

## Ethics of Scientific Research and Artificial Intelligence: Importance and Impact

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**Abstract**---Researchers must possess distinctive qualities that qualify them to produce solid scientific research of cognitive value that contributes to serving society. No one can be considered a successful researcher unless they adhere to the values and standards upon which scientific research is based. Excellence is therefore measured by a researcher's commitment to research ethics and their strict adherence to them. This positively impacts the quality and academic standard of the research process, while simultaneously providing opportunities for excellence and competitiveness. This commitment also contributes to improving the quality of higher education outcomes by preparing qualified graduates capable of meeting the ever-evolving demands of the labor market.

**Keywords**---Research ethics, scientific research, technological development, human development, artificial intelligence.

### INTRODUCTION:

#### Defining Concepts and Terminology

##### 1- Research Ethics:

It is the application of fundamental ethical principles to research work. It encompasses areas such as human and animal testing, various types of academic scandals, including scientific misconduct (such as data falsification and cheating), and reporting violations. The 1964 Declaration of Helsinki is the basis for globally accepted codes of conduct for medicine. The social sciences rely on a set of ethics that differs somewhat from those required by medicine.scientific and academic research is built on trust. It is essential for academic researchers to be confident that the results of any research are accurate, valid, and free from any fraud. Therefore, research ethics play an important role in disseminating accurate information.

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## 2. Technological evolution:

It is a theory that describes the radical transformation of society through technological development. This theory originated with the Czech philosopher Radovan Reža.

Humanity in Transition: A Look at the Distant Past, Present, and Distant Future, by Masefield 1993. Technology (which Richa defines as "a material entity created by the application of mental and physical effort to nature in order to achieve some value") develops in three stages: tools, machines, and automation.

## 3. Human Development:

Human development is the process of expanding the choices available to individuals. It includes three main options: providing a healthy life free from disease, increasing the spread of knowledge, and providing resources that help individuals achieve a decent standard of living. Human development is also defined as the process that aims to increase the quantity and volume of choices available to people by increasing human skills and qualifications.

## 4. Artificial Intelligence:

Artificial intelligence (AI) is the behavior and characteristics of computer programs that enable them to mimic human mental abilities and working patterns. Among the most important of these characteristics is the ability to learn, reason, and react to situations not programmed into the machine. However, this term is controversial due to the lack of a specific definition of intelligence.

Artificial intelligence can also be defined as the intelligence exhibited by machines and programs that mimic human mental abilities and working patterns, such as the ability to learn, reason, and react to situations not programmed into the machine. Through this, computers and programs capable of adopting human behavior can be created.

First, a definition of scientific research.

Scientific research is a method for describing facts using a set of criteria that contribute to the growth of knowledge. It is worth noting that researchers have differed in their approach to defining it, depending on their inclinations. And their scientific convictions, including the following:

Abdul Basit Khader defined it as: "An organized intellectual process carried out by a person called (the researcher) in order to investigate the facts in a specific issue or problem called (the research topic), by following an organized scientific method called (the research method); with the aim of arriving at appropriate solutions for treatment, or at results valid for generalization to similar problems called (the research results)."

Muhammad Enaya defined it as: "The systematic investigation of scientific facts using specific scientific methods and approaches, with the aim of verifying their validity, modifying them, or adding new information to them."

While Fredrick Kerlinger defined it as: "A critical, systematic, and controlled experimental investigation of assumptions that determine the nature of the relationships between the variables of a particular phenomenon."

From the above, we note that there are numerous definitions of the concept of scientific research. However, all of these definitions share several points, as follows:

- Scientific research does not rely on non-scientific methods such as experience. Rather, it follows a systematic approach and method for research.
- Scientific research has the ability to adapt to and thus control the environment under study. It aims to increase and expand human knowledge.
- Scientific research is concerned with testing all the information it obtains, verifying its validity, and experimentally proving it. It is then published and announced.

Scientific research is used in various fields, whether educational, social, economic, professional, or cognitive, as it encompasses all areas of life with their various problems.

Based on the above, scientific research can be defined as a planned, objective process based on a set of steps aimed at investigating a specific phenomenon and identifying the facts and principles necessary to discover solutions to problems in all fields.

## **2/the development of the stages of scientific research:**

Many diverse methods and approaches have been used to gain knowledge. These methods represent steps that represent the stages of scientific research development. The stages can be divided according to the following, taking into account that these stages are interconnected and not separate from each other:

The Chance Stage: This stage was characterized by a lack of interest in investigating the causes of phenomena or problems, as the occurrence of these phenomena and problems was attributed to chance.

