify the sciences through the formulation of principles that mainstream the particular universes of each field of knowledge, generating integration - articulation in science education. Thus, the general theory of systems poses the properties of systems as assumptions whose understanding is possible when the system is studied in its entirety [4, 5].

2.2.5. Complexity

Faced with a complex reality, characterized by integrality, sensitivity to initial conditions, instability, uncertainty, chaos, fluctuations, turbulence, self-organization, dissipative structures, chance, indeterminism, fractality (impossibility of order, determinism, stability, causality, linearity or predictability), Edgar Morin proposes the theory of complexity [3, 7].

The epistemology of complexity posits that scientific knowledge represents only one of the various ways of knowing the world, but not the only one [3]; In this sense, the concept of knowledge is more pertinent than the concept of knowledge and even more so than that of scientific knowledge [3]. This position invites you to develop a special ability to listen to others, to understand their points of view, to overcome unilateral, one-dimensional and convergent visions. [3].

In addition, it raises the need for an integrationist and holistic approach to science to study reality; the approach and solution of problems, this approach has been developing in an evolutionary process; starting first with multidisciplinary studies, then interdisciplinary studies, and finally transdisciplinary or metadisciplinary studies; that is, research with an emphasis on the confluence of knowledge, on its reciprocal interaction and integration, or on its transformation and overcoming [3].

2.2.6. *Interdisciplinarity*

Gusdorf (1998), quoted in Bernal (2010: 53) conceives interdisciplinarity as "unity and integration of disciplinary knowledge". That is, as a reason for unity, relationships and reciprocal actions, and interpretations between various branches of knowledge called scientific disciplines, without ignoring the limits of each discipline. Based on these conditions, a reciprocal exchange of scientific results is proposed in a

mutual development of the various disciplines, including the new discipline that is born from the exchange itself [3].

2.2.7. *Transdisciplinarity*

It is conceived as the "integration between the fields of knowledge"; transcendence, regulation of the disciplines through principles or objectives that make up the horizon of knowledge. Metalanguage, metascience, metaknowledge [3].

Table 2. *Epistemological foundations of scientific thought in the age of knowledge.*

Epistemological foundations of scientific thought in the age of knowledge	Crisis of modernity and the epistemological foundations of modern scientific thought.	Inability to respond to the phenomena of a dynamic and complex global world	Globalization Interdependence Uncertainty Relativism Periodo racionalista del conocimiento científico (1941 – 1970). Positivistas versus hermenéuticos:
		Evolution of the concept of social science	Periodo humanista (1970 – 2010). Positivismo lógico versus racionalismo Periodo evolucionista, (2010 con proyección al 2030). Epistemologías Integracionistas
	The emergence of theories and epistemological approaches with an emphasis on the integration of knowledge for the search for creative and holistic solutions favorable to problem solving.	Concordism Multidisciplinarity Connectivism Systems Complexity	
		Practical implications	Plurality of methods Complementarity of methods Synergistic work (cooperation, collaboration), between researchers, research communities and research centers. Organization of investigative work in plans, programs and research projects

Source: own elaboration (2021).

3. **Methodology**

The article represents the product of a qualitative - interpretive research of documentary review, oriented under methods and techniques inherent to documentary analysis and hermeneutics. Data analysis techniques such as coding, categorization and information triangulation were used; being necessary the use of registration forms and documentary analysis; and digital portfolios.

The content compiled from bibliographic and electronic sources related to the subject under investigation and the results of the content analysis carried out were organized and systematized with an original style [1, 6, 8, 10, 12, 14, 15]. The contributions shown in this document show the hermeneutical interpretation of the analyzed material.

4. **Discussion**

When analyzing the foundations of scientific thought in the age of knowledge, there are two fundamental aspects to consider; Crisis of modernity and the epistemological foundations of modern scientific thought; and the emergence of approaches with an emphasis on the integration of knowledge for the search for creative and holistic solutions favorable to the resolution of complex problems. Both aspects are linked to each other.

Indeed, for Bernal (2010), the crisis of modernity is

associated with the evolution of the concept of social science, stimulated by the inability of modern scientific thought to respond to the phenomena of a global, dynamic and complex world. Said evolution is represented in three periods: rationalist (1941 – 1970), humanist (1970 – 2010) and evolutionary (2010 with a projection to 2030); in them it is glimpsed how the scientific community has matured in order to the conception of the social sciences and the research processes in this field [3].

The disputes and opposing ideas between rationalists, humanists and social critics, provided an epistemological framework that served as the basis for consolidating a more realistic ontological vision, that is, inclusive, plural and complementary, which originates the emergence and consideration of epistemological theories and approaches with emphasis in the integration of knowledge for the search for creative and holistic solutions favorable to problem solving. [3, 9]. Among these approaches, concordism, multidisciplinarity, Connectivism, systems and complexity stand out.

Such approaches have generated practical implications linked to the plurality and complementarity of research methods. So that currently, in universities and research centers, there is openness to use a variety of methods to access knowledge [13]. In addition, the complementarity or integration of various methods in research work is a guarantee of scientific rigor. Another of the practical implications originating from the consideration of integrationist epistemological approaches is the synergistic work

(cooperation, collaboration), between researchers, research communities and research centers, who conduct research organized in research plans, programs and projects.

So, scientific thought in the age of knowledge is configured by the need to think about the world from a new paradigm capable of responding to the challenges of the knowledge society linked to globalization, interdependence, uncertainty and relativism. This need stimulates the resignification of the concept of social science, assigning it a holistic character, and the emergence of approaches with an emphasis on the integration of knowledge for the search for creative and holistic solutions favorable to the resolution of complex problems.

5. Conclusion

The scientific thought in the age of knowledge has

originated has originated a set of practical implications in the research processes and methods that currently has the support of the world scientific community, among them, 1. Plurality of methods, 2. Complementarity of methods, 3. Synergistic work (cooperation, collaboration), between researchers, scientific communities and research centers; and, 4. Organization of the investigative work in plans, programs and projects.

Regarding the plurality and complementarity of methods, the integration of qualitative and quantitative research approaches stands out, with their methods, techniques and instruments. It should be noted that this integrating process requires being governed by logic and rationality in order to the nature of the research and its purposes, so that the integration of research methods, techniques and instruments must respond coherently to each specific objective. It demands a rigorous knowledge of the different research approaches by researchers, who must make well-founded decisions for this purpose [3].

Table 3. *Scientific thought in the age of knowledge and practical photographs in research.*

	Approaches	Methods	Techniques	Instruments
Scientific thought in the age of knowledge and practical implications in research.	Plurality of methods or approaches for the construction or production of scientific knowledge. (Bernal, 2010)	Quantitative	Empirical – inductive. Hypothetical – deductive. Synthetic analytic. Historical – comparative. dialectical critic.	Observación Encuesta Entrevista Grupos focales Análisis documental
		Qualitative	Ethnography. Phenomenology, Hermeneutics. grounded theory. Participatory action research. Systematization of experiences.	Check sheet; observation sheet; attitude scale, questionnaire Yarleque et. to the. (2011).
	There is no supremacy of one method or approach over another, but each one has its own strengths and weaknesses, in addition to the trend in current science is the complementarity between them. (Bernal, 2010)			
	None of the research methods (inductive, deductive, inductive-deductive, analytical, synthetic, analytical-synthetic, historical-comparative, qualitative and quantitative) alone has universal validity to satisfactorily solve research problems. (Bernal, 2010)			

Source: own elaboration (2021).

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