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Sailing the X.0 Wave Theory: Navigating the Future of Civilization

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ABSTRACT: This paper delves into the X.0 Wave/Tomorrow Age Theory, a comprehensive framework conceived, invented, introduced, and developed by Prof. Dr. Hamid Mattiello between 2010 and 2017, to analyze the evolution of human civilization through distinct epochs of knowledge, technology, and business (KTB). The theory segments history into transformative waves, from the first development ($X.0 \leq 1.0$) and Agricultural Age ($X.0 = 1.0$) and the X.0 Wave/Tomorrow Age Theory ($2.1 \leq X.0 \leq 2.2$) spanning the 17th Century to 1870, to the current Age of Artificial Intelligence ($X.0 = 4.0$). It also projects into the anticipated Human Age ($X.0 = 5.0$) and Transhuman Age ($X.0 = 6.0$) and beyond ($6.0 \leq X.0$). Each wave represents a revolutionary phase characterized by significant advancements that shape societies, industries, and technologies. The X.0 Wave Theory integrates these historical phases with the Seven Pillars of Sustainability (7PS) to evaluate their societal impacts. The paper explores how these waves influence future developments by examining historical roots, emerging technological paradigms, and socio-economic dynamics. It examines how advancements in AI, biotechnology, and virtual reality are reshaping industries and global business practices, while also addressing the ethical and sustainability considerations essential for navigating these changes. By forecasting future trends, confronting current challenges, and preparing for potential crises, the X.0 Wave Theory offers a robust framework for understanding and adapting to the rapid pace of technological evolution. This paper provides deep insights into how these transformative waves shape our past, present, and future, offering valuable perspectives for navigating the complexities of an increasingly digital and interconnected world.

Keywords: The X.0 Wave/Tomorrow age theory; Human civilization evolution; Knowledge; Technology; Business epochs (KTB) model; AI (Artificial Intelligence); Human and transhuman age; Seven pillars of sustainability (7PS) model; Technological paradigms; Socio-economic dynamics; Biotechnology; Virtual reality; Ethical considerations; Sustainability; Future trends; Technological evolution

Key Questions raised by this research include:

- How can societies balance technological advancements with sustainability goals, particularly in the face of disruptive innovations like AI and biotechnology?
- How can the interconnected advancements in Knowledge, Technology, and Business (KTB) be leveraged to drive sustainable and ethical development in the progression of human civilization? See Figure 1.
- What role should ethical principles such as Love and Peace play in shaping the future trajectory of technological development? See Figures 1–3.
- How can the 7PS model be applied in real-world governance and business strategies to ensure a harmonious integration of sustainability and technological progress? See Figures 1–3.
- In what ways can forecasting and scenario planning be utilized to prepare for the challenges of the Human and Transhuman Ages?

The X.0 Wave Theory integrates these historical phases with the Seven Pillars of Sustainability (7PS) to evaluate their societal impacts. This paper explores how these waves influence future developments by examining historical roots, emerging technological paradigms, and socio-economic dynamics. It evaluates how advancements in AI, biotechnology, and virtual reality are reshaping industries and global business practices, while also addressing the ethical and sustainability considerations critical for navigating these changes. See Figures 2 and 3.

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This theory delves into the progression of human civilization, highlighting how advancements in Knowledge, Technology, and Business (KTB) are closely linked and mutually influential. See Figure 1.

Key Results include the identification of patterns in the evolution of technological paradigms and their effects on global society, industries, and business practices. The paper finds that the ongoing wave of Artificial Intelligence (X.0 = 4.0) is reshaping industries and pushing forward new ethical and sustainability challenges. Additionally, the 7PS model is integrated to evaluate the balance between technological development and sustainability, emphasizing the need for human-centric values like Peace and Love in guiding future developments. These insights contribute to shaping policy, ethical frameworks, and sustainable practices in the digital age. See Figures 2 and 3.

Key Impacts are significant, as they provide a framework for understanding how future technological advancements, such as AI, biotechnology, and virtual reality, will reshape industries and societies. The study emphasizes the integration of sustainability principles into the development of these technologies, suggesting that Love and Peace can guide the ethical application of innovations, ensuring that they benefit humanity while addressing social equity, environmental challenges, and economic stability.

Implications suggest that the X.0 Wave Theory provides a robust framework for forecasting future trends, confronting current challenges, and preparing for potential crises. It highlights the importance of aligning technological advancements with ethical principles and sustainable practices. The paper concludes that the X.0 Wave Theory offers a valuable tool for navigating the complexities of an increasingly digital and interconnected world, ensuring a balanced and sustainable approach to technological evolution.

The X.0 Wave/Tomorrow Age Theory

The X.0 Wave/Age Theory identifies distinct ages of civilization marked by significant technological advancements:

(1) **Agricultural Age (X.0 = 1.0)**: Characterized by the advent of farming and settled communities.
(2) **Industrial Age (X.0 = 2.0)**: Marked by the rise of industrialization and mechanized production.
(3) **Information Age (X.0 = 3.0)**: Defined by the explosion of information technology and digital communication.
(4) **Age of Artificial Intelligence (X.0 = 4.0)**: Highlighted by the integration of AI into various facets of life and society.

The theory emphasizes the transformative power of innovation and technological progress, acknowledging both the opportunities and the challenges they bring, such as job displacement and environmental degradation. Looking ahead, it also envisions future waves:

(5) **Human Age (X.0 = 5.0)**: At the first edge of tomorrow, focusing on human-centric advancements and ethical considerations.
(6) **Transhuman Age (6.0 ≤ X.0)**: Where technology and biology converge, shaping a new frontier of human evolution.

By exploring these waves, the series will offer a comprehensive overview of how technological advancements have shape. They will continue to shape human society, providing viewers with a deep understanding of our past, present, and future.

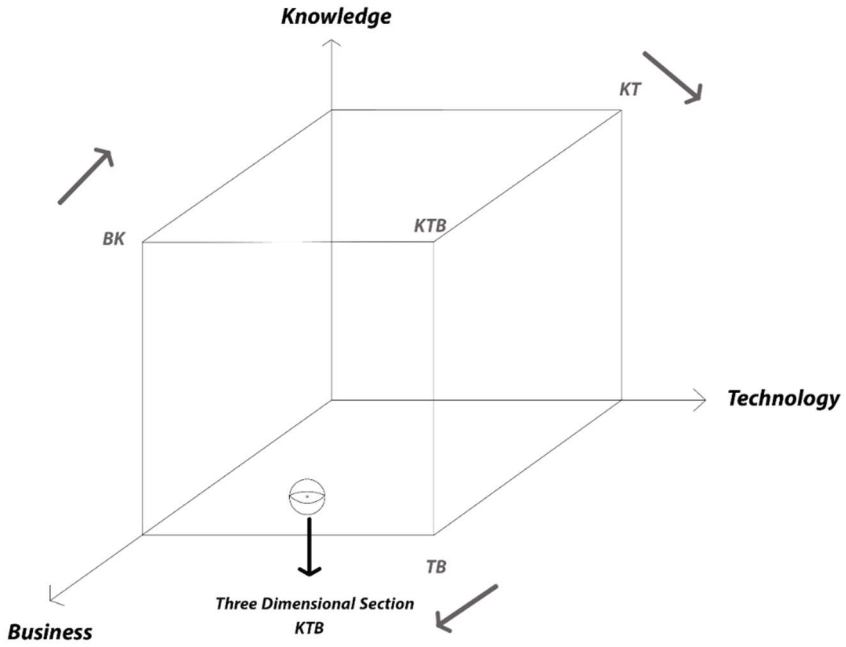

Figure 1. Knowledge, Technology, and Business (KTB) Model [1–30].

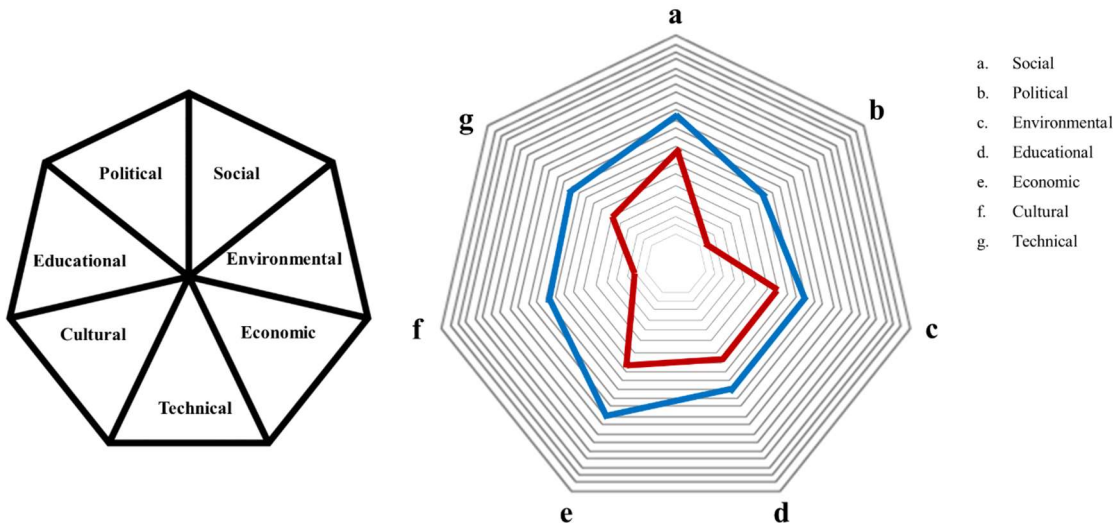

Figure 2. Spider diagram of the seven pillars of sustainability (7PS) model [1–30].

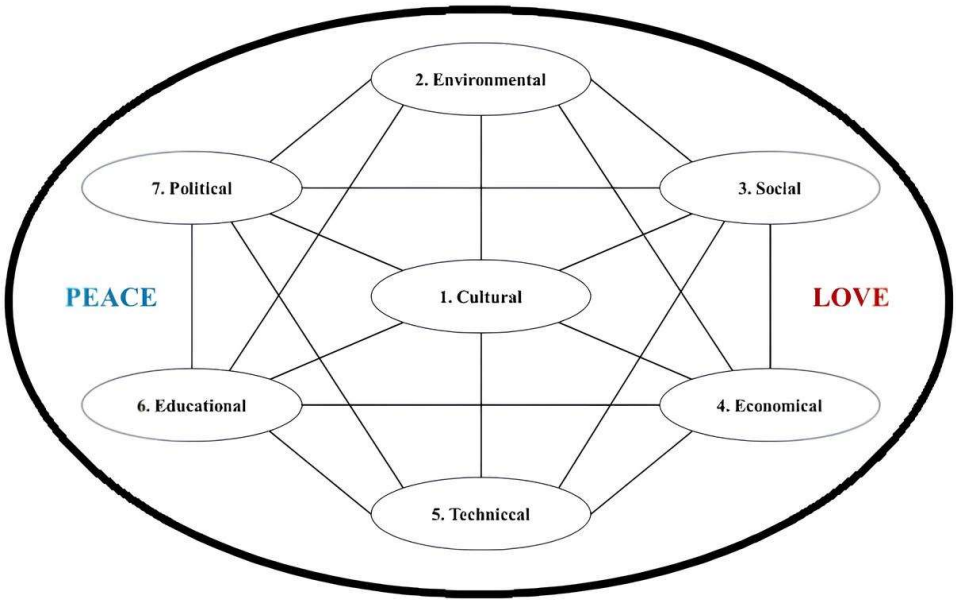

Figure 3. The seven pillars of sustainability (7PS) model, connections, priorities, and values (peace & love) [1–30].

1. Introduction

The X.0 Wave/Age Theory, also known as the Theory of Comprehensive Everything, is an innovative framework conceived, invented, introduced, and developed by Prof. Dr. Hamid Mattiello in 2010. This theory provides an in-depth analysis of the evolution of human civilization, focusing on the interconnected advancements in Knowledge, Technology, and Business (KTB). It divides history into distinct waves or ages, each characterized by transformative innovations that profoundly shape societal structures, interactions, and institutions. The framework is grounded in the Seven Pillars of Sustainability (7PS) model, which serves as a lens for understanding the broader implications of these transformations. See Figures 1–3.

1.1. Research Problem

While the evolution of human civilization has been studied through various lenses—technological revolutions, economic shifts, and cultural changes—there remains a gap in comprehensive models that link these aspects holistically. Current frameworks often focus on isolated technological or industrial shifts without considering the broader, interdependent forces that drive these changes. This lack of integration leaves unanswered questions about how the intertwined progression of knowledge, technology, and business can shape the future of human society in a sustainable and ethically responsible manner.

1.2. Research Objective

The primary objective of the X.0 Wave Theory is to fill this gap by offering a unified framework that explores how knowledge, technology, and business evolve in concert through distinct historical phases or waves. The theory aims to provide insights into how these waves have reshaped societies in the past and, more importantly, how they will continue to shape the future. By examining the role of emerging technologies such as artificial intelligence, biotechnology, and virtual reality, the theory offers a forward-looking analysis of how these innovations will influence societal structures, industries, and governance.

1.3. Research Gaps

1. **Lack of Holistic Models**
2. **Future Technological Shifts**
3. **Integration of Sustainability**
4. **Ethical Considerations**

By addressing these research gaps, the X.0 Wave Theory provides a comprehensive understanding of how human civilization evolves through distinct phases, offering valuable insights into the implications of technological progress for the future of society.

1.4. Explanation of the KTB Model

The KTB model (Knowledge, Technology, and Business model) is central to the X.0 Wave Theory and represents the three interdependent pillars that drive the transformation of human civilization: See Figure 1.

1. **Knowledge(K):**
   Knowledge refers to the intellectual advancements that humanity has achieved throughout history. It encompasses science, philosophy, and education innovations that shape societal structures. Knowledge is the basis upon which technological developments are built and the direction in which industries evolve.
2. **Technology(T):**
   Technology signifies the tools and innovations humans create to address challenges and improve the quality of life. From the invention of the wheel to the rise of artificial intelligence and biotechnology, technology is a key enabler of progress. The X.0 Wave Theory closely tracks technological evolution as it intersects with knowledge, creating new possibilities and industries.
3. **Business(B)**:
   Business refers to the economic activities, models, and systems that are shaped by technological advancements and knowledge. The evolution of business practices—from agricultural economies to industrial and digital economies—is closely tied to the progress made in knowledge and technology. The KTB model studies how businesses adapt to and capitalize on new innovations, which in turn shape the global economic landscape.

The KTB model provides a framework for understanding the reciprocal relationship between Knowledge, Technology, and Business across the different ages or waves in the X.0 Wave Theory. These three pillars work together to drive societal evolution, with each wave marking a significant development phase in all three domains. See Figure 1.