The stage of trial and error, relying on experience: This stage is characterized by repeated attempts until a solution is found to the problem faced by any individual, thus gaining the experience that helps them solve simple problems that may arise in their lives. The stage of reliance on authority and tradition

The opinions and ideas of those in power, whether politicians or religious figures, were relied upon regardless of their validity during this period.

The stage of speculation, contemplation, debate, and dialogue: During this stage, researchers were liberated from the power of authority and prevailing traditions. Researchers began to rely on debate, discussion, and logic to arrive at an explanation of phenomena and solve the problems they faced. The most important feature of this stage is the emergence of inductive thinking.

Which arrives at knowledge by moving from partial examples to the final result, and the emergence of analogical reasoning, which relies on moving from premises to arriving at the final result. The stage of the scientific method: The scientific method was initially used to arrive at information in the field of natural sciences, and then its use was expanded to include the humanities and social sciences.

The scientific method is applied by performing a number of steps: formulating hypotheses, collecting data, and conducting experiments with the aim of refuting or supporting the hypotheses based on the results obtained.

## **3/ the objectives of scientific research**

There are many objectives of scientific research, and the following highlights the most prominent of these objectives:

Description: This is one of the most important objectives and is achieved by gathering information about a phenomenon, helping the researcher formulate hypotheses and interpret the phenomenon realistically.

Prediction: This goal is focused on in scientific research; it helps develop visions and predictions of possible future changes to various phenomena, after studying the phenomenon and the conditions that may affect it.

– Explanation: This objective focuses on comprehensively explaining the phenomenon and identifying all the causes that lead to its occurrence. There are two types of research based on this objective: purely interpretive research and applied explanatory research.

– Evaluation: This objective focuses on evaluating any phenomenon being studied.

– Refutation and Implementation: This goal comes after conducting a number of experiments on any phenomenon. The researcher supports the theory and confirms its validity, or may reject it due to proven falsehood.

– Verification: This goal aims to verify the validity of previous research on the same topic or refute its validity by taking several study samples and within an environment different from the one chosen for the study.

– Finding contemporary knowledge: This is an important goal, and it refers to the researcher's pursuit of new information and knowledge that benefits the development and advancement of science.

– Control and regulation: This goal comes after studying and verifying any phenomenon. The researcher utilizes a set of tools that help him control and regulate his study.

## **4/The Importance of Writing Scientific Research**

Research is conducted for one or more of the following reasons:

– Interest in developing and serving society.

- \_ Interest in discovering the unknown and obtaining new information.
- \_ Striving to reach solutions to unsolved issues.
- \_ Submitting the research as a requirement for a doctoral or master's degree.
- \_ Institutions' interest in conducting studies and research that contribute to their expansion and development.

Verifying the results of previous research due to doubts about its outcomes. The researcher feels pleasure when solving problems they or others face, or when they creatively accomplish work that is beneficial to themselves and others.

### **5/Characteristics of Scientific Research**

Scientific research has several characteristics that make it a well-rounded and comprehensive research. The following are the most important of these:

- \_ Depth, analysis, criticism, and presentation of information after answering a number of questions such as: Why?, How?, So what?, and other questions posed during the research process.
- \_ Highlighting the researcher's independence in presenting information, arriving at new insights, and striving to solve research problems. This is achieved by presenting their own ideas in their own language, avoiding literal transmission of information, etc.
- \_ Objectivity: This involves several aspects, including avoiding bias and emotions when presenting ideas, viewing the topic from a neutral perspective, and presenting rational evidence based on rational persuasion.
- \_ Investigation: Scientific research is concerned with studying a problem or phenomenon in all its concepts and aspects comprehensively and accurately. It follows scientific research methods, the most important of which are descriptive, inductive, analytical, and narrative.
- \_ Documentation: The information contained in the research is attributed to its source and reference, with attention paid to diversifying the references used. Accuracy and seriousness.

\_ Explain and define the information being written based on the original references from which it was taken.

- \_ Pay attention to writing and expression styles, the rules followed in academic writing, punctuation, and spelling.

### **6/Types of Scientific Research**

Research can be divided, based on its nature and motivations, into two main types:

- \_ Basic or research research, sometimes called theoretical research.
- \_ Applied research.

It can also be divided into three main types, based on the methods and approaches used:

- Historical research.
- \_ Descriptive research.
- \_ Experimental research.

### **7/Definition of Scientific Research Ethics**

The term "research ethics" refers to the application of ethical rules and codes of professional conduct in the process of collecting, analyzing, reporting, and disseminating information about research topics, particularly when dealing with individuals' rights to privacy, confidentiality, and consent. This is especially true in light of the times when researchers have become arrogant in their approach to research topics, motivated by the pursuit of truth.

