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## Philosophical paradigms in information technology research

Geoffrey Mwamba Nyabuto \* and Franklin Wabwoba

*Information Technology, Kibabii University, P.O. Box 1699—50200, Bungoma.*

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### Abstract

Having been in existence for nearly 30 years, information technology has revolutionized how human beings carry out their day-to-day life. Its use and adoption have brought about many philosophical issues that need to be reviewed. There are ethical issues concerned with the use of information technology ranging from fake news, autonomous systems, biasedness in AI systems and data privacy among others. As research is being carried out to answer some of these concerns, it will be important to look at the core building blocks of a paradigm and some of the research paradigms that can be used in this field.

This paper introduces the field of information technology, where its definition and notable contributions are highlighted. Then it goes on to do a review of existing research paradigms with an emphasis on key components of a research paradigm and the types of research paradigms. Lastly, the paper reviews philosophical issues that exist within information technology with an emphasis on ethical issues. With an understanding of this, it will be easier for researchers in this field to choose a paradigm within the area of information technology that best suits their research.

**Keywords:** Information Technology; Artificial Intelligence; Paradigm; Positivist; Subjectivist; Ethics; Information Technology Research

### 1. Introduction

Information Technology has been one of the key technologies revolutionizing how things are done in modern societies. It is one of the youngest subfields of computing that evolved in the 90s from earlier fields of computer science and artificial intelligence. This being a relatively young field and with its nature of interaction with society and humans, there has been a lot of interest in trying to understand its philosophical implications, research paradigms and ethical issues. Information technology is an applied science interfacing between technology and humans hence finding the best research paradigms to use is very important and key to understanding underlying philosophical concepts.

This discipline evolved from computer science and whereas computer science is concerned with the development, analysis and use of algorithms, Information technology is more of an applied field since it deals with all aspects related to the storage and use of information using computing devices. Since this information is collected and used in the context of humans and society, it will be important for this paper to review some of the existing research paradigms, outline their advantages and disadvantages and recommend the paradigm that could best be used in this field.

### 2. Research Paradigms

Paradigm simply means the way of thinking. In the educational setup, we define the research paradigm as the worldview of the researcher (Kumatongo & Muzata, 2021). It defines the researcher's views of the world, perspective, school of thought, and shared beliefs that shape the interpretation of research data (Mackenzie & Knipe, 2006). This is important

\* Corresponding author: Geoffrey Mwamba Nyabuto.

as it helps other researchers have the “same view” and be able to understand the context under which the research was carried out. The research paradigm shows a reflection of the researcher views the world he/she lives in, interprets, and behaves in this world. By worldview, we are taking into consideration the researcher’s abstract beliefs and thoughts about how the world is. This of course will shape how the researcher will conduct his/her research, how data will be collected, analyzed and even results interpreted. The research methodology and methods will solely depend on the paradigm the researcher uses i.e., the lenses through which the researcher sees the world.

Research paradigms are important as they outline the researcher’s beliefs and view of the world as well. It dictates which paradigms should be used, hence what should be studied, how it should be studied, and how results should be analyzed and interpreted. In research, the paradigm is key as using a different paradigm may lead to different approaches being used and different results being found and given a different interpretation. The paradigm outlines the researcher’s philosophical orientation and all the other processes including methodology and methods used. Since the analysis of data solely depends on the paradigm that was adopted, results from such data will also depend on the researcher’s view for better and correct interpretation.

Key components of a research paradigm include ontology, epistemology, methodology, methods, and axiology. Ontology is one’s view of reality and epistemology is one’s view of what constitutes knowledge and how it can be gained. These elements will be discussed in detail in the follow-up section.

## **2.1. Elements of Research Paradigm**

### *2.1.1. Ontology of a Research Paradigm*

Ontology can be defined as a branch of philosophy that deals with claims and assumptions made about nature, what exists and how it exists (Chomczyński, 2011). It studies the existence or reality of something being or becoming. It outlines base categories of being and their relationships. Ontology examines your beliefs and assumptions as a researcher of what exists, and how it exists. It is concerned with the assumptions we make to believe that something is real or makes sense (Kivunja & Kuyini, 2017).