The theory posits that there have been several ages/waves of civilization so far, each marked by significant technological advancements and societal shifts: See Figures 4–9.

Figures 2 and 3: 7PS Model, Connections, Priorities, and Core Values (Peace & Love):

The 7PS Model (Seven Pillars of Sustainability), assesses sustainability using FUZZY-AHP for prioritization. The seven pillars are: Culture (foundation and 1st priority), Environment, Social, Economy, Technical, Education, Politics, and Peace and Love as Core Values.

Applications (Hexagon Diagram):

In the 7PS spider diagram, each side represents one sustainability indicator and is scored from 0 to 25. The diagram is designed as a complete hexagon, indicating the balance and coordination among the indicators.

Pandemic Impact:

Pre-pandemic (2017), scores showed balance (blue hexagon), at that time, the diagram appeared in blue and resembled a regular hexagon, indicating good balance and sustainability within businesses.During COVID-19, scores dropped (red hexagon), showing reduced sustainability, however, during the COVID-19 pandemic, the diagram

changed to red. This change signified a decrease in the scores of sustainability indicators, with the hexagon becoming noticeably irregular with sharp corners and indentations, indicating reduced sustainability and coordination during that period. The model helps track and improve sustainability over time.

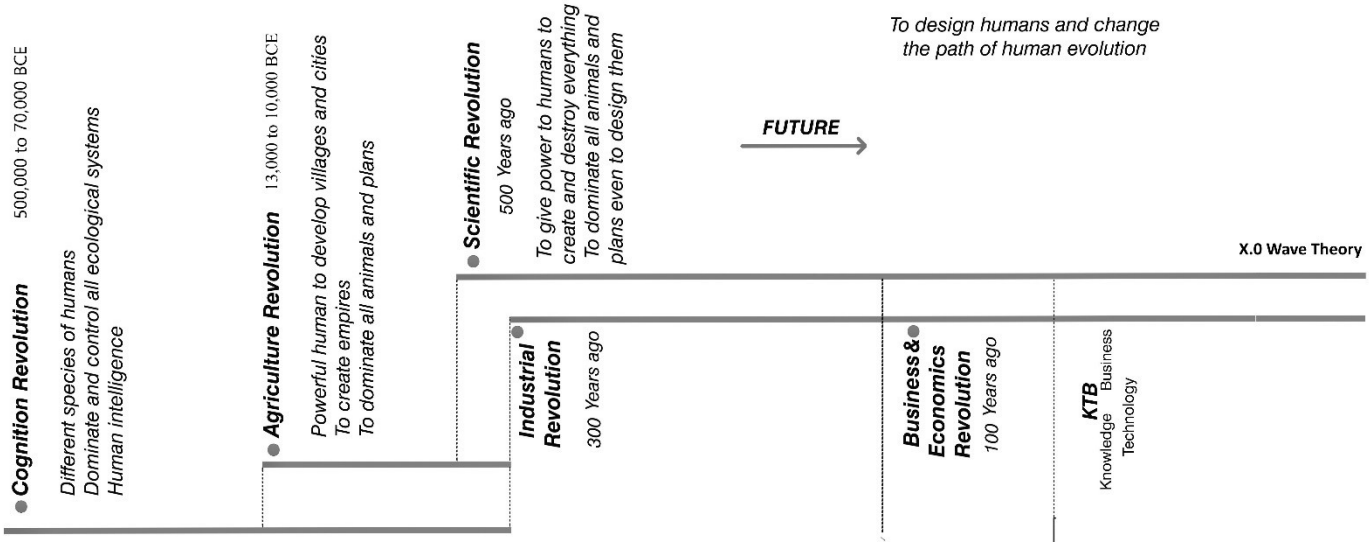

Figure 4. Revolutions at the X.0 wave/age (1.0 ≤ X.0 ≤ 5.0) theory [1–42].

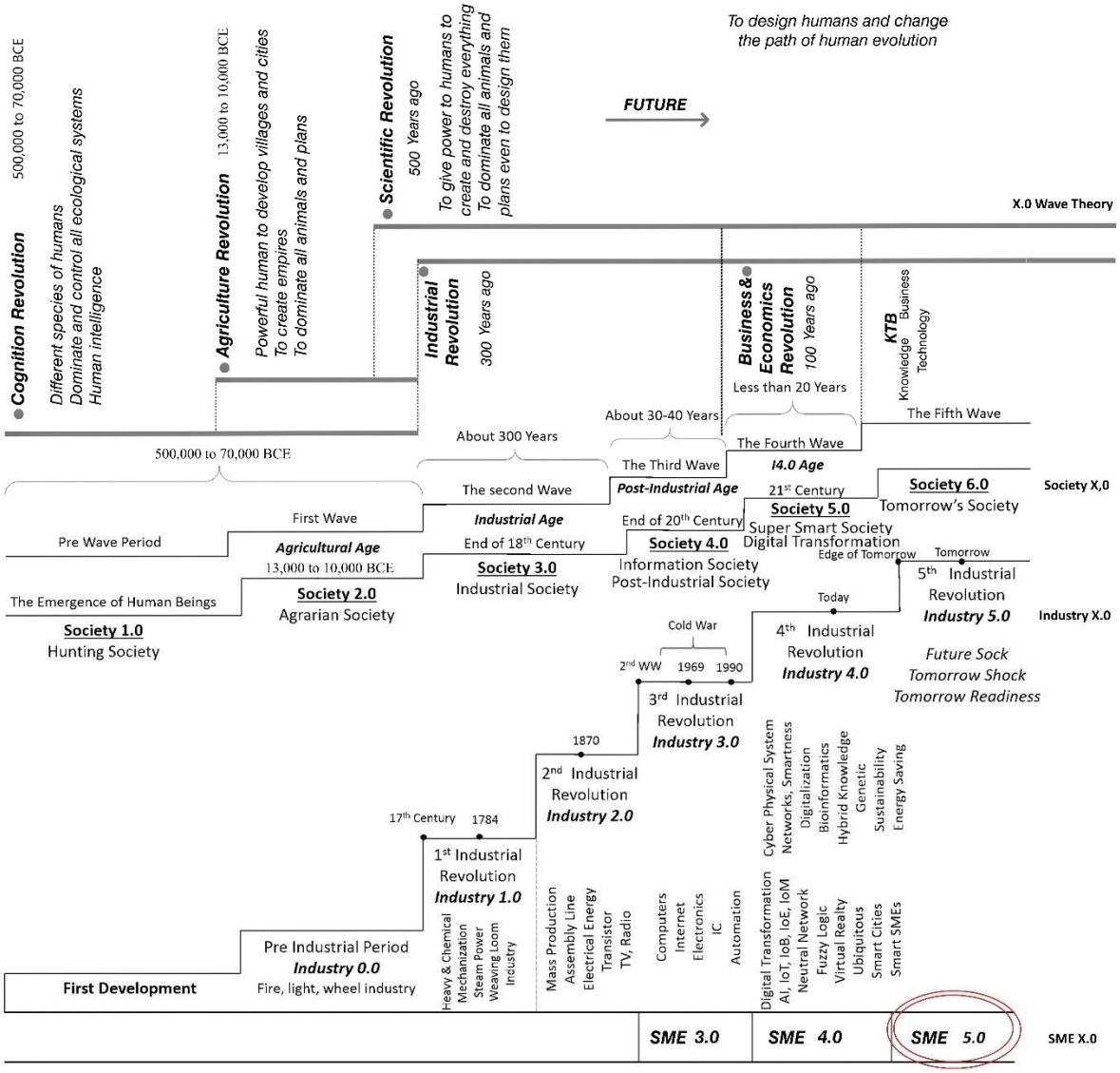

Figure 5. The X.0 wave/age (1.0 ≤ X.0 ≤ 5.0) theory, revolutions, ages, society, industries, technologies, and SMEs [1–42].

SME	Society	Industry	Waves/Ages	Revolutions			Year
	Hunting Society Society 1.0		Pre wave period	-)Cognition Revolution -)To Dominate and Control all ecological System -) Human Intelligence	The Emergence of Human Beings	-)First Development -)Different Spices of Human	**500,000 to 70,000 BCE**
	Society 2.0 Agrarian Society	-) Pre Industrial Period -) Industry 0.0 -) Fire, Light, Wheel Industry	-)The First Wave -)Agricultural Age	-)Agriculture Revolution -) Powerful Human to Develop Urban Areas -) To Create Emprises To Dominate All Animals, Plans and planets			13,000 to 10,000 BCE
				-) Scientific Revolution -)To Give Power to Humans to Create and Destroy Everything In the Planet -) Just one Human Specie			500 Years ago

Figure 6. Histomap of the X.0 Wave/Tomorrow Age Theory (X.0 = 1.0) from 500,000/70,000 years ago to 500 years ago [1–30].

	Society 3.0 Industrial Society	-)1st Industrial Revolution -) Industry 1.0	The Second Wave Industrial Age	Industrial Revolution			17th Centaury
		-) Heavy and Chemical Industry -) Mechanization -) Steam Power -) Wearing Loom					1784
		-)2nd Industrial Revolution -) Industry 2.0 -)Mass Production -)Assembly Line -) Electrical Energy -) Transistor, TV, Radio					1870

Figure 7. Histomap of the X.0 Wave/Tomorrow Age Theory (2.1 ≤ X.0 ≤ 2.2) from 17th Century to 1870 [1–30].

SME	Society	Industry	Waves/Ages	Revolutions			Year
SME 3.0	-) Society 4.0 -) Information Society -) Post Industrial Society	Industry 3.0 • Computers • Internet • Electronics • IC • Automation	-) The 3rd Wave -) Post Industrial Age	-)Business and Economics Revolution1 Future	To Design Humans and Change the Path of Human Evolution	100 Years 40 Years The Cold War	2nd WW 1969 1990 2000
SME 4.0 Smart SME	-)Society 5.0 -) Smart Citizen	The 4th Industrial Wave • AI, IoT, IoB, IoE • IoM, Neutral Network • Fuzzy Logic • Ubiquitous • Networks	-) 4th Industrial Wave -) Digitalization Age -) Digital Transformation -) Virtual Reality -) Cyber Physical Systems -) Smartness -) Digitalization	-)Business and Economic Revolution 2 -)Hybrid Organization -)Cloud HR -)Greenhouse Gases Reduction -)Energy Saving -) CSR	Bioinformatics Hybrid Knowledge Genetics Sustainability	10 Years	2006 2011 Today
SME 5.0 SMEs for Tomorrows' Shocks	Society 6.0	Industry 5.0	-) The 5th Industrial Wave -) Tomorrow Age		**KTB** Model Future Shocks Tomorrow Shocks	**The first Edge of Tomorrow (2020-2030)**	Tomorrow
SME X.0	**Society X.0**	**Industry 5.0**	**-) The Xth Industrial Wave**		**KTB Model**	**The Xth Edge of Tomorrow**	Tomorrow

Figure 8. Histomap of the X.0 Wave/Tomorrow Age Theory, (1.0 ≤ X.0 ≤ 5.0) from 2nd WW to the first edge of tomorrow (2020–2030) [1–30].

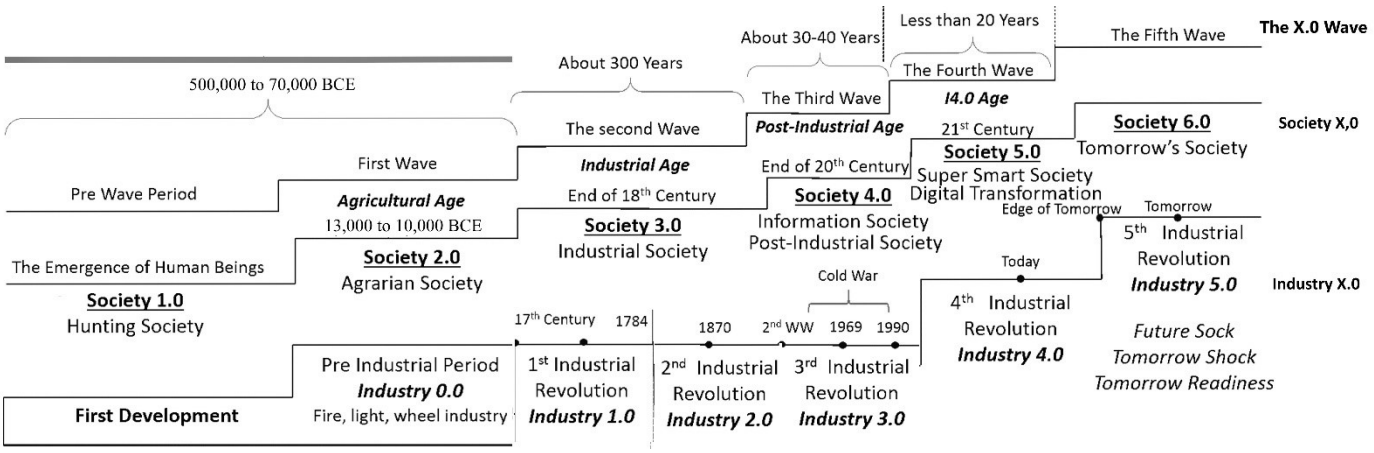

Figure 9. The X.0 wave/age ($1.0 \leq X.0 \leq 6.0$) theory, ages, society, industries, and technologies [1–30].

1. **X.0 = 1.0-The Cognition and Agricultural Age**
2. **X.0 = 2.0-The Industrial Age**:
   - **1st Industrial Age/Revolution**
   - **2nd Industrial Age/Revolution**
3. **X.0 = 3.0-The Information Age/Post-Industrial Age, (Alvin Toffler's Three Waves of Civilization (The 3rd Wave))**
4. **X.0 = 4.0-The Intelligence Age (Digitalization Age, Biotechnology, Virtual Reality)**
5. **X.0 = 5.0-The Human Age or The Age of Integration (Prof. Mattiello's 5th Wave/Tomorrow Age Theory or Theory of Comprehensive Everything (Tomorrow's Society))**
6. **X.0 = X.0-The Transhuman Age or The Age of Imagination (Prof. Mattiello's X.0 Wave/Age Theory).**

2. Summary

This article delves into the profound implications of the X.0 Wave Theory, addressing its significance for the future across various dimensions:

1. Historical Analysis
2. Technological Paradigms
3. Socio-Economic Dynamics
4. Business Transformations
5. Ethics and Sustainability
6. Envisioning the Future

(1) **Historical Analysis:** Investigating the theoretical foundations and historical roots of the X.0 Wave/Age Theory, tracing the evolution of human civilization through distinct knowledge, technological, and business advancements.

