



## Islamic Ethics in the Development of Science and Technology

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### ABSTRACT

Islam is a religion that addresses various aspects of life, one of which is science and technology. Science and technology that is not accompanied by Sharia law and religious guidance can lead to harm and even destruction for humanity. Therefore, ethics related to Islamic Sharia are necessary for the development of science and technology. This research uses a descriptive qualitative approach with data collection methods in the form of a literature review. The purpose of this study is to understand Islamic ethics in the development of science and technology. The research results conclude that there are four Islamic ethics that must be present in developing science and technology: Science and technology should strengthen faith and not the other way around, science and technology should obey Sharia and not the other way around, science and technology should be for the common good and not the other way around, and science and technology should align with human nature and not the other way around.

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## INTRODUCTION

Humans are among the best creatures that Allah has created. As leaders on Earth, Allah has endowed humans with various advantages and potentials that make them superior to other creations. Intellect can be interpreted as a gift bestowed upon humans, through which they can protect their physical self from various reprehensible behaviors, and discern between what is true and what is false. (Sultani & Iskandar, 2022) Intellect becomes the most important potential for humans to elevate themselves into noble individuals. Islam itself is a religion that prioritizes knowledge. Therefore, Islam does not hinder its followers from seeking knowledge; instead, it emphasizes that they should always deepen their understanding and contemplate the universe as proof of Allah SWT's omnipotence. Allah SWT says:

وَسَخَّرَ لَكُم مَّا فِي السَّمٰوٰتِ وَمَا فِي الْاَرْضِ جَمِيعًا مِّنْهُ اِنَّ فِيْ ذٰلِكَ لَاٰيٰتٍ لِّقَوْمٍ يَّتَفَكَّرُوْنَ

"And He has subjected to you whatever is in the heavens and whatever is on the earth - all from Him. Indeed in that are signs for a people who give thought." (Q.S. Al-Jāsiyah: 13) (Lajnah Pentashihan Mushaf Al-Qur'an, 2023)

وَجُمَلُهُ ذٰلِكَ اَنَّ خَلْقَهَا وَتَدْبِيْرَهَا وَتَسْخِيْرَهَا دَالٌّ عَلٰى نُفُوْذِ مَشِيْئَةِ اللّٰهِ وَكَمٰلِ قُدْرَتِهِ ، وَمَا فِيْهَا مِنَ الْاِحْكَامِ وَالْاِتْقَانِ وَبَدِيْعِ الصَّنِيعَةِ وَحُسْنِ الْخُلُقِ دَالٌّ عَلٰى كَمٰلِ حِكْمَتِهِ وَعِلْمِهِ ، وَمَا فِيْهَا مِنَ السَّعَةِ وَالْعَظْمَةِ وَالْكَثْرَةِ دَالٌّ عَلٰى سَعَةِ مُلْكِهِ وَسُلْطٰنِيْهِ

The conclusion from all of this is that the creation, arrangement, and subjection of this universe demonstrate the validity of Allah's will and the perfection of His power. And what is within it – in terms of solidity, perfection, the beauty of creation, and elegance of form—shows the perfection of His wisdom and knowledge. Furthermore, its vastness, grandeur, and abundance (of creatures) indicate the expanse of His dominion and power. (As-Sa'di, 2002)

Islam, Knowledge, and Ethical Boundaries Some time ago, there were cases, such as that of the Muslim Abdullah al-Qashimi, who apostatized and turned to atheism. This certainly wasn't solely due to his knowledge but rather his deviation in understanding that knowledge. Therefore, Islam has boundaries in science and technology, which researchers refer to as Islamic ethics in science and technology. This aims to ensure that Muslims remain within the correct and straight boundaries, and do not use science and technology for things forbidden by the religion. It's important to understand that Islam does not oppose science and technology.

However, one should not abandon their religion, especially merely because of a piece of knowledge or a theory. For this reason, further research is needed to determine the boundaries and ethics of Islam so that it is clear to Muslims what needs to be avoided and maintained when exploring science and technology. This research aims to investigate and explain the ethics of Islamic Sharia in science, particularly as it relates to events or occurrences within the Muslim community.