It helps create a conceptual view of what and how reality is and what makes what as a researcher you do believe can be known. These philosophical assumptions of what constitutes reality are important as they dictate how one can make sense of the data collected. This is possible through the different methods used for data collection and analysis. Ontology will ensure researchers understand what kind of data they need as they undertake their research, and how that data will be collected as well as used. This is better defined in the methodology and methods used.

Ontology is very important when choosing a research paradigm as it helps determine what a researcher considers real, assumptions made when trying to understand what is real, and what can be known in the world. It makes researchers ask themselves questions like, is there reality in the world? What exists? Does reality exist or is it human cognition? With ontology, as a researcher, you can examine underlying philosophical assumptions and beliefs you have or take as you do your research. These assumptions are very important as they dictate how we can make sense of data we collect during research and how it will be analyzed and interpreted to make meaning out of it.

### *2.1.2. Epistemology of a Research Paradigm*

Epistemology is derived from the word episteme meaning knowledge. In philosophy, Epistemology is a branch of philosophy that deals with knowledge. It is concerned with what is knowledge, how people learn or know something and how we know that something is true or real (Cooksey & McDonald, 2019). Epistemology is concerned with the basis of knowledge in dimensions like what constitutes it, how we form and get to know about anything in the world as well as how we can pass this information among humans in the world.

As a researcher, it is important to take into consideration what will constitute knowledge in your study, how you expect knowledge to be acquired and at the same time make it known to others. Do you expect people to have personal experiences for us to agree that they have knowledge of the subject matter, or can it be acquired from other sources? What is known about knowledge and possibly the relationship between what is known and what is to be known? How do you as a researcher relate with what is known, from what perspective are you looking at what is known? Is it the same view as the researcher or knower? Such questions are very important as they place a researcher in a position to relate what the research is doing, and what is new and be able to compare it with what is already known. Epistemology is important as it helps the researcher pin the trust or truth we have in data. It gives us a clear path on how we go about uncovering data and facts or views in the social world.

### *2.1.3. Methodology of a Research Paradigm*

Methodology refers to how the research is designed, the methods used as well as the approach and steps used to investigate or find out something. It describes how data will be collected and analyzed to come up with a conclusion (Al-Ababneh, 2020). Instruments used for data collection, and selection of research participants are other aspects that the research methodology covers. Methodology in research will define the systematic path or process research takes for it to come up with meaningful conclusions.

The research methodology outlines all assumptions made in the research, the limits of the research and any mitigation step the research takes. It is through research methodology that we get to know or gain knowledge. It helps answer questions like how one goes about acquiring or gathering data and any other understanding that is relevant to the research and this, of course, will help answer research questions that go a long way in ensuring knowledge has been gained.

## **2.2. Methods of a Research Paradigm**

Methods are the exact steps or procedures taken to collect and analyze data. The essence of any research project is to identify knowledge gaps, collect, and analyze data for it to come up with a meaningful conclusion. It is through methods that the researcher gets to clearly outline how he/she will go about data collection and analysis to draw meaningful conclusions and be able to contribute to the knowledge realm (Sharma, 2018). Data collected in any research project can either be qualitative, quantitative, or both/mixed and can be used in all research paradigms. It is the researcher who decides which method they intend to use in their research.

Research methods can always be traced back to methodological, epistemological, and ontological positions. It is not possible for any research not to align with an epistemological and ontological position. These positions dictate the methods that will be used to collect and analyze data. The researcher's ontological and epistemological positions will dictate the methodology and methods adopted for their research. Different researchers will use different ontological and epistemological approaches leading to different methods being adopted.