(2) **Technological Paradigms:** Exploring emerging innovations like artificial intelligence, biotechnology, and virtual reality, and their potential impacts on future developments. This includes the integration of these technologies into various industries and the potential for creating new business opportunities and disrupting existing ones.

(3) **Socio-Economic Dynamics:** Evaluating the challenges and opportunities brought by technological disruptions, along with policy considerations to foster innovation. This includes examining the impacts on labor markets, economic inequality, and societal well-being, and proposing strategies for inclusive growth and equitable distribution of technological benefits.

(4) **Business Transformations:** Examining how entrepreneurial endeavors and innovative business models are driven by the X.0 Wave/Age Theory. This includes analyzing the shift towards digital enterprises, the role of SMEs in leveraging new technologies, and the emergence of new business ecosystems. Additionally, the focus will be on adapting to the future of Industry 4.0 (Germany), which is called Industry 5.0, and the future of Society 5.0 (evaluated by the Japanese government), which is called Society 6.0, symbolizing Western and non-Western cultural approaches to technological advancement and societal integration.

(5) **Ethics and Sustainability:** Assessing ethical and sustainable governance frameworks amid rapid technological advancements. The 7PS Model is a comprehensive framework designed to address the key aspects of sustainability in the context of rapid technological advancements. It emphasizes the importance of a balanced, integrated approach that takes into account not only technological progress but also the ethical, cultural, social, environmental,

and political dimensions of human life. The model incorporates seven critical pillars that support sustainable development, which are interconnected and should be applied together to ensure a resilient and equitable future.

This includes the application of the 7PS Model: See Figures 2 and 3.

1. **Cultural (the 1st priority as foundation):** Emphasizing the foundational role of cultural values and heritage in guiding sustainable development.

The Cultural pillar forms the priority and foundation of the model because cultural values and heritage provide the essential context for sustainable development. Cultural understanding influences how technologies are adopted, how communities interact with each other, and how people shape their identities. A society's traditions, customs, and beliefs can guide its approach to sustainability, ensuring that development respects local cultures while promoting inclusive progress.

- **Key Focus:** Preserving cultural heritage, fostering cross-cultural understanding, and integrating cultural values into development policies and practices.

2. **Environmental:** Addressing the environmental impact of technological progress and promoting eco-friendly innovations.

The Environmental pillar addresses the ecological implications of technological advancements. With rapid progress, we must ensure that the benefits of new technologies do not come at the expense of the planet's health. This pillar emphasizes the importance of eco-friendly innovations, reducing carbon footprints, and sustainable resource management. It advocates for technologies that help protect the environment, reverse ecological damage, and promote long-term ecological balance.

- **Key Focus:** Sustainable energy solutions, environmental conservation, waste reduction, and fostering a circular economy.

3. **Social:** Ensuring social equity and addressing the societal impacts of technological changes.

The Social pillar ensures that equity, justice, and the well-being of all individuals are at the heart of technological development. Technological advancements must be harnessed to address social inequality, enhance quality of life, and provide access to essential services for all people. This includes focusing on issues like education, healthcare, and access to technology for marginalized or underserved populations.

- **Key Focus:** Addressing social disparities, promoting inclusivity, ensuring equitable access to technologies, and enhancing the quality of life for all.

4. **Economy:** Fostering economic stability and growth by promoting sustainable business practices.

The Economy pillar focuses on the economic stability and growth that sustainable development should bring. As technologies evolve, it's critical to ensure they are utilized to stimulate economic opportunities, job creation, and innovation while promoting sustainable business practices. This pillar advocates for green business models, ethical financial practices, and the transition toward an economy that prioritizes both growth and **sustainability**.

- **Key Focus:** Sustainable business models, innovation-driven economies, green industries, and addressing economic inequalities.

5. **Technical:** Promoting technological advancements that align with sustainability goals.

The Technical pillar focuses on technological advancements, ensuring that progress aligns with sustainability goals. This includes the development of technologies that are environmentally friendly, resource-efficient, and socially beneficial. It also ensures that emerging technologies, such as AI, biotechnology, and automation, are developed and used responsibly.

- **Key Focus:** Advancing eco-friendly technologies, fostering innovation that supports sustainability, and ensuring the responsible use of emerging technologies.

6. **Educational:** Enhancing educational frameworks to prepare a skilled and adaptable workforce.

The Educational pillar emphasizes the importance of building a skilled, adaptable workforce that is ready to navigate a world shaped by rapid technological advancements. It advocates for the inclusion of sustainability in education systems, preparing future generations with the necessary knowledge and skills to thrive in an increasingly complex and tech-driven world.

- **Key Focus:** Education for sustainable development, lifelong learning, tech education, and preparing future leaders to address sustainability challenges.

7. **Political:** Developing political strategies and policies that support sustainable and ethical technological development.

The Political pillar is focused on the need for strong governance and policy frameworks that support sustainability goals. Governments play a key role in creating laws and policies that encourage ethical technological development, promote environmental protection, and ensure social equity. This pillar emphasizes the importance of international collaboration and the need for clear regulations and guidelines that foster responsible innovation.

- **Key Focus:** Policy-making for sustainability, global cooperation, governance frameworks that support technology-driven social and environmental progress, and addressing ethical considerations.

Additionally, **PEACE** and **LOVE** should be integral values underpinning these seven pillars, promoting a holistic approach to sustainability that fosters harmony and well-being in society. See Figures 2 and 3.

Integrating Peace and Love into the 7PS Model

The 7PS Model is designed to address the technical, economic, and social challenges of sustainability, while also emphasizing the importance of human values such as Peace and Love. These values are integrated into the framework to ensure that technological progress leads to harmony, cooperation, and well-being for all people. By incorporating these values, the model encourages the development of technologies that are not just profitable or efficient but also human-centered, fostering peace, justice, and respect across societies.

- **Peace** in this context refers to global harmony, social stability, and a future where technological advancements reduce conflicts and inequality, promoting peaceful coexistence.
- **Love** symbolizes compassion, empathy, and a deep commitment to ensuring that technological development benefits humanity in a way that is inclusive and ethical, respecting all cultures, societies, and individuals.

Together, Peace and Love serve as guiding principles for how the 7PS pillars should be approached, ensuring that technological progress and sustainability efforts are always focused on the well-being of people and the preservation of the planet. See Figures 2 and 3.

In this theory and based on the 7PS model, readiness for the first edge of tomorrow, which is from 2020–2030, is posited through:

(1) **Forecasting:** Utilizing comprehensive data analysis and predictive models to anticipate future trends and challenges.
(2) **Prevention:** Implementing proactive measures to mitigate potential risks and prevent crises.
(3) **Facing Today's Challenges and Tomorrow's Crises:** Developing robust strategies to address current issues and preparing adaptive responses for future disruptions.

This multifaceted approach ensures a resilient and sustainable future capable of navigating the complexities of an evolving technological landscape.

(6) **Envisioning the Future:** Projecting a future guided by the principles of the X.0 Wave/Age Theory, emphasizing holistic integration for human advancement. This includes:
    (1) **AI and Automation:** Understanding the transformative potential of AI in reshaping industries and societal functions.
    (2) **Cultural Dynamics:** Recognizing the influence of cultural contexts on technological adoption and societal change.
    (3) **Global Collaboration:** Promoting international cooperation to address global challenges and harness the benefits of technological advancements for all.
    (4) **Future Scenarios:** Creating foresight scenarios to anticipate future trends and prepare for potential disruptions, ensuring a resilient and sustainable future for humanity.

By addressing these dimensions, this article aims to provide a comprehensive understanding of the X.0 Wave Theory's impact on knowledge, technology, and business and to offer insights into the future challenges and opportunities it presents.

3. Detailed Explanation

3.1. Revolutions in X.0 Wave Theory

The X.0 Wave/Tomorrow Age Theory posits that human history can be segmented into distinct waves, each characterized by significant technological advancements transforming human interaction and societal organization. The theory currently identifies several key revolutions: See Figure 4.

Figure 4: Revolutions at the X.0 Wave/Age (1.0 ≤ X.0 ≤ 5.0).

Figure 4 illustrates the revolutions of the X.0 Wave Theory, highlighting key shifts in human history that have reshaped societies and technologies. These revolutions span from the Cognition Revolution to the anticipated Second Business and Economics Revolution (2020–2030). Below is a breakdown of each of the revolutions mentioned in the figure.

3.1.1. Cognition Revolution (500,000 to 70,000 BCE)

- **Overview**: The **Cognition Revolution** marks the first development of human intelligence and the emergence of modern humans (Homo sapiens) from earlier species. This revolution is fundamental as it allowed human beings to dominate the Earth, eventually leading to the control of other species and ecosystems.
- **Key Features**:
  - Early humans developed the cognitive abilities to create tools, form complex social structures, and adapt to diverse environments.
  - The ability to think abstractly, plan, and communicate enhanced survival and cooperation, marking the emergence of early human societies.
  - Different species of humans (e.g., Neanderthals, Homo habilis) coexisted during this period but were eventually overshadowed by Homo sapiens due to superior cognitive capabilities.

3.1.2. Agriculture Revolution (13,000 to 10,000 BCE)

- **Overview**: The Agricultural Revolution marks the transition from nomadic hunting and gathering to settled agricultural societies. This revolution led to the establishment of villages, cities, and early civilizations, enabling humans to control food production and expand their territorial reach.
- **Key Features**:
  - Humans began domesticating animals and cultivating plants, leading to stable food sources.
  - The surplus food allowed for population growth and the creation of permanent settlements.
  - This period saw the rise of the first organized societies, including early forms of government, trade, and complex cultural practices.
  - It laid the groundwork for the development of social hierarchies and technological advancements.

3.1.3. Scientific Revolution (500 Years Ago)

- **Overview**: The **Scientific Revolution** fundamentally changed human understanding of the world by developing scientific methods and rational thought. This revolution gave humans the power to manipulate the natural world unprecedentedly.
- **Key Features**:
  - Pioneering thinkers like Galileo, Newton, and Darwin revolutionized fields such as astronomy, physics, and biology.
  - The Scientific Revolution enabled humans to harness nature's forces, leading to advancements in medicine, engineering, and agriculture.
  - Humans gained the ability not only to dominate and control the environment but also to reshape and redesign it according to their needs and desires. This revolution laid the intellectual foundation for the Industrial Revolution.

3.1.4. Industrial Revolution (Beginning 300 Years Ago)

The Industrial Revolution began around 300 years ago during the Scientific Revolution and can be divided into two distinct phases:

First Industrial Age (Approximately 1760 to 1840)

- **Overview**: This phase marked the advent of steam power, mechanization, and the rise of factories, which dramatically transformed economies and societies.
- **Key Features**:
  - The development of steam engines and mechanized production processes revolutionized industries such as textiles and iron.

- Urbanization accelerated as people moved to cities to work in factories, leading to significant social and economic changes.
- Mass production led to cheaper goods and the rise of consumer economies.

Second Industrial Age (Late 19th Century)

- **Overview**: This phase introduced innovations like electricity, steel production, and mass production techniques like the assembly line, further advancing industrial capabilities.
- **Key Features**:
  - Electricity powered factories and homes, leading to technological innovations in industries such as telecommunications and transportation.Mass production techniques like the assembly line reduced costs, increased efficiency, and made goods widely accessible.
  - This revolution laid the groundwork for modern economies and global trade networks.

3.1.5. Business and Economics Revolution (Last 100 Years)

This revolution focuses on transforming business and economic systems that have been reshaping societies over the past century. It includes two key phases:

First Business and Economics Revolution (Early 20th Century)

- **Overview**: This phase was characterized by the rise of large-scale enterprises, scientific management, and mass production, significantly boosting productivity and economic growth.
- **Key Features**:
  - The development of corporate structures and management techniques increased efficiency and the ability to manage complex enterprises.
  - The advent of large corporations and industries fostered national and international economies.

Second Business and Economics Revolution (2020–2030)

- **Overview**: The ongoing revolution, aligned with the X.0 Wave Theory, focuses on the integration of advanced technologies such as artificial intelligence, digitalization, and biotechnology. This revolution is expected to create interconnected, innovative, and adaptive businesses and economies.
- **Key Features**:
  - Businesses are expected to leverage cutting-edge technologies to improve operations, enhance productivity, and create new business models.
  - A significant aspect of this revolution is the **7PS Model**, which includes **Cultural, Environmental, Social, Economic, Technical, Educational, and Political** aspects, with an emphasis on **sustainability** and human well-being. See Figures 2 and 3.
  - The **values of PEACE and LOVE** are seen as essential in underpinning the pillars of this revolution, promoting a more holistic approach to business and economics. See Figures 2 and 3.

Figure 4 outlines a series of revolutions that have defined human history and society, each marked by profound technological advancements that have reshaped the way humans live, interact, and govern. From the Cognition Revolution to the ongoing Second Business and Economics Revolution, these milestones represent critical turning points in the evolution of human civilization. The future of the X.0 Wave Theory posits that we are entering a transformative age where advanced technologies will continue to disrupt and innovate, leading to new social, economic, and environmental paradigms.

Figure 5: The X.0 Wave/Age Theory; revolutions, ages, society, industries, technologies, and SMEs (1.0 ≤ X.0 ≤ 5.0).

Figure 5 illustrates the comprehensive X.0 Wave/Age Theory, which explores the evolution of human society, industries, technologies, and Small and Medium Enterprises (SMEs) across different waves or ages. The figure covers a spectrum from the early stages of human civilization to the anticipated future, breaking down each period by revolutions, societal shifts, technological advancements, and the role of SMEs.

Below is a detailed explanation of Figure 5, highlighting the main waves/ages, their corresponding revolutions, societal transformations, technological progress, and the growing importance of SMEs in each period:

(1) X.0 = 1.0: Cognition & Agrarian Age (1.0)

Time Period: 500,000 BCE to 70,000 BCE

- **Revolutions**: **Cognition Revolution** and **Agriculture Revolution**.
- **Society**: Early humans transitioned from nomadic hunter-gatherers to settled agricultural societies.
- **Industries**: The Agriculture Revolution laid the foundation for the first industries centered around food production and early trade.
- **Technologies**: Tools for hunting and food gathering evolved, eventually leading to the domestication of animals and cultivation of crops.
- **SMEs**: While SMEs did not exist in the modern sense, early forms of small-scale agricultural enterprises emerged as human societies shifted to farming and food production.