## METHODOLOGY

This research examines Islamic ethics in the development of Science and Technology, along with an analysis of its causes, impacts, and how to address them. The research method employed is qualitative, using a literature review for data collection. The literature review scrutinizes various sources such as journals,

books, and other supporting materials. The analytical method used is a literature review study. This literature review was conducted through four steps: selecting the topic or discussion, sifting through literature sources, analyzing and synthesizing the content of the literature, and compiling the analysis results (Aminudin et al., 2024). Therefore, this research was conducted by reviewing existing studies and then summarizing and synthesizing the opinions and content of previous research related to the discussion of Islamic ethics in the development of Science and Technology.

## RESULTS AND DISCUSSION

Definition of Ethics In terms of etymology, ethics is a loanword from the English "Etiquette," meaning "rules for polite behavior in society" (Bull, 2008). In Arabic, ethics can be translated as "adab" (أدب), which signifies *حسن الخلق، فعل* "good morals, noble deeds, good delivery, lessons in Arabic sciences" (Ridho, 1960). The Indonesian language defines ethics as "the study of what is good and bad, and of rights and obligations" (Moeljadi, 2022). Based on these definitions, it can be understood that, linguistically, ethics refers to rules or forms of behavior considered good, proper, and beautiful in society. Islamic Ethics According to Wahyuningsih, Islamic ethics is a framework of great virtues that are not merely normative but encompass good relations with God, humans, and the environment. Islamic ethics fosters attitudes of *ihsan* (excellence), honesty, peace, and justice (Wahyuningsih, 2022). Thus, Islamic ethics connects good behavior not only through the lens of society but also through the perspective of God and the surrounding environment. Islamic ethics possesses several inherent characteristics:

1. Rooted in Religion: Islamic ethics is bound by values of faith, reward and sin, and is based on the Qur'an and Hadith. Therefore, Islamic ethics is not only tied to societal views but also to divine judgment in the afterlife.
2. Rational: Reason distinguishes humans from animals, and thus Islamic ethics elevates humans to a more dignified status than animals, as beings capable of thought and understanding meaning.
3. Aligned with Fitrah (Innate Nature): Islamic ethics incorporates the innate values within human beings, such as religiosity, basic needs, and the potential for goodness inherent in each individual.
4. Based on Justice: Islamic ethics places things in their proper proportion and according to their needs, not mere desires. This helps individuals restrain themselves from desires and whims.
5. Brings Happiness: As a set of rules aligned with the commands of Allah and His messenger, Islamic ethics brings happiness to those who adhere to it, both in this world and, more importantly, in the hereafter (Ananda, 2021).

Linguistically, the term "ilmu" is derived from the Arabic word *al-ilm* (العلم), meaning *نقيض الجهل* "the opposite of ignorance" (Al-Misry, 2010). In terms of terminology, there are several perspectives on the meaning of ilmu, some of which include:

1. Moh. Hatta: Ilmu is an organized body of knowledge concerning cause and effect (ratio) within a group of problems that are consistent both internally and externally.
2. Ralph Ross and Ernest Van Den Haag: Ilmu is empirical, systematic, rational, and general knowledge, with all four aspects being interconnected.
3. Afanasyef: Ilmu is an individual's knowledge of their surroundings, such as nature, thought, and society (Anggreini et al., 2023).

Based on these explanations, ilmu is a part of knowledge characterized by being rational, empirical, general, and systematic, encompassing various aspects surrounding an individual. If information has not reached a rational or empirical degree, it cannot yet be considered ilmu and remains merely knowledge. Linguistically, "knowledge" is understood as "everything known concerning a matter" (Moeljadi, 2022).

Knowledge is an expression used to describe someone's familiarity with something or a matter. The explanations above define and clarify the meaning of ilmu and knowledge. Therefore, when we say "ilmu pengetahuan" (science/scientific knowledge), it refers to knowledge that possesses a method, character, and steps in formulating information. From an Islamic perspective, ilmu pengetahuan is the research or in-depth study of knowledge in various matters, considered from the viewpoint and considerations of the Qur'an and Islamic principles (Isman & Hervina, 2023).

Definition of Technology Technology, linguistically, originates from the Greek word *Technologia*, which means handling something in a structured or systematic way. *Techne* itself means skill, craftsmanship, or a certain science (Ully & Nugraheni, 2022). In terms of terminology, the word technology has several definitions from the perspectives of experts, including:

- a. Castells: Technology is a collection of procedures or tools derived from the application of scientific knowledge that enables the repetition of tasks under specific conditions.
- b. Rosenzweig: Technology is the practical application of knowledge, encompassing the use of physical power like machines and tools based on scientific techniques and knowledge in their design, aiming to solve problems.
- c. Zuhri: Technology is the science that discusses tools and machines that simplify work and have a positive impact on life (Azzahra & Nurjaman, 2023).