These behaviors are the motivation for adopting formal codes of conduct to correct these practices and increase the focus on ethical research procedures and impose them on researchers under the name "research ethics."

## 8/Objectives of Research Ethics

a) Research ethics were established to achieve the following objectives:

- \_ Protecting participants in scientific research, their dignity, their rights, and their interests. Ensuring that research is directed in the right manner that helps achieve the good of all individuals and/or groups and/or civilization as a whole.
- \_ Controlling the progress of research plans and events to ensure their ethical reliability, while also taking into account critical and ethical issues such as risk control, privacy protection, and others.

### b) Research Ethics

Research ethics and principles guide researcher behavior and educate and monitor scientists conducting research to ensure a high ethical standard. The most important ethical principles are:

**Honesty:** Honesty means that researchers must be truthful and report data, results, methods, procedures, and publication status honestly, without fabricating, falsifying, or distorting data.

**Objectivity:** Objectivity means that researchers must avoid bias during experimental design, data analysis, data interpretation, peer review, research team decisions, grant writing, expert testimony, and other aspects.

- **Integrity:** It is important for researchers to have integrity to keep their promises and agreements and act honestly.

**Respect for Intellectual Property:** Permission must be obtained from their owners before using data, methods, or results before publishing them in scientific research to attribute credit to them and preserve patents, copyrights, and all intellectual property rights.

**Confidentiality:** Research ethics requires maintaining the confidentiality of private information such as papers or grants submitted for publication, personnel records, trade or military secrets, and patient records.

\_ **Responsible Publication:** Publication must be conducted responsibly, sparingly, and in a measured manner to promote research and scholarship, not just to further one's career.

**Responsible Mentoring:** It is important to help educate, guide, and mentor students to benefit them and allow them to make their own decisions.

\_ **Respect for Colleagues:** It is necessary to respect and treat fellow participants fairly.

\_ **Social Responsibility:** The goals of scientific research include promoting social good and preventing or mitigating social harm through public education and advocacy.

**Non-Discrimination:** Avoiding discrimination against colleagues or students on the basis of gender or race, and relying on academic competence and integrity as a measure of excellence.

**Competence:** Professional competence and expertise must be maintained and developed through lifelong learning.

**Legality:** Knowing and adhering to institutional laws and policies related to the research topic.

\_ **Animal Care:** Research ethics prohibit unnecessary experiments on animals and require respect and care for animals used in research.

\_ **Human Subject Protection:** In scientific research on humans, researchers must minimize harm and risks, benefit subjects, and respect human dignity, privacy, and independence.

## What are fieldwork ethics?

A) Definition

Fieldwork is the process by which researchers observe and collect information on the ground, interacting directly with individuals in the community being studied. This enables the researcher to gather everything related to the lives and ways of life of individuals. Through fieldwork, the researcher can also examine the extent to which the scientific theory used in the study matches real life.

b) Fieldwork Ethics

Fieldwork ethics encompass multiple aspects, some of which are specific to the researcher and some of which are specific to the research. They can be summarized as follows:

\_ Refraining from abusive behavior.

\_ Honesty and openness between the researcher and the respondents regarding the research topic.

- \_ Obtaining permission and approval from the respondents and the responsible authorities before commencing fieldwork.

The ability to satisfy all stakeholders, such as the research agency and the community being studied.

- \_ The researcher's commitment to making the results available to all.
- \_ Protecting the records of the research subjects.
- \_ Establishing healthy and ethical professional relationships.
- \_ Conducting themselves professionally during work and adopting a neutral stance regarding the views of the research subjects.

The researcher should introduce themselves appropriately to the community being studied, and clarify their role by providing an identification card that identifies their role as a researcher.

- \_ Taking into account the researcher's safety and avoiding any risks that may cause harm.
- \_ Carefully selecting a research topic that is appropriate to the community being studied.
- \_ The researcher should maintain confidentiality when it comes to sensitive and private matters.

The researcher must be honest with himself regarding his goal in conducting fieldwork, and that there should be no hidden personal reasons.

### **The Importance of Fieldwork Ethics**

Having established and agreed-upon fieldwork ethics is important for all parties involved in the research. The following are the most important aspects of fieldwork:

Protecting the rights of all parties and their personal and professional safety, and avoiding risks to which the researcher or individuals participating in the field may be exposed.

All parties are committed to adhering to these ethics at every stage of the process, ensuring that the research is authentic, honest, and free from deception.

- \_ The possibility of holding accountable anyone who makes a mistake, as there is a reference basis, and more importantly, the confidence it gives to the final work, due to the researcher's commitment to fieldwork ethics.