(2) X.0 = 2.0: Industrial Age (2.0)

Time Period: 17th to 18th Century

- **Revolutions**: **Scientific Revolution** and **Industrial Revolution**.
- **Society**: This age marked the rapid shift from agrarian societies to industrialized urban centers. The advent of mechanization and the rise of factories reshaped societal structures, creating urbanized societies with new labor dynamics.
- **Industries**: The industrial sector exploded with new factories, innovations in manufacturing, and large-scale production, particularly in textiles, iron, and coal mining.
- **Technologies**: Key technological advances such as the steam engine and the mechanization of production powered the rise of factories and mass production.
- **SMEs**: As industries grew, small-scale enterprises also emerged, particularly in the form of family-owned workshops and artisanal production. These small businesses were often at the heart of local economies, even as larger corporations and industries began to dominate.

(3) X.0 = 3.0: Information Age/Post-Industrial Age (3.0)

Time Period: 20th Century (1960s–1970s) and Beyond

- **Revolutions**: **Information Revolution** and **Digital Revolution**.
- **Society**: The 20th century shifted to knowledge-based societies with greater global interconnection. The advent of the Internet, computers, and digital technologies transformed communication, education, and global commerce. The focus was increasingly on information exchange, intellectual property, and service industries.
- **Industries**: The rise of information technology (IT) led to the creation of the IT sector, telecommunications, software development, and the globalization of business processes. Automation also began to impact traditional manufacturing industries.
- **Technologies**: The development **of personal computers, the Internet, and microprocessors sparked innovations that changed how people worked, communicated**, and engaged in commerce. Innovations like the World Wide Web (1990s) facilitated the growth of e-commerce and online business models.
- **SMEs**: The Information Age enabled the rise of many new types of small businesses, particularly in the tech space, such as software startups, e-commerce platforms, and service-based industries. SMEs in this period grew rapidly through digital channels and benefited from the ease of global communication and digital marketing.

(4) X.0 = 4.0: Intelligence Age (4.0)

Time Period: Emerging currently (21st Century)

- **Revolutions**: **AI Revolution**, **Biotechnology**, and **Digitalization**.
- **Society**: The AI Revolution and advances in biotechnology and virtual reality are leading to profound societal shifts. A growing convergence between human biology and technology is pushing towards more interconnected, digital, and intelligent societies.
- **Industries**: AI, biotechnology, robotics, and Industry 4.0 technologies are reshaping industries such as healthcare, automotive, manufacturing, and finance. Industries increasingly rely on big data, automation, and AI-driven decision-making to improve productivity and efficiency.
- **Technologies**: Artificial intelligence is the cornerstone of this revolution, along with the expansion of biotechnology (e.g., genetic engineering, gene therapies) and Industry 4.0 technologies such as IoT (Internet

of Things) and smart manufacturing. These technologies are enabling more efficient, data-driven, and automated business operations.

- **SMEs**: In the Intelligence Age, SMEs have increasingly relied on cutting-edge technologies to remain competitive. AI and automation help small businesses optimize operations and scale rapidly. Moreover, SMEs in fintech, biotech, and digital services are at the forefront of technological advancements.

(5) X.0 = 5.0: Human Age (5.0)

Time Period: 2020–2030 (Hypothesized Future)

- **Revolutions**: **Integration of Technology and Biology**, **Future of Work**, and **Sustainability**.
- **Society**: The Human Age focuses on the integration of advanced technologies with human biology, such as brain-machine interfaces, biotechnology, and genetic engineering. This age will likely see dramatic advancements in healthcare, human performance, and the broader ethical considerations related to technology.
- **Industries**: New industries will emerge centered around the Human-Machine Interface, biotechnologies, and environmental sustainability. Industries like personalized medicine, biotech-enhanced agriculture, and clean energy technologies will gain prominence.
- **Technologies**: The merging of digital technologies with human biology will give rise to breakthrough innovations in healthcare, AI-assisted medical treatments, advanced robotics, and personalized learning. The goal will be to use technology to enhance human potential and address global challenges like climate change, aging populations, and sustainable development.
- **SMEs**: SMEs in this phase will play a crucial role in biotech innovations, health tech, and sustainability-driven businesses. Small businesses will increasingly focus on niche markets that prioritize human well-being, sustainability, and technological integration.

Explanation of SME 5.0 and SME X.0 in SME Development (Figure 5):

The SME 5.0 and SME X.0 concepts illustrate the progression of SMEs through different stages of development, adapting to societal, technological, and sustainability needs.

SME 5.0: The Human-Centric Approach

Key Features:

- Enhanced Collaboration
- Sustainability and Ethics
- Tailored Solutions

SME X.0: The Next Evolution

Building on SMEs concept, SME X.0 envisions a more holistic model, incorporating the 7PS Framework—culture, environment, social, economy, technology, education, and politics—enhanced by the core values of peace and love for global harmony.

Key Features:

- Comprehensive Sustainability
- Adaptability and Agility
- Core Values

(6) X.0 = 6.0 and 6.0 ≤ X.0: Transhuman Age (X.0)

Time Period: Hypothetical Future

- **Revolutions**: **Radical Human Augmentation** and **Space Exploration**.
- **Society**: The Transhuman Age will see the fusion of technology and human biology at an unprecedented scale, including possibilities like human immortality, mind uploading, and deep space exploration. This age could push the boundaries of human life as we know it.
- **Industries**: Space travel, advanced biotechnology, nanotechnology, and human augmentation will dominate. Industries that focus on post-human society and longevity could become leading sectors.
- **Technologies**: Nanotechnology, genetic engineering, neural interfaces, and artificial superintelligence could define this era. Technology could enable new forms of life and existence, potentially leading to human-like robots and virtual societies.
- **SMEs**: In the Transhuman Age, SMEs may be at the forefront of breakthrough technologies. Small businesses in bioengineering, AI-driven healthcare, and space tech could drive some of the most radical shifts in human civilization.

Figure 5 illustrates the continuous evolution of human societies, industries, and technologies through various transformative waves/ages, from the Cognition & Agrarian Age to the potential Transhuman Age. The X.0 Wave Theory encapsulates how each stage builds upon previous technological, societal, and economic shifts, while also recognizing the evolving role of SMEs in driving innovation and change throughout different periods. This comprehensive framework underscores the profound impact of technology and small businesses on shaping the future of humanity.

3.2. The Waves/Ages of Civilization

The X.0 Wave/Age Theory proposes that human history can be divided into distinct waves or ages of civilization, each characterized by significant technological advancements that fundamentally change the way people live and interact with each other and their environment. The theory emphasizes the importance of innovation and technological progress in shaping human history while also acknowledging the new challenges and risks that each wave/age brings.

This framework, denoted as $f(x)$ where X represents different stages (1, 2, 3, 4, 5, 6, *etc.*), and outlines the evolution of human civilization through these transformative waves, each bringing about profound changes in how societies function and interact.

The X.0 Wave/Age Theory posits that human history can be segmented into distinct waves, each characterized by significant technological advancements that transform human interaction and societal organization. The theory currently identifies several key waves:

(The X.0 wave/age theory, $f(x)$, when X = 1,2,3,4,5,6, …).

(1) X.0 = 1.0/**Cognition & Agrarian Age (1.0):** Beginning around 500,000 to 70,000 BCE, this age saw the transition from hunting and gathering to settled agriculture, leading to the development of early civilizations [1–30]. See Figure 6.

Key Points of Figure 6:

1. Time Period: 500,000 to 70,000 BCE

This period represents the early phases of human development, where significant biological and cognitive changes occurred, setting the stage for the more complex societal and technological developments that followed.

2. Characteristics of the Cognition & Agrarian Age:

- **Pre-Wave Period:**
  Before humans began transitioning from hunting and gathering societies to settled agricultural ones, humans underwent crucial cognitive developments. During this pre-wave period, early human species evolved. These cognitive advancements were fundamental to the emergence of modern humans and their ability to adapt to and manipulate their environment.
  - Development of human intelligence.
  - Emergence of different species of humans (e.g., Homo sapiens, Homo neanderthalensis).
- **Transition from Hunting and Gathering to Agriculture**:
  One of the most significant shifts during this period was the transition from a nomadic, hunting-gathering lifestyle to settled agricultural practices. This change marked the beginning of a more sedentary existence, allowing human populations to form stable communities and, eventually, early civilizations. This agricultural revolution is the foundation of human societies.

3. Transformative Shifts in Human Societies:

- **Early Civilizations, Villages, and Cities**:
  With the advent of agriculture, humans could establish **permanent settlements**. These settlements, which eventually grew into villages and early cities, became the building blocks for more complex societal structures.
  - Communities began to form around agricultural productivity, leading to the rise of social hierarchies and trade systems.
  - The ability to cultivate crops and domesticate animals enabled surplus food production, leading to population growth and the division of labor.

Development of Social Structures:

As humans became more organized in villages and towns, early forms of government, religious systems, and trade networks began to emerge.

Key Technological and Societal Developments:

1. **Emergence of Different Human Species:**
   - **Homo sapiens** eventually emerged as the dominant human species, outcompeting other hominins like Neanderthals (Homo neanderthalensis) and Homo erectus.
2. **Cognitive Revolution:**
   - **Tool-making and Cognitive Advancements**: This period also marked significant advancements in **tool-making**, as early humans developed tools that improved their ability to hunt, gather, and eventually farm. These tools laid the foundation for future technological advancements and allowed humans to manipulate their environment to suit their needs.
3. **The Agricultural Revolution:**
   - The development of agriculture was one of the most pivotal moments in human history. Early humans transitioned from relying solely on wild food sources to actively cultivating **crops** and **domesticating animals**. This shift enabled humans to establish **settled agricultural societies**, which was a precursor to the growth of more complex civilizations.

Figure Representation:

In Figure 6, the Histomap of the X.0 Wave/Tomorrow Age Theory visually highlights the timeline of these transformations. The map likely shows the gradual development of human intelligence and the shift to agricultural societies, marking the pre-wave period and highlighting the beginning of permanent settlements and civilizations.

The figure may also include markers for significant developments in:

- **Biological evolution**: Early species and cognitive shifts.
- **Technological innovations**: Tool-making, fire use, and agricultural techniques.
- **Societal changes**: Formation of villages, cities, and basic governance structures.

Figure 6 serves as a visual timeline of the Cognition & Agrarian Age (X.0 = 1.0), focusing on the foundational shifts in human society from pre-human cognitive evolution through the emergence of agriculture and the formation of early settlements. This age marks the first major turning point in human history, laying the foundation for the development of complex societies, industries, and technologies in subsequent ages. The diagram encapsulates the interplay between biological evolution, technological progress, and societal transformations that set the stage for the subsequent ages of human development.

(2) X.0 = 2.0/**Industrial Age (2.0):** Spanning the 17th–18th centuries, marked by steam power, mechanization, and the rise of factories, which revolutionized mass production and urbanization [1–30]. See Figure 7.

- **Time Period**: 17th–18th centuries
- **Characteristics**:
  1. Marked by steam power, mechanization, and the rise of factories.
  2. Revolutionized mass production and urbanization.
  3. Revolutionizing production and commerce.

Figure 7: Histomap of the X.0 Wave/Tomorrow Age Theory (X.0 = 2.0—Industrial Age).

Figure 7 represents the Industrial Age (X.0 = 2.0), which spans from the 17th to 18th centuries, and further breaks down into the First and Second Industrial Revolutions. This figure likely offers a visual mapping of the key technological and societal shifts during the Industrial Age, highlighting the pivotal role that steam power, mechanization, and factories played in transforming human civilization.

Key Characteristics of X.0 = 2.0 (Industrial Age):

1. **Steam Power and Mechanization:**
   - **Introduction of Steam Power**: The Industrial Age began with the introduction of steam engines, which significantly changed the way goods were produced and transported. Steam engines powered everything from factory machinery to steamships and trains, enabling the rapid movement of goods and people over long distances.

- **Mechanization**: The rise of mechanical tools and machinery to replace manual labor led to the mass production of goods. This mechanization improved efficiency, reduced costs, and allowed for the large-scale manufacturing of products like textiles, iron, and later steel.

2. **Rise of Factories:**
   - Factories became the central hubs of production, leading to the development of urban centers. The factory system organized workers, resources, and machines under one roof, allowing for specialized tasks and **economies of scale** that significantly increased productivity.
3. **Revolutionizing Mass Production and Urbanization:**
   - The combination of steam power, mechanization, and factories led to the mass production of goods. Items that once took weeks to produce by hand were now made in bulk at much faster rates.
   - This revolution led to rapid urbanization, as people moved from rural areas to cities in search of factory jobs. Cities expanded quickly, and the rise of industrial economies gave birth to a new social order, with workers, factory owners, and entrepreneurs forming the backbone of the economy.

Subdivisions of the Industrial Age:

X.0 = 2.1—First Industrial Revolution (1760–1840):

- **Time Period**: The First Industrial Revolution occurred roughly from 1760 to 1840, marking a period of intense technological and economic change.
- **Key Developments**:
  - **Steam Power**: The widespread use of steam engines revolutionized transportation (steamships and railways) and factory production.
  - **Mechanization**: The development of machinery for industries like textiles and iron led to the replacement of manual labor with machine-driven production.
  - **Growth of Factories**: The factory system emerged, centralizing production in urban areas and creating a new class of industrial workers.
  - **Economic Growth**: The First Industrial Revolution laid the groundwork for rapid economic expansion, with increases in manufacturing and output.

X.0 = 2.2—Second Industrial Revolution (Late 19th Century):

- **Time Period**: The Second Industrial Revolution began in the late 19th century and continued into the early 20th century.
- **Key Developments**:
  - **Electricity and Steel Production**: The introduction of electricity powered new forms of industrial machinery and lighting, while innovations in steel production enabled the building of stronger, more durable infrastructures, like bridges and skyscrapers.
  - **Chemical Industry**: The rise of the chemical industry brought about significant advancements in manufacturing, including the production of synthetic materials, pharmaceuticals, and fertilizers.
  - **Mass Production and the Assembly Line**: The late 19th century saw the emergence of mass production techniques, especially with the introduction of the assembly line by figures like Henry Ford. This system greatly enhanced production speed and efficiency, making goods available at much lower prices.
  - **Further Urbanization**: The expansion of factories and industries led to more rapid urbanization, with people flocking to cities in search of work. The new industrial cities became hubs of innovation and commerce.

Histomap Representation in Figure 7:

- **Figure 7** likely maps out the First and Second Industrial Revolutions with clear visual markers, providing a timeline of the technological advancements and the social changes that occurred from the 17th century through to 1870.
- It may show the development of key industries, such as textiles, iron, steel, and chemicals, as well as the geographic spread of industrialization across Europe, the Americas, and later to other parts of the world.
- The expansion of transportation networks (railroads, steamships) and the creation of new cities are likely highlighted, showing how industry transformed not just economies but entire societies.