In the quantitative research method, the researcher will collect numerical data that can be summarized using statistical methods to quantify opinions, views and thoughts about a given thing (Sharma, 2018). The findings of such research can be used to come up with a conclusion that can be generalized for the entire population. Qualitative research methods use a non-numerical approach to gain insights into any problem. This method is used to gain an understanding of the underlying reasons, views and motivations and sometimes acts as a basis for setting up quantitative research. This method used approaches like observations, focused group discussions, interviews, and case studies to collect data from participants. The third method is mixed research which involves using and integrating both qualitative and quantitative research methods to come up with a meaningful conclusion. This method is usually adopted in situations where either of the two methods is unable to give a full understanding of the problem under investigation.

### *2.2.1. Axiology*

Axiology looks at the judgement of values in research (Chopra, 2005). For every research, it is important to consider all ethical aspects. It is worthwhile to consider defining, understanding, and evaluating what is right and wrong behavior in research. Axiology considers the values we are attaching to the different research entities like participants, data itself and the intended audience or users of this data. In every research aspect, it is important to consider the human aspect and how our research and their findings will affect them. It is important for research to outline its methodologies and methods and their ethical aspects. Any research that does not take care of all or most ethical issues will not be well accepted, and their finding may not be well utilized.

As a researcher, you must consider the values and morals that you will be guided by as you carry out your research. It is important as well for the researcher to outline what he/she will do to ensure all participants involved in research are ethically protected. It is true that as humans we have our rights and any form of research being carried out that involves humans as participants must take into consideration the rights of these participants and clearly outline how they will be protected. It must outline how it intends to uphold their rights as well as measures the research has taken to ensure participants' rights are well taken care of. Moral, cultural, and intercultural issues bound to occur or be encountered must be spelt out and methods/ways to address them as well outlined. Ways of minimizing any risk must be outlined as well.

The field of information technology deals with data. This data includes personally identifiable data that must be handled with a lot of care. Research around medical, financial, and personal data is very sensitive information that researchers

must have a clear understanding and outline of how it must be collected securely, de-identified, stored and retrieved regarding data privacy. This is why a researcher in this field needs to take into consideration all aspects of ethics.

### **2.3. Types of Research Paradigms**

#### *2.3.1. Scientific Research Paradigm*

This paradigm is also called the positivism paradigm and it is constructed based on empiricism (Ryan, 2018). According to this paradigm, the purpose of research is to prove or disapprove of a hypothesis. In the positivist paradigm, a lot of emphases is put on the scientific methodology used to carry out research, the use of statistical data analysis techniques and final generalizable findings (Alharahsheh & Pius, 2020). This paradigm is built on the basis that reality can be observed, and knowledge is based on the sense of experience, and this can be advanced through observation. The scientific paradigm of research aims at coming up with a generally agreeable conclusion that can be set as a way of doing things. As with this paradigm, the scientist or researcher is the observer of the objective reality.

According to positivism, there is only one single truth about anything in the world and knowledge is always independent of the researcher since things are given an objective view (Park et al., 2019). Some of the ontological assumptions made in this research paradigm include reality being external to the researcher or scientist and truth about anything in the world being presented as an object that is independent of the researcher or observer. World objects have a meaning that is independent of any consciousness of the objects. Epistemologically, the truth can be attained because knowledge rests within undisputed truth from where beliefs are deduced.

Research in the positivism paradigm relies on logic, formulation, and testing of the hypothesis by developing mathematical equations, statistically analyzing data and being able to make conclusions. This paradigm aims to come up with a generalizable conclusion by providing explanations and prediction models to provide measurable outcomes. Research carried out through this paradigm can be reproduced through the same methodology and they do not hold personal accounts of how they are done.