### **Examples of Social Fieldwork**

Fieldwork is suitable for both the social sciences, such as anthropology, history, and economics, which focus on people and their lives from a cultural and social perspective, and the natural sciences, such as biology and chemistry, where the researcher focuses on the sensory and material aspects of human life and the environment.

One of the most important examples of social fieldwork is what anthropologists do through what is called ethnography. The researcher resides in the studied location for a period of time, studying the lives, customs, and behaviors of individuals to gain a deep understanding of those societies. During this process, the researcher records his observations of the activities and actions he observes, enabling him to formulate a clear understanding of those societies.

#### **Approaches to Artificial Intelligence**

There is no unified theory or model guiding AI research, as researchers disagree on many issues. One of the most long-standing unanswered questions is: Should AI mimic natural intelligence by studying psychology or neuroscience?

Or is human biology as irrelevant to AI research as avian biology is to aeronautical engineering? Can intelligent behavior be described using simple, elegant principles (such as logic or optimization)?

Or does it necessarily require solving a large number of unrelated problems? Can intelligence be reproduced using high-level symbols, such as words and ideas? Or does it require "semi-symbolic" processing?

## Cybernetics and brain simulation



The human mind provides inspiration for AI researchers, but there is no consensus on the acceptable extent of such simulation.

In the 1940s and 1950s, a number of researchers explored the relationship between neuroscience, information theory, and cybernetics. Some built machines that used electronic networks to display primitive intelligence, such as W. Gray Walter's turtles and the Johns Hopkins monster. Many of these researchers gathered to attend meetings of the Teleological Society at Princeton University and the Relativity Club in England.

By 1960, this approach had become largely abandoned, although some elements of it were revived in the 1980s.

### Traditional Symbolic Artificial Intelligence

With the advent of digital computers in the mid-1950s, AI research began exploring the possibility of reducing human intelligence to the manipulation of symbols. The research centered on three institutions: CMU, Stanford, and MIT, each of which developed its own research methodology.

John Haugeland calls these approaches to AI "good old-fashioned AI" or "GOFAI."

### Knowledge Simulation.

Economists Herbert Simon and Alan Newell studied human skills and attempted to formalize them. Their work laid the foundation for the science of artificial intelligence, as well as cognitive science, operations research, and management science. Their research team conducted psychological experiments to demonstrate the similarities between human problem-solving skills and the skills of the programs they designed (such as the "general problem solver").

Based at Carnegie Mellon University, it eventually led to the development of the Soar construct (a symbolic cognitive construct) in the mid-1980s.

### Logical Artificial Intelligence

Unlike Noel and Simon, John McCarthy argued that machines don't need to mimic human thought, but rather try to find the essence of abstract logic and solve problems, regardless of whether people are using the same algorithms. He said that the Stanford lab, which focuses on using logic to solve a wide range of problems,

Including knowledge representation, automated planning and scheduling, machine learning logic has also been a focus of work at the University of Edinburgh and elsewhere in Europe that has led to the development of the programming language Prolog and the science of logic programming.

"Non-uniform" symbolic AI

Researchers at MIT (such as Marvin Minsky and Seymour Papert) found that solving difficult problems in vision and natural language processing requires special solutions—and they argued that no simple, general principle (such as logic) can encompass all aspects of intelligent behavior.

Roger Schank described their "anti-logical" approaches as "irregular" (in contrast to the "regular" models at Carnegie Mellon and Stanford). Logical knowledge bases (such as Doug Lenat's Cyc project) are an example of "irregular" AI because they must be designed manually, one complex concept at a time.

#### Knowledge-Based Artificial Intelligence

When large-memory computers became available around 1970, researchers from all three traditions began to build knowledge into AI applications. This "knowledge revolution" led to the development and deployment of expert systems (introduced by Edward Feigenbaum) Also driving the knowledge revolution was the realization that vast amounts of knowledge would be required for many simple applications of AI., the first truly successful form of AI software.

#### Computational Intelligence

Interest in neural networks and "connectivity" was revived by David Rumelhart and others in the mid-1980s. These approaches, along with other semi-symbolic approaches such as fuzzy systems and evolutionary computation, are now studied collectively in the emerging field of computational intelligence.

#### Statistical Artificial Intelligence

In the 1990s, AI researchers developed complex mathematical tools to solve specific subproblems. These tools are truly scientific, meaning their results can be both measured and verified, and they have been responsible for many of the recent successes of AI research. This common mathematical language also allows for a high level of collaboration with other fields (such as mathematics, economics, or operations research). Russell Stewart and Peter Norvig have described this movement as nothing less than a "revolution" and a "triumph for the systematics."

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