Based on the explanations above, technology can be understood as the science, procedures, or application of scientific knowledge related to machines and tools that are beneficial for simplifying human tasks or problems that occur repeatedly. The existence of technology in human life is undeniable. According to Cahyono in Bahri, et al., in the era of digitalization, technology is no longer limited to applied tools but has transformed into virtual entities such as social media, blogs, applications, and the like (Bahri et al., 2022).

Generally, Islam does not prohibit the advancement of time and the use of Science and Technology in life, whether the technology is developed by a Muslim

or a non-Muslim. This is evident when Prophet Muhammad (PBUH) used a catapult seized from the Jews during battle (Al-Mubarakfury, 2013). This serves as proof that it is not problematic for a Muslim to use products made by people of other faiths, as long as it does not violate Sharia.

Regarding the development and use of Science and Technology, Islam specifically sets boundaries for its followers. These boundaries are considered from various aspects, such as religious and humanitarian perspectives. Therefore, there are ethics that must be adhered to in the development of Science and Technology to ensure it remains within Islamic guidelines and does not harm human beings. Some of these ethics include:

### *IPTEK Should Strengthen Faith, Not Weaken It*

Faith is a foundational pillar of Islam. Without faith, one cannot truly be called a Muslim. Even if someone wears outwardly Islamic attire, if they do not believe in Allah as their God and Prophet Muhammad (PBUH) as His messenger, they cannot be considered a follower of Islam (Daniyarti, 2022). A significant portion of current Science and Technology development and advancement originates from atheists. Atheism itself is the belief in the non-existence of a single, superhuman entity encompassing the entire universe, often referred to as God. This belief then extends to critiquing religious teachings, transcendental realities, and supernatural realities (Muhammad et al., 2022). Not only do they disbelieve in God, but their approach to Science and Technology also negates the existence of faith and religion. This, in turn, erodes the understanding of religious communities, particularly Muslims. However, in Islam, Science and Technology serves as a sign of Allah SWT's greatness, which should inherently strengthen and deepen one's faith. Allah says:

الَّذِينَ يَذْكُرُونَ اللَّهَ قِيَامًا وَقُعُودًا وَعَلَىٰ جُنُوبِهِمْ وَيَتَفَكَّرُونَ فِي خَلْقِ السَّمٰوٰتِ وَالْاَرْضِ رَبَّنَا مَا خَلَقْتَ هٰذَا بٰطِلًا سُبْحٰنَكَ  
فَقِنَا عَذَابَ النَّارِ

(those who remember Allah while standing, sitting, or lying on their sides, and reflect on the creation of the heavens and the earth, [saying], "Our Lord, You did not create all this in vain. Glory be to You! Protect us from the torment of the Fire." (Āli 'Imrān: 191) (Lajnah Pentashihan Mushaf Al-Qur'an, 2023)

الَّذِينَ يَذْكُرُونَ اللَّهَ فِي جَمِيعِ اَحْوَالِهِمْ : قِيَامًا وَقُعُودًا وَعَلَىٰ جُنُوبِهِمْ ، وَهُمْ يَتَذَكَّرُونَ فِي خَلْقِ السَّمٰوٰتِ وَالْاَرْضِ ،  
قَابِلِينَ : يَا رَبَّنَا مَا اَوْجَدْتَ هٰذَا الْخَلْقَ عَبَثًا ، فَاَنْتَ مُنْزَرٌ عَنْ ذٰلِكَ ، فَاصْرِفْ عَنَّا عَذَابَ النَّارِ

(Those who remember Allah in all their states, whether standing, sitting, or lying down; and they reflect on the creation of the heavens and the earth, [saying]: "Our Lord, You have not created all this in vain; Glory be to You, then protect us from the torment of the Fire.") (Nakhbah Minal-Ulama, 2009)

The Atheist Perspective vs. Islamic View In contrast to the general scientific view of atheist thinkers, they perceive religion merely as a form of knowledge. Karl Marx asserted that religion and its teachings are simply a shadow or projection of human nature yearning for paradise. He believed that religion originates from within human beings themselves (Dani, 2022). From Karl Marx's perspective, atheism interprets religion and God as nothing more than illusions and fantasies created by humans to achieve the ideals of eternity and a comfortable life, based on the empty dream called paradise.