Research around natural science uses this paradigm and results obtained from such a research project should be applicable in other situations. This ideally means that positivist researchers should be able to observe occurrences in one area and be able to generalize the same to other related areas. Due to this approach, positivist researchers usually advocate for the use of quantitative research methods to collect and analyze data to come up with conclusions. Knowledge gained by positivists is said to be objective with an experimental methodology, and naive realism as the ontology. In objective epistemology, the view is that knowledge is gained through reason. Research helps us discover or know things we did not know previously, hence gaining knowledge. The assumption is knowledge gained through this paradigm is nearly real in our area of research. This research paradigm is used in the natural world and the same approach cannot be used to investigate the social world as it is not value-free. This has led to the relaxation of the positivism paradigm and the introduction of a near positivism paradigm called the post-positivism paradigm that implies reality is not perfect and the truth is not absolute. This paradigm allows the making of observations without necessarily undertaking any experimentation. Post-positivism stipulates that reality can never be fully understood but just makes approximations to a near-real thing.

#### *2.3.2. Interpretivism Paradigm*

The interpretivism paradigm was a reactionary development to the positivism paradigm. It was developed as an anti-positivism paradigm. This paradigm is based on an individual's ability to construct meaning from anything hence the name constructionism paradigm (Pervin & Mokhtar, International Journal of Academic Research in Progressive Education and Development, 2022). In this paradigm, reality is relative i.e., it is difficult to separate reality from the participant as it is subjective. This paradigm was influenced by phenomenology and hermeneutics. In phenomenology, there is a greater emphasis to consider people's subjective interpretation of things, their different perceptions of the world and how they see it (Qutoshi, 2018). According to this paradigm, reality is not objective but subjective i.e., socially constructed. It will be important for researchers to understand and appreciate the subjectiveness of how each person views the world. This paradigm assumes that social reality is seen differently by different people, and each gives it a different perception and interpretation.

This paradigm's approach is that research cannot be objectively observed from the outside world. It must take into consideration people's view of it from the inside. Generalization of research findings obtained in positivism is not possible since the individual's view of the world is taken into consideration. This paradigm is used in social sciences research that involves the human perception of the world. The research methodology used in interpretivism usually takes a different approach as compared to the positivism paradigm. Since the subjectiveness of the world from a

personal view is very important, this paradigm uses qualitative methods to gather the research's subjective view of the world (Pervin & Mokhtar, International Journal of Academic Research in Progressive Education and Development, 2022).

With the interpretivism paradigm, researchers tend to understand world phenomena rather than explain them (Kivunja & Kuyini, 2017). Researchers here will try to understand and explain things as viewed from the participant's perspective. The ontological view as with this paradigm is to construct reality indirectly through an individual's view and interpretation of the world and their reality is always subjective. Because of its subjectiveness, people will tend to interpret things differently as they view them hence making different meanings out of them. This means that there are different distinct views of the same thing, and all this depends on the participant's view and interpretation. It is not possible to have a globally agreeable way of viewing or doing things in this paradigm as there is subjectiveness in how each participant views things. This makes generalization impossible.

The building blocks of natural science are generalizations which are not possible in this paradigm. This essentially means that we cannot employ this methodology to research areas of natural science. Humans are the building blocks of the social world. The individual subjective view is very key in trying to understand the social world. This means that this paradigm works well in researching social sciences as opposed to natural sciences.

Research findings from this paradigm are hard to verify as it leaves off the scientific process of verification. This means that research findings carried out using this paradigm cannot be used in another setup since everything is dependent on the respondents. Extension of knowledge is made possible through the generalization of theories and findings as research findings from such can be applied in other areas. This has made many positivists question the essence or value added by interpretivism research. Research findings from interpretivism are contextualized, and the data collected is usually qualitative. This ties data to the participant as each element of data collected is based on the participant's understanding and view of the same.

Interpretivism, just like positivism, does not appreciate the value politics play in shaping knowledge and social realities. In this paradigm, researchers will interact and associate with participants to get all the information they need. It is generally agreeable that research carried through this paradigm has multiple realities from an individual's perspective and is socially constructed. It is also important to take into consideration the value of the context in any research as per this paradigm. The context will shape the finding and interpretation of this research finding taking into consideration the individual's view.

Since research using this paradigm depends on the participants, it is difficult to share the outcomes taking into consideration data privacy. This is because the interpretation of each element collected using this methodology purely depends on the participant. This raises the ethical question of whether sensitive information is being collected and analyzed securely and with the required privacy.