Figure 7 illustrates the Industrial Age (X.0 = 2.0), breaking it down into two significant phases: the First Industrial Revolution (1760–1840) and the Second Industrial Revolution (late 19th century). This diagram emphasizes how steam power, mechanization, and factories fundamentally reshaped human societies through technological progress, mass

production, and urbanization. It demonstrates how these changes laid the groundwork for the modern industrial economy and created the foundation for the technological advancements that followed in later ages.

(3) X.0 = 3.0/**Information Age/Post Industrial Age (3.0):** Emerging in the 20th century, characterized by the digital revolution, computers, and the internet, transforming communication and information sharing [1–37,43,44]. See Figure 8.

- **Time Period**: 20th century (1969–1970)
- **Characteristics**:
    1. Before 1970, businesses held significant sway over technologies, particularly Information Technology (IT). However, after 1970, technologies, especially IT, gained the upper hand, exerting influence, dominance, and control over businesses, economies, and even human life and civilization.
    2. This marked a profound shift in the power dynamics, where technological advancements became pivotal drivers shaping various aspects of society, commerce, and human existence.
    3. Globalization and the digital revolution.
    4. Characterized by the digital revolution, computers, and the internet.
    5. Transformation of communication and information sharing.
    6. Rise of knowledge-based industries and the globalization of the economy.
    7. ARPANET (1969): Creation by the Massachusetts Institute of Technology (MIT) as a key development, leading to the birth of the modern internet and revolutionizing global communication.

Figure 8: X.0 = 3.0/Information Age/Post-Industrial Age (3.0).

Figure 8 represents the Information Age (also known as the Post-Industrial Age) under the X.0 = 3.0 framework, a transformative period that began in the 20th century and was marked by the rise of digital technologies, such as computers, the internet, and the digital revolution. This figure highlights how the advent of new information technologies radically shifted the way societies function, economies operate, and individuals communicate.

Key Characteristics of X.0 = 3.0 (Information Age/Post-Industrial Age):

1. Shift in Power Dynamics (Before and After 1970):

- Before 1970, businesses were the primary drivers of technological advancements, particularly in fields like Information Technology (IT). Corporations and industries controlled the development and use of technologies, leveraging them to enhance productivity and profitability.
- After 1970, however, a profound shift occurred, where technologies, especially information technology, began to exert significant influence over businesses, economies, and human life. This shift meant that technology was no longer just a tool for businesses to use but instead became a powerful driver of societal and economic change, with technology influencing and shaping the development of industries, economies, and even culture.

2. Globalization and the Digital Revolution:

- The Information Age is closely associated with the digital revolution, where computers and information technology became the backbone of the global economy. This led to the globalization of trade, commerce, and communication, as new digital platforms enabled instantaneous communication and data exchange across the globe.
- Technologies like computers and the internet have made it easier for businesses to operate across borders, connect with international markets, and collaborate globally. This era also witnessed the rise of global supply chains, where goods and services are produced, distributed, and consumed across international boundaries, significantly changing the global economic landscape.

3. Transformation of Communication and Information Sharing:

- One of the most profound aspects of the Information Age was communication transformation. With the widespread adoption of computers, email, and eventually the internet, the way people interacted with each other and shared information changed dramatically.
- The internet and the advent of digital communication platforms (e.g., email, instant messaging, social media) revolutionized how people connected, making communication faster, more efficient, and accessible globally. The ability to share information instantly across vast distances marked a huge leap from the slower, traditional forms of communication such as postal mail and telephones.

4. Rise of Knowledge-Based Industries:

- As information technologies advanced, the global economy shifted from being primarily industrial and manufacturing-based to one centered around knowledge-based industries. These industries focus on producing and distributing information, ideas, and intellectual property rather than physical goods.
- **Knowledge work**—such as software development, digital marketing, data analysis, and content creation—became central to the economy. This shift led to the growth of new sectors like the tech industry, finance, education, and consulting, all of which heavily rely on digital tools and information technologies to function.

5. ARPANET and the Birth of the Modern Internet:

- **ARPANET**, developed by the Massachusetts Institute of Technology (MIT) in 1969, is one of the most significant milestones in the creation of the internet. Originally designed as a military communications network, ARPANET connected computers across universities and research institutions, facilitating data sharing and research.
- The development of ARPANET and subsequent advancements in computer networking laid the foundation for the modern internet, which began to take shape in the 1970s and 1980s. By the 1990s, the World Wide Web (WWW) emerged, turning the internet into a global communication and information-sharing platform. This development has since revolutionized how we access and share knowledge, conduct business, and interact socially.
- Figure 8 maps out the key elements of the Information Age/Post-Industrial Age (X.0 = 3.0), highlighting the shift in power dynamics from businesses controlling technology to technology itself becoming the driving force in society. The rise of computers, the internet, and the digital revolution transformed how information was shared and communicated, leading to the globalization of economies and societies.
- The birth of ARPANET and the eventual development of the internet laid the groundwork for the information-centric global economy, where knowledge-based industries became dominant.

The Information Age, or Post-Industrial Age, marks the transition to an era where technology not only serves businesses but also fundamentally reshapes human interaction, commerce, and society as a whole.

(4) X.0 = 4.0/**Intelligence Age (4.0):** Defined by the widespread adoption of artificial intelligence, biotechnology, and digitalization, fundamentally altering all aspects of life and work [1–30]. See Figure 8.

- **Time Period**: Emerging currently
- **Characteristics**:
    1. Characterized by artificial intelligence (AI), biotechnology, and virtual reality. (VR), transforming industries and daily life, and the Future of Work
    2. Widespread adoption of AI, VR, Industry 4.0, Society 5.0, biotechnology, and digitalization.
    3. Fundamental alteration of all aspects of life and work.
    4. Integration of advanced technologies into various sectors of the economy.

Figure 8: X.0 = 4.0/Intelligence Age (4.0).

Figure 8 outlines the Intelligence Age (X.0 = 4.0), the next transformative phase in human history. Currently emerging, this age is characterized by the widespread adoption of cutting-edge technologies such as artificial intelligence (AI), biotechnology, and digitalization. These technologies are reshaping how societies operate, how industries function, and how individuals experience daily life and work.

Key Characteristics of X.0 = 4.0 (Intelligence Age):

1. Transformation through Artificial Intelligence (AI), Biotechnology, and Virtual Reality (VR):

- The Intelligence Age is largely defined by the transformative impact of AI, biotechnology, and virtual reality (VR) across all sectors of life.
- AI has begun to play a crucial role in automating tasks, improving decision-making, and enabling new forms of personalized services across industries such as healthcare, finance, and education.
- Biotechnology is advancing rapidly, with applications in genetic engineering, gene editing (e.g., CRISPR), and biomedicine offering new possibilities for improving health and extending human lifespan.
- Virtual Reality (VR) and augmented reality (AR) are transforming how individuals interact with information and the world around them, offering immersive experiences that have applications in fields such as training, entertainment, and medicine.

2. Widespread Adoption of Advanced Technologies:

- The Intelligence Age is characterized by the widespread adoption of multiple breakthrough technologies transforming everyday life. AI, Industry 4.0 (the fourth industrial revolution focused on automation, data exchange, and IoT), Society 5.0 (a human-centric society driven by technology), and digitalization are at the forefront of this transformation.
    - AI is enabling automation at an unprecedented scale, impacting industries such as manufacturing, transportation, and customer service, with machines now able to perform tasks traditionally done by humans, from driving cars to diagnosing medical conditions.
    - Industry 4.0 introduces smart factories where machines, sensors, and robots interact in real-time, enhancing productivity and efficiency. It integrates IoT (Internet of Things) devices and big data analytics to optimize manufacturing processes.
    - Society 5.0, particularly in countries like Japan, envisions a society where technology serves humanity by solving complex challenges like aging populations and urbanization, improving sustainability and quality of life.

3. Fundamental Alteration of All Aspects of Life and Work:

- The Intelligence Age is fundamentally changing all aspects of life and work. From healthcare to education, transportation to entertainment, no sector remains untouched by these advancements.
    - **Work**: AI, automation, and robotics are transforming the future of work, with jobs in routine and manual tasks increasingly being replaced by intelligent systems. At the same time, new job categories are emerging, especially in AI development, data science, and robotics.
    - **Lifestyle**: People's daily lives are being redefined with technologies such as smart homes, wearables, and AI-powered personal assistants that make daily activities more efficient and personalized. Additionally, biotechnology offers the potential for enhanced health and longevity through personalized medicine and genetic therapies.

4. Integration of Advanced Technologies into Various Sectors:

- The Intelligence Age sees advanced technologies becoming integral parts of multiple sectors within the global economy:
    - **Healthcare** is embracing AI for diagnostics, biotechnology for new treatments and therapies, and wearables for real-time health monitoring.
    - **Transportation** is undergoing a revolution with autonomous vehicles, electric cars, and drone delivery systems, all powered by AI and IoT.
    - **Education** is moving towards personalized learning with the help of AI-driven platforms that adapt to students' needs and progress.
    - **Entertainment** is being revolutionized by virtual reality (VR) and augmented reality (AR), creating fully immersive experiences in gaming, film, and training simulations.
- Figure 8 depicts the Intelligence Age (X.0 = 4.0), a phase currently emerging and defined by the pervasive presence of AI, biotechnology, and digitalization.
- This age is defined by a dramatic shift in how humans interact with technology, with AI at the forefront, automating tasks and enhancing decision-making, while biotechnology and VR redefine healthcare and human experiences. Advanced technologies are integrated across various sectors, altering how industries function and how people live and work. The age heralds a future where intelligent systems, smart technologies, and biotech will continuously reshape the fabric of society and civilization.

In this age, the distinction between human and machine labor, as well as the boundaries between the physical and digital realms, are becoming increasingly blurred. This era promises profound changes in how we live, work, and interact with each other and the environment.

(5) X.0 = 5.0/**Human Age (5.0):** Hypothesized future wave focusing on the integration of technology and human biology, leading to significant advances in healthcare and human performance [1–30]. See Figure 8.

- **Time Period**: From the first edge of tomorrow (2020–2030), hypothesized future wave.
- **Characteristics**:
    1. Focus on the integration of technology and human biology.

2. Development of biotechnology, genetic engineering, brain-machine interfaces, consciousness, and beyond
3. Significant advances in healthcare and human performance.
4. Emphasis on environmental sustainability, social justice, and human well-being.
5. Combination of the future of Industry 4.0 as the symbol of Western culture (which is called Industry 5.0) and future of the Society 5.0 (which is called Society 6.0) as the symbol of non-Western culture.
6. Envisions the integration of technology into biology, promising advances in healthcare and human performance, with a focus on sustainability and social justice.
7. Proposes a comprehensive framework to address future challenges.
8. Concepts related to Industry 5.0, Society 6.0, Urban 6.0 (Utopia), Entrepreneurship 5.0, Edu 5.0, Welfare 5.0, and SME 5.0.

Figure 8: X.0 = 5.0/Human Age (5.0).

Figure 8 outlines the Human Age (X.0 = 5.0), which is a hypothesized future wave of civilization. This wave is expected to occur from the first edge of tomorrow (2020–2030) and will center around the integration of technology with human biology. It envisions a transformative era that leads to remarkable advancements in healthcare, human performance, and biotechnology while addressing pressing global challenges such as environmental sustainability and social justice.

Key Characteristics of X.0 = 5.0 (Human Age):

1. Focus on the Integration of Technology and Human Biology:

- The Human Age is defined by the fusion of biotechnology and human biology. It marks a new frontier where technology doesn't just complement human biology but is integrated into it at a fundamental level.
  - Technologies like genetic engineering, brain-machine interfaces, and neurotechnology are expected to enable humans to augment their biological capabilities, extend life, improve cognitive functions, and enhance physical performance.
  - The development of technologies that enable human enhancement (e.g., through implants, cybernetics, or genetic modifications) may revolutionize how humans approach their physical and cognitive limits.

2. Development of Biotechnology, Genetic Engineering, and Brain-Machine Interfaces:

- Biotechnology and genetic engineering will likely play pivotal roles in this age, with advances in CRISPR and other gene-editing tools enabling the modification of human genes to treat diseases, enhance physical traits, or even introduce entirely new capabilities.
- Brain-machine interfaces (BMIs) will allow for direct communication between the human brain and computers, enabling new forms of interaction with technology. This could potentially lead to enhanced cognitive abilities, mind-controlled devices, and even the development of artificial consciousness.
- The focus on consciousness and beyond suggests that new ways of understanding and possibly manipulating human consciousness will emerge, opening possibilities for merging human identity with technology.

3. Significant Advances in Healthcare and Human Performance:

- Healthcare will see radical advancements in the Human Age, with innovations driven by biotechnology, AI, and data analytics. Personalized medicine—tailoring medical treatment to the individual's genetic makeup—will become the norm, resulting in better outcomes and more efficient healthcare systems.
- Human performance will be greatly enhanced through technological integration, enabling individuals to reach physical and mental levels of performance previously unimaginable. This may include smart prosthetics, enhanced vision, and genetic modifications that increase strength or endurance.

4. Emphasis on Environmental Sustainability, Social Justice, and Human Well-Being:

- As we move into the Human Age, there will be a heightened focus on sustainability and social justice. The integration of technology into human biology will not only focus on enhancing human performance but also on ensuring that technological advancements contribute to a better quality of life for everyone.
- This may involve the development of sustainable technologies that help mitigate environmental damage, reduce waste, and promote renewable energy sources. It will also likely include a societal shift toward addressing inequality and poverty, and ensuring fair access to the benefits of these advanced technologies.

5. Industry 5.0 and Society 6.0:

- The Human Age envisions the next stage in industrial and societal evolution:

- **Industry 5.0** represents the evolution of Industry 4.0 (the smart manufacturing era driven by automation, IoT, and AI) but with a greater emphasis on human-centric approaches, personalization, and the well-being of workers. It is about combining the capabilities of advanced technology with human skills and creativity to deliver products and services that benefit society.
- **Society 6.0** is seen as the evolution of Society 5.0 (which focuses on creating a human-centered society where technology enhances the quality of life). Society 6.0 will likely combine non-Western cultural values with technological advancements to create a more inclusive, equitable society.

6. Comprehensive Framework for Future Challenges:

- The Human Age proposes a comprehensive framework for addressing future challenges. This framework is built on integrating human biology with technology while emphasizing the values of sustainability, equality, and human well-being.
- This approach will involve collaboration across industries and cultures to ensure that future technological innovations serve the common good of humanity and contribute to creating a sustainable world for future generations.