### *Science and Technology Should Obey Sharia, Not Vice Versa*

Islamic law, or Sharia, can be defined as rules or norms from Allah and Prophet Muhammad (PBUH) intended to guide humanity, especially Muslims, in matters of muamalat (dealings), aqidah (creed), and akhlaq (morality) (Ridwan et al., 2023). Allah SWT has revealed His Sharia through His divine words and the sayings of His Prophet as guidance and a way of life for humanity. Islamic law encompasses various aspects of life, including obligations and prohibitions, mahdhoh (pure acts of worship) and ghoiru mahdhoh (general dealings) (Rozi, 2023). In every command or prohibition, there is wisdom and benefit for humanity. Therefore, one who abandons Sharia turns away from immense good. Islamic law has several characteristics, including:

- a. Perfect: Islamic law is perfect and possesses truth, meaning everything regulated in Islam is precise and aligns with human nature itself, as it originates from the Creator of humanity.
- b. Flexible: Islamic law is adaptable and not always rigid; it allows for excuses, concessions (rukhsah), and ease in its implementation.
- c. Universal: Islamic law is comprehensive, covering various aspects of life, and can be applied anywhere in the world. As long as one is Muslim, they must uphold Sharia wherever they are.
- d. Ta'abbudi: This means Islamic law is established solely as a form of worship and obedience to Allah SWT, earning rewards for those who sincerely obey His Sharia.
- e. Ta'aqquli: This means that most Islamic laws can be reasoned and understood through logic. For instance, prayer movements, besides being a form of worship, can also be a form of exercise and beneficial for health.
- f. Dynamic: Islamic law can adapt to changes in time and address contemporary issues and problems.
- g. Systematic: Islamic law has a structured framework, from age considerations to stages of worship. Islamic laws are interconnected and mutually supportive (N. S. Harahap & Hasanah, 2025).

Given the various advantages of Islamic law outlined above, it would be highly regrettable if humans were to abandon Allah's law merely for the sake of scientific views that might deviate from human nature itself. Ultimately, what they believe might lead to destruction for human life. Allah says:

فَأَذَاقَهُمُ اللَّهُ الْخُرْزِي فِي الْحَيَاةِ الدُّنْيَا وَعَذَابُ الْآخِرَةِ (25) كَذَّبَ الَّذِينَ مِنْ قَبْلِهِمْ فَاتَّسَمَّ الْعَذَابُ مِنْ حَيْثُ لَا يَشْعُرُونَ  
أَكْبَرُ لَوْ كَانُوا يَعْلَمُونَ (26)

"Those before them denied [the laws of the messengers], so the punishment came upon them from where they did not perceive. Az-Zumar. So Allah made them taste humiliation in the worldly life. And the torment of the Hereafter is certainly greater, if they only knew." (Az-Zumar: 25-26)

For instance, consider what has happened in some countries that have opened the doors to promiscuity based on the principles of human rights. They argue that biological relationships and romantic connections are a matter of individual freedom and full right. This is then followed by the widespread use of sex toys to satisfy desires. This ultimately leads to the loss of the sacred value of marriage, which then impacts birth rates. We can see how in Japan, the sex

recession rate has increased, leading to a drastic decline in births by 2020 (A'lauddin et al., 2023). Therefore, IPTEK should be developed in accordance with Islamic law, and not the other way around.

### ***Science and Technology Should Bring Benefit, Not Harm***

The function of technology is to bring benefit (maslahat) to humanity, animals, and the environment. Similarly, scientific knowledge should be developed to achieve general welfare. This aligns with the principles of Islam, which aim to bring benefit and well-being to the entire universe. Islam invites humanity to achieve true success, both in this world and, more importantly, in the hereafter. Islam encourages people to think, maintain physical and spiritual cleanliness, perform ablution (wudhu), avoid unlawful and harmful foods, and steer clear of things that could endanger individual and public health (Irfiani & Tarlam, 2023). This demonstrates how Islam emphasizes the importance of maintaining well-being for both individuals and the wider community. One principle in Usul al-Fiqh (principles of Islamic jurisprudence) states:

*لا ضرر ولا ضرار*

"Neither harm nor be harmed." (Siregar et al., 2023)

Science and Technology should be a driving force for creating benefit among people. However, the misuse of Science and Technology in inappropriate ways causes various forms of damage on Earth and even beyond. For example, the use of advanced technology in logging leads to extensive deforestation. Space debris from space travel, and the dependence and developmental delays caused by gadget and smartphone technology in children, are further examples. According to Sihombing's research, gadget use by toddlers can negatively impact them by depriving them of adequate physical and social interaction during critical growth periods (Sihombing, 2024). This demonstrates that Science and Technology is sometimes used in ways that bring harm. Therefore, the use of Science and Technology should be adjusted to consider and prioritize benefit.

#### **1. Science and Technology Should Align with Fitrah, Not Oppose It**

Linguistically, fitrah comes from the word fathoro, meaning "to create." In general terminology, fitrah refers to the inherent nature or potential that Allah bestows upon individuals before birth (Septemiarti, 2023). Here, "fitrah" specifically refers to the general meaning of a living being or what is known as instinct. Innate fitrah is a sunnatullah (Allah's way) that is fixed in humans and other creatures and cannot be changed. Whoever attempts to alter it will achieve nothing but destruction and ruin for themselves. Allah says:

*سُنَّةَ مَنْ قَدْ أَرْسَلْنَا قَبْلَكَ مِنْ رُسُلِنَا وَلَا تَجِدُ لِسُنَّتِنَا تَحْوِيلًا*

("Such was the way of Our messengers whom We sent before you, and you will not find any change in Our way." (Al-Isrā': 77)

Like other living beings, humans possess innate predispositions from birth and a divine drive to survive as an entity or living creature on Earth. This fundamental instinct, consciously or unconsciously, guides humans to continue existing and maintaining their population. Some of these human instincts include seeking physical needs like food and drink, self-preservation, reproduction through relations with the opposite sex, and socialization. However, the rapid

advancement of Science and Technology has caused some humans to deviate from these instincts, as detailed below:

#### *Basic Physical Needs as Living Beings*

Humans require nutrient and water intake to maintain their metabolism and bodily needs. Therefore, by innate fitrah, humans are constantly driven to seek these necessities, such as food and drink, and to adapt to their environment (N. Harahap et al., 2024). Thus, instinctively, humans will naturally seek their basic needs without needing to be taught or commanded. However, examining the current state of society, many individuals prioritize enjoying Science and Technology developments over their primary needs.

For example, in 2015, a child named Hsieh died after playing games in an internet cafe for three days. In Thailand, a child also died after playing Diablo III nonstop for 40 hours in 2013. Similarly, there was a case of a 20-year-old man in China who died after playing King of Glory for 9 hours a day for five months (Febrianti & Fitriyanti, 2023). These incidents represent a distortion of the human instinct to supply basic physical needs, which should be sufficient food, drink, and rest, but are instead directed towards meaningless activities.

#### *Drive for Relations with the Opposite Sex*

The drive for relations between males and females is a fundamental instinct for living beings, especially humans. This instinct draws humans into a stronger and more sacred bond known as marriage (Irade et al., 2024). Through relations with the opposite sex, humans continue their lineage and foster affection within the family. Allah says:

وَمِنْ آيَاتِهِ أَنْ خَلَقَ لَكُمْ مِنْ أَنْفُسِكُمْ أَزْوَاجًا لِتَسْكُنُوا إِلَيْهَا وَجَعَلَ بَيْنَكُمْ مَوَدَّةً وَرَحْمَةً إِنَّ فِي ذَلِكَ لَآيَاتٍ لِقَوْمٍ يَعْقِلُونَ  
"And among His signs is that He created for you mates from yourselves that you may find tranquility in them; and He placed between you affection and mercy. Indeed in that are signs for a people who give thought." (Ar-Rūm: 21)

Some developments in Science and Technology have led to new breakthroughs concerning gender freedom and an ever-increasing number of genders. This removes the natural, instinctive boundaries that should exist between male and female, leading to chaos that even proponents cannot clearly explain. This phenomenon is currently known as LGBT+, an acronym for Lesbian, Gay, Bisexual, Transgender, and similar identities. In Indonesia alone, it was estimated in 2014 that 1% of the population identified as LGBT+ (Yuniarni & Derysmono, 2022).