### *2.3.3. Critical Paradigm*

This paradigm centers its research on issues touching on social justice. It is also called the transformative paradigm due to its nature of trying to change the social justice system for the better through the political landscape. In this paper, we will not discuss much on this research paradigm since information technology does not carry out much of its research on the areas of interest to the paradigm.

## **2.4. Philosophical Paradigms in Information Technology**

### *2.4.1. Information Technology*

The field of information technology (IT) is solely concerned with the storage, retrieval, analysis, and presentation of information using computational devices (Mitcham, 2009). Since the invention of computer, the world has witnessed a lot of innovations brought by computers. Information technology is a field that arose in the 90s from the earlier computing field of computer science and artificial intelligence. With the great and more adoption of IT, there have been several philosophical concerns raised by researchers that should be researched and addressed. Since this field interface with natural and social sciences, i.e., it makes use of scientific tools like computers and its application, the use of information is in the social world, it will be key for us to outline key research paradigms that should be used in this field.

#### 2.4.2. Philosophical Issues in Information Technology

Several issues in IT need to be researched. They include computing systems, artificial intelligence (AI), and ethical issues surrounding information and data security among others. For this paper, we will review some of the ethical issues in artificial intelligence and their proposed research paradigms.

Artificial Intelligence is the ability of a digital computer to perform tasks commonly associated with intelligence (Cycleback, 2018). This field tries to build computing systems that can think, reason, and just make conscious decisions just like human beings. The concept of intelligent machines came into being with Allan Turing in his famous game theory where he simulated a game in which computers were to trick a human being to the extent of being unable to distinguish who is a human and who is a machine (Turing, 1950). With more and more advancements in computing and processing powers, several innovations and developments have come into play and the application of artificial intelligence has spanned to all areas of life than earlier thought.

Artificial Intelligence poses several ethical issues to the social world. Data privacy has always been a concern in the field of information technology as computing devices capture personally identifiable data, several questions arise on what and how best it can be done to ensure and guarantee the security of such data. Others include safety and use of robotics in human space and who bears the responsibility should something go wrong with robots.

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### 3. Ethical Issues in Information Technology

Given the interfacing nature of information technology and society, several ethical issues should be taken into consideration as researchers try to answer questions. Below are some of the philosophical concerns in the field of information technology.

#### 3.1. Information Privacy

Ethical issues in this section are with privacy and security of personally identifiable information. Millions of personally identifiable data are being collected daily whose storage, access, retrieval, and use are of great concern to researchers and philosophers. In privacy, we look at several aspects including one's ability to control his/her information, what should be collected of him/her, how this information is stored and retrieved, the secrecy of this information and the controls an individual has over his/her information. Sometimes the speed with which technology is evolving has always outdone the pace with which regulations are made. This to some extent has exposed individuals and left them for exploitation by government or private agencies (Romansky, 2014). For example, in Kenya, mobile lending applications can access an individual's phone contact list and send disturbing messages to all their contacts in case the individual fails to repay the loan as agreed (Bhalla, 2022). This is just one of the instances of how exploiters have been able to misuse and abuse personal data collected from individuals.

The digital sphere is ever-increasing, and more data is being electronically collected and stored either locally or in the cloud. Social media is collecting a lot of data every second and with advancements in AI, more sophisticated tools are being developed and used to help in data collection and analysis. Privacy of this data on the internet sometimes cannot be guaranteed as such AI-developed surveillance systems can illegally access, analyze and use this information for security, marketing, and promotional services among other uses. This raises very important ethical questions about what can be done to guarantee the security of this data.