7. Concepts Related to Industry 5.0, Society 6.0, and Beyond:

- The Human Age introduces several evolving concepts, including:
  - **Entrepreneurship 5.0**: The idea of creating businesses that not only focus on profit but also contribute to social good, sustainability, and innovation in a human-centered way.
  - **Edu 5.0**: A vision for education that focuses on teaching skills for the future, including those needed to operate in a technologically augmented society.
  - **Welfare 5.0**: A social system that provides comprehensive support, leveraging technology to ensure fair distribution of resources and care for individuals in society.
  - **SME 5.0**: Small and medium enterprises (SMEs) that adopt advanced technologies to enhance their capabilities, making them more agile, innovative, and sustainable.
- Figure 8 presents the Human Age (X.0 = 5.0) as a hypothetical future wave of civilization, centered on the integration of technology and human biology. This age will likely bring revolutionary advances in healthcare, human performance, and technological capabilities that enhance human capabilities.
- The key characteristics of this age include the development of technologies such as biotechnology, genetic engineering, and brain-machine interfaces, as well as a focus on environmental sustainability, social justice, and human well-being.
- This age also anticipates the emergence of Industry 5.0, Society 6.0, and other cultural shifts, all designed to create a more human-centered, equitable, and sustainable future. Through this integration of human and technological systems, the Human Age envisions a future where technology and biology seamlessly work together to solve humanity's greatest challenges and enhance the human experience.

(6) X.0 = 6.0 and 6.0 ≤ X.0 /**Transhuman Age (X.0):** A future wave where technology and biology merge, potentially leading to radical changes such as human immortality and space exploration [1–30].

- **Time Period**: Hypothesized future wave
- **Characteristics**:
  1. Merging of technology and biology, transcending human limitations.
  2. Potential for radical changes such as human immortality and space exploration.
  3. Emphasis on understanding and anticipating the impacts of technological advancements.
  4. Exploring immortality, space exploration, and navigating the transhuman frontier.
  5. Related concepts include Industry X.0, Society X.0, Urban X.0 (Future Utopia), Entrepreneurship X.0, Edu X.0, Welfare X.0, SME X.0, and Transhuman.

The X.0 Wave/Age Theory emphasizes the importance of innovation and technological progress in shaping human history. It suggests that each wave builds upon the achievements of the previous one while introducing new challenges and risks. This framework highlights the need for businesses to adapt to new technologies to thrive in an evolving landscape. It underscores the significance of responsible innovation to ensure these advancements benefit humanity.

By understanding and anticipating the potential impacts of technological advancements, the X.0 Wave/Age Theory encourages individuals and organizations to embrace change and prepare for future challenges and opportunities. This article explores these themes, providing insights into the ongoing and future transformations driven by the X.0 Wave/Age Theory [1–30].

Figure 9: X.0 = 6.0/6.0 ≤ X.0 and the Transhuman Age (X.0).

Figure 9 outlines the Transhuman Age (X.0 = 6.0), which is a hypothesized future wave of civilization characterized by the merging of technology and biology, potentially leading to radical changes such as human immortality and space exploration. This age represents an evolutionary leap where humans transcend their biological limitations and enter an era where advanced technologies fundamentally alter the nature of existence itself.

Key Characteristics of X.0 = 6.0 (Transhuman Age):

1. **Merging of Technology and Biology, Transcending Human Limitations:**
   - The Transhuman Age is defined by the fusion of technology and biology, where advanced technologies such as artificial intelligence, nanotechnology, genetic engineering, and cybernetics become integrated into human biology at a profound level.
   - This merging could result in humans transcending their natural biological limits, such as aging, disease, and even mortality. The concept of human enhancement becomes central, where humans not only augment their physical and mental abilities but also redefine the very nature of being human.
   - For example, technologies could help humans overcome the aging process, eliminate genetic diseases, or even enhance cognitive and physical abilities beyond the current limits of biology.
2. **Potential for Radical Changes: Human Immortality and Space Exploration:**
   - The Transhuman Age presents the potential for radical transformations in human existence, particularly with concepts such as:
     - **Human Immortality**: Through advancements in biotechnology, genetic modification, and nanomedicine, the idea of achieving immortality—or at least dramatically increasing human lifespan—becomes conceivable. This could involve eliminating the cellular processes that lead to aging or replacing failing organs with bio-engineered or synthetic ones.
     - **Space Exploration**: The merging of technology and biology could also enable human space travel beyond our solar system, possibly facilitating the colonization of distant planets or intergalactic exploration. Advances in space travel technologies, paired with human enhancement, could make it possible for humans to survive in harsh extraterrestrial environments or travel vast distances in space.
3. **Emphasis on Understanding and Anticipating the Impacts of Technological Advancements:**
   - While the Transhuman Age holds great promise, it also brings complex ethical, social, and philosophical challenges. It emphasizes the need to understand and anticipate the impact of these radical technological advancements on individuals, societies, and the environment.
     - How will human identity and social structures evolve when individuals can enhance their physical and mental capabilities?
     - What ethical considerations arise from technologies that allow humans to extend life indefinitely or modify their genetics?
4. **Exploring Immortality, Space Exploration, and the Transhuman Frontier:**
   - The Transhuman Age envisions exploring new frontiers in both human existence and the universe. This includes exploring concepts like immortality through radical medical breakthroughs or developing humanity's capabilities for long-term space exploration.
     - For example, biological immortality could lead to entirely new ways of thinking about life, death, and what it means to be human.

In this context, space exploration may not only involve reaching Mars or the Moon but also exploring the possibilities of human expansion to other star systems, using enhanced human capabilities to survive and thrive in deep space.

5. **Related Concepts in the Transhuman Age: Industry X.0, Society X.0, and Beyond:**
   - The Transhuman Age will give rise to new conceptual frameworks that will shape the future of industries, societies, and humanity as a whole. These include:
     - **Industry X.0**: A concept that transcends the Industrial Revolution, marking an era where advanced technologies shape industries in new and profound ways. This could involve technologies that enable autonomous production, genetically tailored goods, or even the full integration of AI-driven industries.

- **Society X.0**: A vision of society where traditional concepts of social, political, and economic systems are overhauled by technological advances. The fusion of technology with biology could reshape social systems, governance, and the very structure of human society itself.
- **Urban X.0 (Future Utopia)**: The concept of a future utopia where technology creates ideal urban environments that prioritize human well-being, sustainability, and interconnectedness. This could include cities with advanced AI systems, biotech-enhanced infrastructure, and smart living environments.
- **Entrepreneurship X.0**: A new model of business and entrepreneurship in a world dominated by technology and biotechnology, where new opportunities arise to create human-centered innovations.
- **Edu X.0**: A transformative approach to education, where learning is driven by AI, virtual reality, and bio-enhancements. Education X.0 would prepare individuals for a society that is increasingly reliant on advanced technologies.
- **Welfare X.0 and SME X.0**: The reimagining **of welfare systems and small-medium enterprises (SMEs) to fit into this new technological framework**, where human capabilities are augmented and businesses adapt to new realities and technologies.

6. Understanding the X.0 Wave/Age Theory:

- X.0 Wave Theory underlines the critical role of technological innovation in shaping human history and society. It highlights that each wave of advancement builds upon the achievements of the previous one while also introducing new challenges and risks.
- Adapting to these emerging technologies is essential for thriving in this evolving landscape. Moreover, the need for responsible innovation will be key to ensuring that the advances in biotechnology and transhumanism benefit humanity as a whole, rather than exacerbating inequality or social division.

Figure 9 presents the Transhuman Age (X.0 = 6.0/6.0 ≤ X.0) as the next frontier in human evolution, marked by the profound merging of technology and biology. This wave could enable radical changes such as human immortality, the potential for space exploration, and the transcendence of human limitations.

- Key characteristics of this age include the integration of AI, biotechnology, and cybernetics to reshape human life fundamentally.
- The age will bring about new industries, societies, and cultural systems (e.g., Industry X.0, Society X.0), where technology drives the transformation of human existence. In contrast, new frameworks will need to address ethical concerns, social changes, and the responsible application of these advancements.
- As we move into this future, it is crucial to understand and anticipate the impacts of such technologies on humanity, focusing on ensuring that these radical transformations are beneficial for all.

3.3. Envisioning the Future

In this theory, and based on the 7PS model, readiness for the first edge of tomorrow, which is from 2020–2030, is posited through:

(1) **Forecasting**: Utilizing comprehensive data analysis and predictive models to anticipate future trends and challenges.
(2) **Prevention**: Implementing proactive measures to mitigate potential risks and prevent crises.
(3) **Facing Today's Challenges and Tomorrow's Crises**: Developing robust strategies to address current issues and preparing adaptive responses for future disruptions.

3.4. Addressing Today's Challenges and Tomorrow's Crises

The Tomorrow's Crises Chain in the X.0 Wave/Age theory highlights interconnected risks across the seven pillars of sustainability, alongside external shocks like pandemics, environmental disasters, and technological disruptions. These cascading risks can amplify one another, potentially leading to catastrophic outcomes if not effectively managed. See Figure 10.

Key Risks in the Crises Chain:

1. Risks Related to the Seven Pillars of Sustainability (7PS):
2. Health and Pandemic Risks (e.g., COVID-19)
3. Environmental Disasters in Remote Regions
4. Nuclear and Technological Risks

5. Risk of the "Domino Effect":

A critical element of the chain is the consequence amplification where one crisis intensifies others.

The Need to Prevent the Crises Chain from Merging:

The theory stresses that the convergence of these crises into a unified chain must be avoided at all costs. Allowing them to align could result in catastrophic outcomes for humanity. Strategies must focus on:

1. Risk Splitting
2. Collaboration and Governance
3. Proactive Sustainability

The X.0 Wave Theory, also known as the Tomorrow Age Theory or the Theory of Comprehensive Everything, offers a comprehensive framework for understanding, forecasting, preventing, and addressing the complex challenges of today and the crises of tomorrow. It aims to offer comprehensive readiness for tomorrow's sustainable energy challenges, crises, and concerns, particularly focusing on the decade from 2020 to 2030. This theory is designed to harness opportunities associated with sustainable development while addressing today's challenges and tomorrow's crises. Key areas of concern include: See Figure 11.

(1) **Risk of COVID-19 Contagion**
(2) **Biological Attack Contagion**
(3) **Economic Shifts and Recession Risks**
(4) **Social Anxiety Crises**
(5) **Greenhouse Gas Emissions and Climate Pollution**
(6) **Climate Change Crises**
(7) **Technological Crises**
(8) **Biodiversity Collapse.**

3.5. Addressing Future Concerns

The X.0 Wave Theory not only charts the progress of human civilization but also provides a roadmap for navigating future crises and challenges. By examining past waves and forecasting future trends, this theory aims to ensure a comprehensive and sustainable approach to development, addressing the immediate risks and preparing for the unforeseen crises of tomorrow.

By integrating insights from past publications, conferences, and ongoing research projects, the X.0 Wave Theory offers a robust framework to understand and tackle the multifaceted challenges of today's world and the uncertainties of the future, ensuring a sustainable and resilient path forward.

This comprehensive strategy lays the foundation for a resilient and sustainable future, equipped to navigate the complexities of an ever-evolving technological landscape. Key elements include:

- **AI and Automation:** Harnessing the transformative power of artificial intelligence and automation to redefine industries and enhance societal functions while addressing ethical and workforce challenges.
- **Cultural Dynamics:** Acknowledging the pivotal role of cultural contexts in shaping the adoption of technology and driving societal evolution, ensuring inclusivity and respect for diverse perspectives.
- **Global Collaboration:** Strengthening international partnerships to address shared challenges and maximize the benefits of technological advancements for all, fostering equity and global prosperity.
- **Foresight and Preparedness:** Developing forward-looking scenarios to anticipate emerging trends, mitigate potential disruptions, and safeguard humanity's resilience and sustainability in the face of uncertainty.

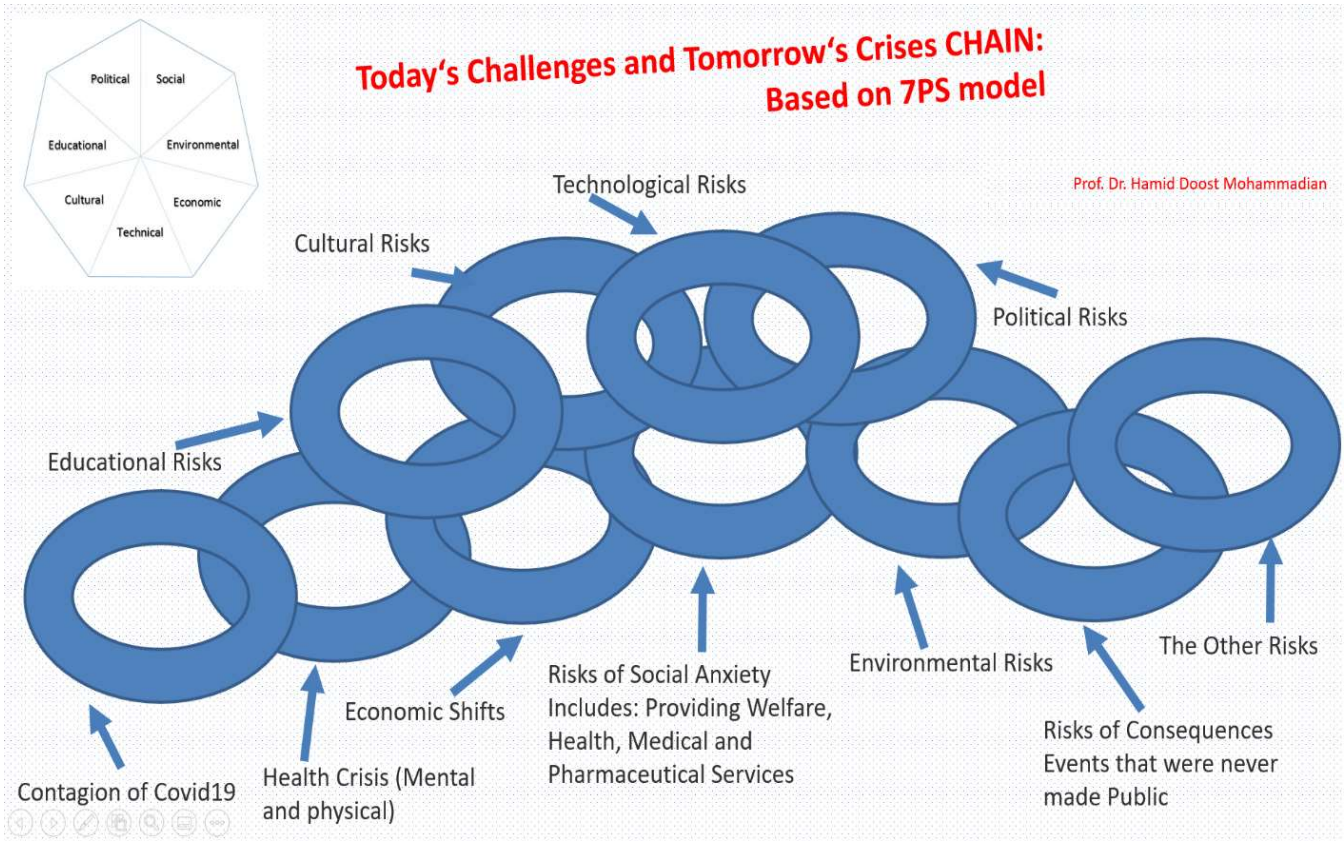

Figure 10. Tomorrow's crises chain at the first edge of tomorrow at the X.0 wave/age (X.0 = 5.0) theory [5,6,29,30].