Beyond deviating from religious teachings, the LGBT+ phenomenon is considered an ailment that causes individuals to depart from their innate fitrah or natural disposition. This then leads to physical and mental health issues, and even impacts the continued existence of humanity itself. Certainly, this condition needs to be addressed to help individuals return to a state aligned with their innate fitrah.

### *Self-Preservation and Population*

Humans possess an instinct for fear, worry, and sympathy when they or their loved ones are threatened or in danger (Mukhlis, 2021). This fosters a sense of humanism or humanity among people, making them integrated beings who respect and protect one another. However, current conditions show that some uses and developments of Science and Technology are directed towards destruction and killing of fellow humans, and even the environment. This eradicates brotherhood and sympathy, leading to mass slaughter.

An example is what happened in Japan with the massive bombings of Hiroshima and Nagasaki, which originated from Science and Technology development in Manhattan. On August 6, 1945, the B-29 aircraft Enola Gay dropped the "Little Boy" atomic bomb, causing over 140,000 deaths and immense environmental devastation in Hiroshima. Then, on August 9, 1945, the B-29 aircraft Bockscar dropped America's second atomic bomb, "Fat Man," killing 70,000 people, with its radiation lingering for several months (Maulad et al., 2023).

### *Socialization*

Socialization is one of the primary human instincts. From various innate fitrah discussed earlier, diverse innate dispositions ultimately lead to the formation of social beings who are interconnected (Nurhuda et al., 2023). This applies to both male and female relationships, as biological and loving instincts, and to fulfilling basic needs like food and drink.

The current advancement of Science and Technology has caused humans to focus on virtual social relationships, often neglecting the real world. We can see how family gatherings, which should be filled with laughter and conversation, now turn into silence as each person focuses on their smartphone. According to research by Kartikaningrum, et al., unwise gadget use can affect children's interaction, making them passive and solely focused on their devices (Kartikaningrum et al., 2023).

## **CONCLUSIONS AND RECOMMENDATIONS**

Islamic ethics is understood as a framework of profound virtues that extends beyond mere normative rules to encompass good relationships with God, humanity, and the environment. Key characteristics of Islamic ethics include its foundation in religion, alignment with fitrah (innate human nature), rationality, emphasis on justice, and its ability to bring happiness. Science (*Ilmu Pengetahuan*) is defined as knowledge formulated with a specific method, character, and systematic steps. Its sources generally include experience, ideas, reason, experimentation, and divine revelation. Technology refers to the science, procedures, or applications of scientific knowledge related to machines and tools that simplify human tasks or recurring problems. These three elements collectively form Science and technology. Based on research, there are four key ethical principles for Science and Technology development in Islam. Science and technology should strengthen faith, not weaken it. As science and technology advances and develops, humanity should increasingly witness the greatness and majesty of God's power, rather than being drawn away from religion. Science and

technology should obey sharia, not oppose it. Islam is a perfect religion encompassing all aspects of life, science and technology development should aim to uncover the wisdom behind islamic law, not challenge it. Science and technology should bring benefit, not harm. The core purpose of science and technology is to bring ease and benefit to humanity. if science and technology instead cause harm, it deviates from its original objective. Science and technology should align with fitrah, not deviate from It. Science and technology development should ensure that humanity remains true to its innate instincts, such as seeking food and drink, procreation, fulfilling biological needs between men and women, and engaging in social interaction.

It is recommended that institutions, researchers, and policymakers actively integrate Islamic ethical principles into all phases of scientific and technological development. This can be achieved through ethical review boards, continuous ethical education, and fostering interdisciplinary collaborations that ensure innovation not only advances human capability but also aligns with faith, sharia, and fitrah. By doing so, science and technology will truly serve as tools of benefit, sustainability, and spiritual reflection within the Muslim world.

#### **FURTHER STUDY**

Future research should explore practical models and frameworks for applying Islamic ethical principles in various fields of science and technology, such as biotechnology, artificial intelligence, environmental engineering, and digital innovation. Studies could also investigate how Muslim-majority countries can integrate these principles into national innovation policies and educational curricula, ensuring that ethical considerations are not only theoretical but effectively implemented at institutional and societal levels.

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