In this digital era of big data, it is increasingly becoming difficult to control who collects which data and who uses it (Klein, 2022). AI has further fueled it making it nearly impossible to have enough control mechanisms for the same. AI has led to advancements including the use of biometrics like face recognition to identify individuals. This has made it easier for entities and governments to profile and search for people. One unique thing about biomarkers is their permanency state i.e., a person's biomarkers are permanent unless and otherwise. Now the key ethical question asked of organizations collecting such information is the concern of data privacy. What happens if for one reason this information is hacked, how will we be able to properly do validation and block the hackers in future from using these biomarkers to identify themselves given their permanent nature? This presses and emphasizes the importance of ensuring security of all personal information collected from individuals. All the processes involved in information management i.e., collection, storage, retrieval, and use of such information should put hacker-proof mechanisms to guarantee privacy (Cooper & Yon, 2019).

As they call it, data is the new oil. Many times, individuals are dubbed into getting free services and they end up sharing their personal raw information that is sometimes used in unintended ways by the sites collecting this information. Social media and other sites like Facebook, Google, and Amazon provide "free" services to their customers but in turn, collect

a lot of raw data from them. A lot of this information is further processed and either sold to other companies or used by the same companies to do profiling by revealing our psychological behaviors or better product recommendations and marketing through the customization of ads (Crocco et al., 2020).

Robotics through the application of AI has been able to automate several tasks, among them surveillance. With more adoption of IT through the Internet of Things, we are witnessing new emerging issues like smart systems, which include smart homes, and smart cities, among others which are more controlled by robotics and IT infrastructure. These devices do collect a lot of personal data whose privacy should be guaranteed. For example, your TV could be collecting what you like watching and use this to sell adverts to you. As well these devices could be monitoring your life patterns like the time you arrive home and the kind of food you eat at every time and use this information for other purposes that you may not be aware of.

The formation of legal data protection frameworks by different countries is one key milestone in ensuring personal data is protected and individuals have control over their data. As at end of 2021, 71% of the countries worldwide have already developed and put in place legislation to support data protection whereas 9% have draft legislation and 15% have data but do not have any legislation (Data Protection and Privacy Legislation Worldwide, 2021). Some of the data protection legislation by countries are as below; in Argentina, the legislation is clear that the individual from whom this personal data is collected must give consent for any entity to collect the information. The same sentiments are echoed by France where authority and control is given to the subject from whom data is being collected. In addition, the processing of this data must be done fairly, within the law and only for the legitimate intended purpose (Snook, 2023). The European Union has developed and enhanced its general data protection and regulations policies and often updates to ensure that they are able to deal with emerging issues regarding personal data protection (Dijk et al., 2021).

Using the set frameworks, in case of any breach, legal entities like courts should be able to find responsible entities or persons guilty, prove and hold them accountable and take legal actions against them. This must be set clearly within the legal framework. It is quite a challenge to enforce this, but it is important. With the Internet, it is possible for someone to commit a crime in places far from his/her physical presence. As countries come up with data protection frameworks and legal actions for anyone breaching them, it is important to consider such instances and address them within the legal frameworks. This calls for political goodwill and a call for countries to come together to fight such crimes.

### 3.2. Opacity of AI systems

AI systems built with machine learning can make key decisions that impact human life. For example, an AI system can be used to decide if a given user account is likely to violate some terms and conditions, hence the account is either restricted or blocked. Another example is using the prediction tool machine learning and AI to decide what kind of adverts or promotions are shown to some users. You are likely to miss or see some adverts that are solely decided by these systems.

Systems are said to be opaque if their internal implementation cannot be easily revealed (Rubin, 2020). Many organizations that develop AI systems do not or are not ready to reveal the algorithm that powers these systems. Some fear copying and reproducing such commercial tools or hackers being able to capitalize on system weaknesses and hack them. Some of these algorithms are proprietary hence they are not free to the public. In some cases, the development of these AI systems lacks active engagement with end users during development. People use such systems without knowing the algorithms they are running on. This sometimes can be brought about by the lack of technical skills for one to evaluate how the algorithm was designed and how it works and be able to interrogate if it conforms to the ethical issues that may arise. AI systems are majorly relying on machine learning models to learn hidden patterns from the data and able to make conclusions based on this data. Sometimes the models can come up with a wrong pattern that may not work or give correct responses.