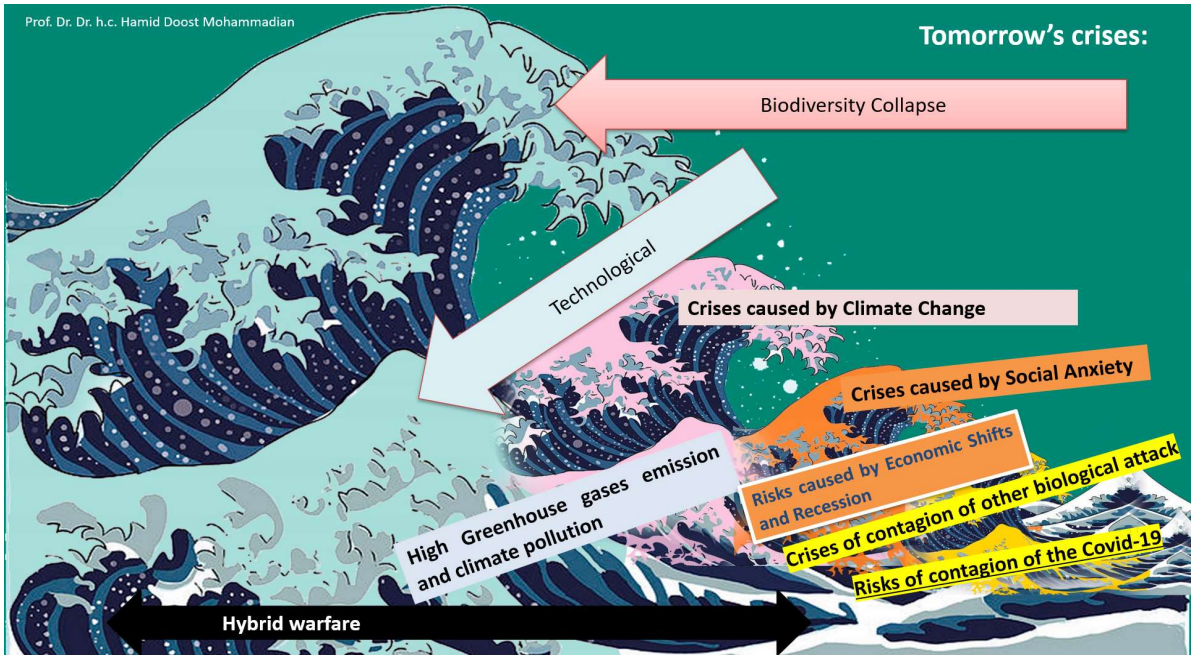

Figure 11. Tomorrow's crises waves at the first edge of tomorrow at the X.0 wave/age (X.0 = 5.0) theory [5,6,29,30].

By addressing these dimensions, this article aims to provide a comprehensive understanding of the X.0 Wave Theory's impact on knowledge, technology, and business and to offer insights into the future challenges and opportunities it presents.

Table 1 outlines the method for calculating the composite sustainability index (Si = $f(x)$), which integrates the probability (Pi), impact (Ii), and normalized ratio (ri Normal) of each pillar. This approach is based on the methodology established in [1–8], which serves as the primary source for the framework, while additional sources [2–30] provide supplementary data and validation for these metrics. The use of Pi, Ii, and ri Normal allows for a nuanced assessment of sustainability that accounts for the likelihood of impact, the significance of each pillar, and standardized comparative values across different contexts.

Table 1. The table describes how to measure sustainability based on the impact (i), probability (p) and ratio (r) of each pillar presented on Figures 1 and 2 [1–30].

Index	Description	Row
Si/*f*(*x*)	Composite sustainability index calculated by aggregating the probability (Pi), impact (Ii), and normalized ratio (ri Normal) for each pillar. Formula Si = $f(x) = \sum_{i=1}^{n}(\text{Pi} \times \text{Ii} \times \text{ri Normal})$ This index evaluates the overall sustainability impact of a set of pillars.	1
Pi	Probability of each pillar's influence on sustainability, determined through historical analysis, predictive modeling, or expert evaluation. A value close to 1 indicates high certainty in its positive effect, while 0 indicates no effect. Ranges from 0 (no impact) to 1 (certain impact).	2
Ii	Impact level of each pillar on sustainability, representing the magnitude or significance of its influence. Rated on a scale from 1 (minimal impact) to higher values indicating substantial impact.	3
ri Normal	Normalized ratio for each pillar that adjusts for external and comparative factors to standardize measurements across different pillars. Values range from 0 (poor conditions) to 1 (optimal conditions) for sustainability.	4
$\mathbf{Si} = f(x) = \sum_{i=1}^{n}(\mathbf{Pi} \times \mathbf{Ii} \times \mathbf{ri\ Normal})$		

- **Si/*f*(*x*):** The composite sustainability index (Si = *f*(*x*)) aggregates the product of the probability (Pi), impact (Ii), and normalized ratio (ri Normal) for each pillar to provide an overall sustainability score. This metric reflects the combined effect of each pillar's likelihood of impact, significance, and standardized measurement across comparative factors. The method of calculating Si follows the framework detailed in the source [1] and is supported by additional insights from sources [2–30]. The use of Pi, Ii, and ri Normal ensures that each pillar's influence is measured fairly and comprehensively, supporting decision-making processes for sustainable development.
- **Ranges:**
  - **Pi (Probability):** A value close to 1 signifies a high probability of the pillar affecting sustainability positively, while a value near 0 suggests minimal probability.
  - **Ii (Impact):** Higher values indicate a more substantial positive or negative effect on sustainability, with lower values representing a minimal impact.
  - **ri Normal (Normalized Ratio):** Values are adjusted to standardize across pillars, ensuring comparisons are consistent and relevant to the overall sustainability assessment.

4. Results and Discussion

4.1. Application of the 7PS Model to a Sustainable Future for KTB (Knowledge, Technology, and Business) and Human Life Through the X.0 Wave Theory

The X.0 Wave Theory, also known as the Tomorrow Age Theory or the Theory of Comprehensive Everything, offers a robust framework for understanding, forecasting, and addressing the complex challenges and crises of both today and tomorrow. By integrating the 7PS model (Cultural, Environmental, Social, Economic, Technological, Educational, Political) and embracing the integral values of PEACE and LOVE, we can guide sustainable development across Knowledge, Technology, and Business (KTB) sectors and human life. The following discussion demonstrates how the 7PS model can be applied to achieve a sustainable future through the X.0 Wave Theory, prioritizing the dimensions as identified by the Fuzzy-AHP method. See Figures 2 and 3.

Table 2 presents the ranking of the 7PS model indicators using the Fuzzy Analytic Hierarchy Process (Fuzzy AHP), providing a comprehensive assessment of the key dimensions required for achieving sustainability within the Knowledge, Technology, and Business (KTB) sectors. The prioritization was determined through expert pairwise comparisons and the subsequent computation of weights for each indicator, following the methodology outlined in [1]. This source serves as the primary reference for the Fuzzy AHP approach used in this study.

Table 2. Ranking of 7PS Model indexes based on Fuzzy AHP [1–30].

7PS Model Indicators	Source	Rank
Economic	0.324	4
Social	0.353	3
Environmental	0.382	2
Technical	0.251	5
Cultural	0.481	1
Educational	0.221	6
Political	0.175	7

The process involved defining the decision problem, conducting pairwise comparisons, and calculating the consistency ratio (CR) to verify the reliability of the results. The fuzzy weights and final prioritization of each dimension were derived from expert responses, which were processed and validated using AMOS software (Amos 26.0).

As shown in Figure 12 from [1], the Fuzzy AHP steps were structured to facilitate pairwise comparisons and assess the consistency of expert inputs. The output in Table 2 reflects the relative importance of each 7PS dimension based on their contributions to sustainable development and innovation in the KTB sectors.

The indicators evaluated include Cultural, Environmental, Social, Economic, Technological, Educational, and Political factors. Each of these was assessed based on expert feedback and verified through the Fuzzy AHP approach. This method, known for its ability to incorporate linguistic variables, enables nuanced ranking and robust decision-making in sustainability evaluations, as validated by [1].

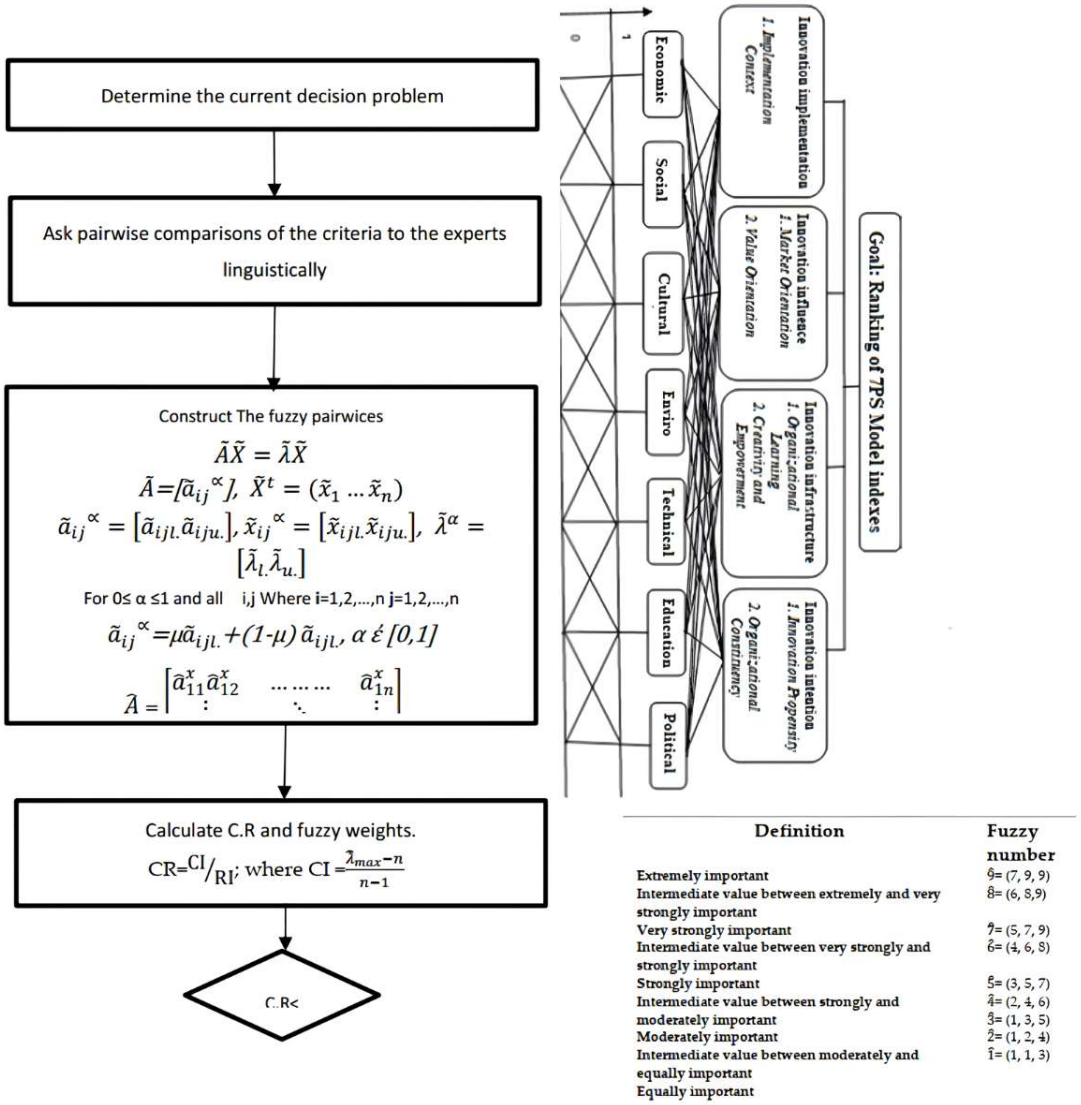

Figure 12. Steps Fuzzy AHP [1].

4.2. Sources for Validation and Supplementary Data

The rankings in Table 2 are further validated using additional data from sources [2–30], which include empirical studies, case analyses, and theoretical frameworks. These sources reinforce the reliability and context of the indicators' weights and the overall findings. It is important to emphasize that while these supplementary sources provide supportive data and context, the primary methodology and data used to generate Table 2 were derived from [1].

4.2.1. Culture (Rank 1, Score 0.481)

Cultural factors ranked highest in the Fuzzy AHP analysis, indicating their significant influence on sustainability in the KTB sectors. Research from [1] demonstrates that cultural norms and values play a critical role in shaping behaviors that encourage or hinder the adoption of sustainable practices. For instance, fostering a culture that values sustainability can lead to increased public engagement and the integration of innovative, eco-friendly solutions in business and technology.

Cultural factors profoundly influence human behavior, values, and the adoption of sustainable practices in KTB sectors. Promoting awareness and education about the benefits of sustainable development is crucial. Cultural norms around knowledge sharing and innovation can impact the uptake of sustainable technologies and business models. By fostering a culture that values sustainability, we can encourage the adoption of practices that support long-term ecological and social well-being. According to research, culture has a 52% impact on organizational sustainability and is 85% effective in fostering innovation culture, which in turn has a 59% impact on sustainability.

4.2.2. Environment Impact (Rank 2, Score 0.382)

Environmental factors are essential for sustainable development, securing the second position in the ranking. Studies such as [1] emphasize the importance of sustainable production practices and reducing carbon footprints to mitigate climate change. Effective environmental policies and the adoption of green technologies can contribute to long-term ecological health and the resilience of KTB sectors. The environmental impact of KTB activities is a significant challenge that must be addressed to achieve sustainability. For example, the production and disposal of technological devices have substantial environmental repercussions. Strategies such as the circular economy and sustainable production can help minimize these impacts. The adoption of renewable energy sources and green technologies can reduce emissions and improve environmental health, contributing to a sustainable future. Environmental responsibilities include reducing greenhouse gas emissions and waste production, essential in addressing climate change and biodiversity loss.