Decisions made by AI models are dynamic as more data keeps on triggering in, it is possible for the system to negate an earlier made decision once more data is provided and the model re-evaluated. This means the models are opaque as their exact internal working and decision making is based on data. The quality of decisions made by such systems is purely dependent on the quality of data provided. If incomplete data is provided, then the model will end up drawing “wrong” patterns from the data hence being unable to make correct decisions.

Proposals by many researchers are to have these systems be “open” and explainable such that even someone who does not understand well computing can know how exactly the algorithms work and arrive at the desired output (Floridi et al., 2018). As there is a continued push to have explicable AI systems, some researchers have noted that this in the long run may hinder further development and prevent us from reaping the benefits of AI systems at the expense of their

explicability. Explainable ML algorithms are important in some fields like medicine and judicial systems among others since it will be important for people to know the exact considerations used by such models to make decisions (Joh, 2017). However, in some situations, the value derived by using the algorithm will out way the importance of the explicability of the very algorithm. other decisions, for example, an AI algorithm used to detect fraudulent transactions.

### 3.3. Autonomous Systems

Autonomous systems such as self-driving vehicles and weapons can undertake several mission-critical operations without human intervention (Bahadori et al., 2005). Researchers have mixed views on the deployment and use of such systems. Some think their use will minimize losses of human life, especially for the ones used in weapons whereas others think their use may end up endangering the human species. Since these are programmable systems that are prone to hacking, it is important for the developers to embed some ethical considerations in such systems so that as they make their decisions, they have an ethical perspective. Such systems, if hacked and misused, may cause massive destruction.

On the other hand, there are several emerging issues on who should take responsibility in case of any failure of these systems. The systems have many players in their development, deployment and use, and the worry is in case of any failure for example if a self-driving car fails to correctly identify an object or person before it and even rams into it, the big question researchers are asking themselves is who should take responsibility? Is it the person who developed the algorithm, the one who tested the algorithm or the one who deployed the algorithm? How can these systems be made intelligent with ethical consideration factored into their development? If a self-driving car is carrying 5 passengers and suddenly an object(person) is detected in front, what kind of judgement will it make? Will it consider the safety of the 5 passengers on board or the one person in front of it? How will it be able to make the right judgment? If the system is confronted with a situation where braking is necessary, how will it know the correct amount of braking that should be applied to ensure the safety of both passengers and other persons (Keeling, 2020)? How can autonomous weapons like drones in rescue missions be able to detect civilians from targets? Is it true that such an AI-powered system may end up harming innocent civilians at the expense of the targeted persons (Klincewicz, 2015)?

From the above examples, autonomous systems should be equipped with some ethical setups that can help them make correct decisions while reducing any form of risk to human life involved. Previously, there have been cases where autonomous systems have failed due to unanticipated reasons and their effect has been fatal. This is why it is important for researchers to develop a way forward on how such a situation should ideally be handled in case it arises and what ought to be done to block it from happening. Generally, there has been a recommendation to have autonomous systems that have an ethical perspective in any form of decisions they make where human life is involved.

In conclusion, in any place where robotics or autonomous systems are being deployed, it is important to have a very strong ethical view of this before any deployment. Participation of humans during the process of development of these autonomous systems is very important and failure of these systems has far-reaching negative consequences in human life i.e., death.

### 3.4. Fake News

Fake news constitutes misinformation and disinformation. Misinformation refers to the spreading of false or inaccurate information whereas disinformation is deliberate misinformation with malicious intentions. With the advent of the Internet and its penetration, we are seeing more use of digital systems to pass information as opposed to the traditional manual way of relaying the same. In modern times, social media has been the main source of news. Facebook, Twitter, and other social sites constitute a bigger percentage of digital sources from which many people receive information (Newman et al., 2021). Sometimes it is very difficult to differentiate fake and true news in social media. Some fake news appears to be very true than even true information. This means that the Internet and information technologies have been used as better tools for spreading fake news that has far-reaching effects (Baptista & Gradim, 2020).

The spreading of fake news is done for diverse reasons and motivations. Some users share fake news without necessarily knowing that what they are sharing is fake whereas others do so for either monetary gains, sympathy, gain political mileage or many other reasons (Pinto et al., 2020). There are several ethical issues that surround this topic of social media and fake news. Nowadays even respectable institutions have gotten themselves spreading fake news without knowing. It is now becoming very hard to believe a lot of information that is distributed through social media networks because of this. Researchers are asking themselves tough questions like how social media can be regulated to filter out fake news while giving its users their basic freedom of speech. What constitutes fake news and how best can users be able to confirm if something is true or fake especially those not so well conversant with social media? What legal actions can be carried out against the people who generate and share fake news? Who bears the responsibility for



this fake news? Can we trace back to the originator of this fake news and try to establish the intentions behind the actions?

### 3.5. AI-Based Biases

AI systems use data to make decisions. This ideally means that the systems make decisions purely based on the data that has already been collected. If this data is biased, then the systems are likely to make biased decisions. For example, building an AI-based system to support a company in the hiring process may even lead to further bias if the company was previously hiring more people of a given sex, race, ethnicity, or age group. This is possible because data from such a company is already biased hence the algorithm developed will be fed with biased information and this will lead to further biasedness. It will be difficult to break from the norms if AI-based systems will be used to make decisions.

It is important when building such systems to bear in mind this aspect of biasedness and be able to build systems that do not have any form of bias. It could be difficult for this to be done since AI systems rely on mathematical models which are difficult to build fairness into (Selbst et al., 2019).

### 3.6. Automation and its effects on Employment

For quite a long time, there has been an effort to reduce the cost of production while maximizing outputs. In the industrial revolution era, this was achieved through the mechanization of many activities that humans were doing and now in the current era, this is being done through the automation of services offered by humans. What this means is that fewer and fewer people will be required to do what is currently being done by humans. Advancements in AI have led to the development of sophisticated systems and robots with human-like intelligence, and they can do what humans are doing and sometimes do it efficiently and faster (Acemoglu & Restrepo, 2018).

AI will disrupt the labor market in several ways including rendering many people unemployed and as well as introducing a new face of machine-human interaction, especially in the workplace. Some of the questions researchers are asking themselves include what next after all this? What will be the value of humans if machines can think and make rational decisions just like them in the workplace? What is the impact of the deployment of these AI machines on the environment? Are waste products from these AI-based machines recyclable? What will be the source of energy to power all these machines since we are already battling the effects of global warming? How will these machines work with humans in the workplace? What will be the nature of their interaction? Are labor laws to be modified in a way that includes these machines? What kind of rights do these machines have in relation to labor laws?

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## 4. Conclusion

There are several research issues within the field of information technology that should be investigated. The internet has made the world look like a global community where one is able to socialize just like they are physically together. There are several ethical issues that arise from the use of IT in human life right from the adoption and use of AI systems, social media, and its use among others. Choosing the right research paradigm is very important as findings will purely depend on the research paradigm chosen. This paper has reviewed elements of a research paradigm, discussed them as well as outlined how research in information technology interfaces with these elements. On the other hand, different research paradigms have been reviewed and the paper outlined the advantages and contexts of using each of the paradigms. Based on the kind of research to be undertaken, it is important to make the right consideration while choosing the paradigm to use.

The paper proposes using the scientific research paradigm in the field of information technology as findings from any research in this field can be generalized and applied “globally”. Research in this field should follow a specific pattern and statistical methods should be adopted to support data collection, analysis, and presentations. Personal views and options may not count as the proposed method of data collection is quantitative. However, there could be limited levels of subjectiveness in some research findings within IT that could require the use of interpretivism in carrying out these activities.

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## Compliance with ethical standards

### *Disclosure of conflict of interest*

No conflict of interest to be disclosed.

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