4.2.3. Society Factors (Rank 3, Score 0.353)

Social factors, ranking third, highlight the importance of equity, inclusivity, and access to resources in fostering sustainable development. Research from [1] supports this, noting that initiatives promoting equal access to education, social mobility, and income equality are crucial for enhancing the sustainability of KTB sectors. Social sustainability encompasses broader issues such as social justice, community empowerment, and public welfare. Social factors, including income inequality, access to education, and social mobility, influence the adoption and success of sustainable initiatives. Ensuring equitable access to resources and opportunities is essential for fostering a just society. In the context of KTB, this means creating inclusive policies that promote diversity and equal opportunities for all individuals, regardless of their background. Social sustainability encompasses themes such as social welfare, safety, empowerment, and improving the quality of life.

4.2.4. Economy Factors (Rank 4, Score 0.324)

The economic dimension holds the fourth position, showing its importance in the overall sustainability model. [1] underscores that economic stability, financial resources, and incentives for adopting sustainable practices are critical for supporting business and technological advancements. Policies that promote investment in renewable energy and sustainable infrastructure are fundamental for long-term economic growth. Economic factors, such as the cost of sustainable technologies and the availability of financial resources, play a critical role in their adoption. Investing in infrastructure development and providing incentives for businesses and consumers to switch to sustainable practices can drive economic growth. Policies that support green innovation and sustainable business models can create new

markets and job opportunities, fostering a resilient economy. Economic development should aim at increasing wealth, eradicating poverty, and creating employment, aligning with social justice goals.

4.2.5. Technology Factors (Rank 5, Score 0.251)

Technological innovation, ranked fifth, is key for enhancing the efficiency of sustainable practices. According to [1], the development and deployment of clean energy technologies, automation, and digital solutions can support sustainability, although challenges such as electronic waste and cybersecurity must be addressed. Sustainable technology practices ensure that innovations contribute positively to environmental and social outcomes. Technological innovation is key to achieving a sustainable future. Advances in clean energy, digitalization, and automation can enhance efficiency and reduce environmental impacts. However, it is important to address the potential negative consequences of these technologies, such as electronic waste and cybersecurity threats. Sustainable production and disposal methods, along with ethical guidelines, can help mitigate these issues. The role of appropriate technology and technological innovations is crucial for the success and sustainability of small and medium enterprises (SMEs).

4.2.6. Education Factors (Rank 6, Score 0.221)

Education, ranked sixth, plays a significant role in equipping individuals with the knowledge and skills needed for sustainable practices. Research in [1] indicates that educational programs focused on sustainability can foster awareness and proactive behavior among individuals, helping to build a workforce capable of implementing sustainable business and technological strategies. Education in sustainable development is essential for fostering the knowledge, skills, and values needed to drive sustainable practices. It should involve policymakers, decision-makers, planners, implementers, and the general public. Education enhances economic prosperity, growth, and innovation, making it crucial for businesses to invest in training to protect themselves from current and future crises. Human resources play a central role in economic activities, with education being key to sustaining high levels of profitability and innovation.

4.2.7. Politics Factors (Rank 7, Score 0.175)

Political factors, while ranked the lowest in this analysis, remain crucial for enabling sustainable development. [1] illustrates how regulations, subsidies, and incentives can drive industries toward adopting sustainable practices. Effective governance and the creation of regulatory frameworks that promote sustainability can facilitate collaboration between the public and private sectors, ensuring that goals are met across KTB domains. Political factors, including regulations and policies, are crucial in shaping the adoption and implementation of sustainable practices. Governments can play a significant role by offering subsidies and incentives for sustainable initiatives, as well as regulating industries to ensure environmentally and socially responsible behavior. Sustainable governance involves developing capacities and creating an atmosphere of interaction and dialogue between different societal elements, business environments, and the government.

4.2.8. Integrating PEACE and LOVE into Sustainability

Additionally, PEACE and LOVE should be integral values underpinning these seven pillars, promoting a holistic approach to sustainability that fosters harmony and well-being in society. Peaceful coexistence and compassionate interactions between individuals, communities, and nations are essential for achieving sustainable development goals. Love for humanity and the planet drives collective efforts towards a more equitable, inclusive, and thriving future for all. See Figures 2 and 3 for visual representations of the interconnectedness and priorities of the 7PS model with PEACE and LOVE.

4.3. The Three Technological Revolutions (D3)

The three technological revolutions (D3)—decarbonization, decentralization, and digitalization—are poised to shape the 21st century, driving sustainability. Aligned with the priorities of the 7PS model, these revolutions underscore the importance of prioritizing cultural, environmental, social, economic, educational, technological, and political dimensions for a sustainable future.

4.4. Technologies for Making the World a Better Place for Living at the X.0 Wave Theory and Based on 7PS Model

The X.0 Wave Theory envisages a transformative future where advanced technologies shape sustainable and equitable societies. These technologies can be mapped to the 7PS model priorities, while also being integral to the three technological revolutions (D3): decarbonization, decentralization, and digitalization. Here is an in-depth exploration of their applications in various domains:

1. **Cultural Priority: Artificial Intelligence (AI) and Machine Learning (ML)**
   - **Applications**:
     - **Cultural Preservation**: AI and ML can digitize and analyze cultural artifacts, languages, and traditions, preserving them for future generations.
     - **Content Personalization**: AI-driven recommendations enhance user experiences in cultural consumption, such as personalized museum tours or curated content on streaming platforms.
     - **Global Understanding**: Real-time language translation and cultural exchange programs powered by AI foster global understanding and cooperation.
   - **D3 Impact**:
     - **Digitalization**: Facilitates digital preservation and accessibility of cultural heritage.
     - **Decentralization**: Empowers local communities to share and manage their cultural assets.
2. **Environmental Priority: Internet of Things (IoT) and Big Data**
   - **Applications**:
     - **Smart Cities**: IoT sensors monitor air and water quality, manage energy usage, and optimize waste collection, reducing environmental impact.
     - **Climate Monitoring**: Big Data analytics predict climate changes and environmental trends, aiding in proactive measures to mitigate effects.
     - **Resource Management**: IoT devices track natural resource usage, ensuring sustainable practices in agriculture, water management, and conservation efforts.
   - **D3 Impact**:
     - **Decarbonization**: Enhances energy efficiency and reduces carbon footprints through optimized resource management.
     - **Digitalization**: Improves data collection and analysis for better environmental decision-making.
3. **Social Priority: Digital Twins and Blockchain**
   - **Applications**:
     - **Urban Planning**: Digital twins simulate urban environments, helping planners design efficient, resilient, and livable cities.
     - **Healthcare**: Blockchain secures patient data, ensuring privacy and enabling efficient healthcare delivery. Digital twins can model individual health scenarios for personalized medicine.
     - **Social Welfare**: Blockchain ensures transparent distribution of social benefits and services, reducing fraud and improving trust.
   - **D3 Impact**:
     - **Digitalization**: Enhances urban management and healthcare systems through advanced simulations and secure data handling.
     - **Decentralization**: Promotes transparent and accountable social services.
4. **Economic Priority: 3D Printing and 5G**
   - **Applications**:
     - **Manufacturing**: 3D printing enables localized production, reducing waste and transportation costs. It supports rapid prototyping and customization.
     - **Connectivity**: 5G provides the backbone for smart factories, real-time data exchange, and remote work, boosting productivity.
     - **Innovation**: These technologies enable new business models and services, fostering economic growth and resilience.

- **D3 Impact**:
  - **Digitalization**: Drives Industry 4.0 with interconnected, automated production processes.
  - **Decentralization**: Empowers local manufacturing and reduces dependence on centralized supply chains.

5. **Technological Priority: Cybersecurity**
   - **Applications**:
     - **Data Protection**: Ensures the security of sensitive information across industries, from finance to healthcare.
     - **Infrastructure Security**: Protects critical infrastructure from cyber threats, ensuring continuity of services.
     - **Personal Privacy**: Safeguards individual privacy in an increasingly digital world.
   - **D3 Impact**:
     - **Digitalization**: Essential for secure digital transformations and the protection of data.
     - **Decentralization**: Supports secure decentralized systems and transactions.
6. **Educational Priority: Augmented Reality (AR)**
   - **Applications**:
     - **Immersive Learning**: AR creates interactive educational experiences, making learning engaging and effective.
     - **Remote Education**: AR enables virtual classrooms and labs, providing access to quality education regardless of location.
     - **Skill Development**: AR simulations offer hands-on training in various fields, from medicine to engineering.
   - **D3 Impact**:
     - **Digitalization**: Transforms education through interactive and accessible digital tools.
     - **Decarbonization**: It reduces the need for physical infrastructure and resources in education.
7. **Political Priority: AI and Blockchain in Governance**
   - **Applications**:
     - **E-Governance**: AI streamlines public services, enhances decision-making, and improves citizen engagement through data analytics.
     - **Transparent Voting**: Blockchain ensures secure, tamper-proof voting systems, enhancing democratic processes.
     - **Policy Making**: AI provides data-driven insights for effective and inclusive policy formulation.
   - **D3 Impact**:
     - **Digitalization**: Modernizes governance through efficient, data-driven processes.
     - **Decentralization**: Enhances transparency and accountability in political systems.

Integral Values: Peace and Love

Additionally, peace and love should underpin these technological advancements, promoting a holistic approach to sustainability that fosters harmony and well-being in society. These values encourage collaboration, empathy, and a focus on the common good, ensuring that technological progress benefits all members of society and contributes to a peaceful and loving world.

4.5. Application Domains

The X.0 wave theory envisions a future where digital transformation, underpinned by the 7PS model and the D3 technological revolutions, creates a sustainable and harmonious world. Key technologies such as Artificial Intelligence (AI), Machine Learning (ML), the Internet of Things (IoT), Big Data, Digital Twins, Blockchain, 3D Printing, 5G, Augmented Reality (AR), and Cybersecurity have the potential to revolutionize various sectors and enhance our quality of life. However, as we embrace these advancements, it is crucial to ensure that humanity remains at the core of this transformation. The slogan "Go digital without losing humanity" encapsulates this sentiment, reminding us to balance technological benefits with human values.

4.5.1. Health

- **Artificial Intelligence and Machine Learning:** These technologies can analyze vast amounts of medical data to diagnose diseases early, personalize treatments, and predict health trends. AI-driven tools can assist in medical research, accelerating the discovery of new treatments.
- **Internet of Things (IoT):** Wearable devices and smart health monitors can track vital signs in real-time, enabling proactive health management and remote patient monitoring.
- **3D Printing:** This technology can produce customized medical implants and prosthetics, enhancing the quality of life for patients. It also allows for the creation of complex tissues and organs for research and potential transplants.
- **5G:** High-speed connectivity supports telemedicine, allowing patients in remote areas to access healthcare services and consultations with specialists.
- **Augmented Reality (AR):** AR can assist in medical training by providing immersive simulations and enhancing the precision of surgeries through detailed overlays of medical images.

4.5.2. Energy

- **Big Data and Digital Twins:** These technologies enable the optimization of energy production and consumption by modeling and simulating energy systems. Digital twins can predict maintenance needs and enhance the efficiency of renewable energy sources.
- **Blockchain:** Blockchain technology can facilitate peer-to-peer energy trading, making it easier for individuals and businesses to trade renewable energy and track its provenance.
- **3D Printing:** In the energy sector, 3D printing can produce complex parts for renewable energy systems, such as wind turbines and solar panels, reducing production costs and waste.
- **5G:** Ultra-reliable and low-latency communication networks are essential for smart grids, optimizing energy distribution and consumption in real-time.
- **IoT:** Smart meters and sensors can monitor and manage energy use more effectively, reducing waste and lowering costs.

4.5.3. Environment

- **Artificial Intelligence and Machine Learning:** These technologies can analyze environmental data to predict and mitigate the impact of climate change, optimize resource management, and enhance conservation efforts.
- **IoT:** Environmental sensors can monitor air and water quality, track wildlife, and manage natural resources more efficiently.
- **Blockchain:** Blockchain can ensure transparency and traceability in supply chains, helping to reduce environmental impact by promoting sustainable practices.
- **5G:** Connectivity is crucial for deploying IoT devices in remote areas, enhancing environmental monitoring and response capabilities.
- **3D Printing:** Reducing waste in manufacturing processes by enabling on-demand production and recycling materials for new uses.

4.5.4. Learning and Education

- **Artificial Intelligence and Machine Learning:** Personalized learning experiences can be created using AI, adapting content to each student's needs and pace.
- **Augmented Reality (AR):** AR can provide immersive learning experiences, bringing historical events to life, or simulating complex scientific experiments.
- **5G:** High-speed connectivity supports remote learning, ensuring students in rural or underserved areas can access quality education.
- **Big Data:** Analyzing educational data can help identify trends, improve curricula, and tailor teaching methods to enhance learning outcomes.
- **Blockchain:** Blockchain can secure academic records, making it easier to verify credentials and achievements.

4.5.5. Welfare and Social Services

- **Artificial Intelligence and Machine Learning:** AI can identify patterns in social issues, aiding in the design of effective intervention strategies. It can also assist in delivering personalized social services.

- **IoT:** Smart homes and connected devices can enhance the quality of life for the elderly and disabled by enabling independent living through automation and remote monitoring.
- **Blockchain:** Blockchain can ensure the transparency and efficiency of welfare distribution, reducing fraud and ensuring aid reaches those in need.
- **5G:** Enhances connectivity in rural and underserved areas, improving access to social services and emergency response.
- **Augmented Reality (AR):** AR can be used in training social workers, providing immersive scenarios that prepare them for real-life challenges.

4.5.6. Cities and Urban Mobility

- **Artificial Intelligence and Machine Learning:** AI can optimize traffic management systems, reduce congestion, and enhance public transportation efficiency.
- **IoT:** Smart city infrastructure, including sensors and connected devices, can improve waste management, energy use, and public safety.
- **Big Data:** Analyzing urban data can help plan and develop sustainable cities, and improving living standards.
- **Blockchain:** Blockchain can manage and secure urban assets, from property records to energy grids.
- **5G:** High-speed connectivity is essential for autonomous vehicles, smart traffic systems, and real-time city management.
- **Augmented Reality (AR):** AR can assist urban planning by providing detailed visualizations of proposed developments, ensuring better decision-making.

4.5.7. Businesses and Small Medium Sized Enterprises (SMEs)

SMEs, or Small and Medium-sized Enterprises, are businesses with relatively small-scale operations compared to large corporations. These enterprises often face unique challenges, such as limited resources, including financial and human capital, as well as difficulties in accessing markets and competing against larger competitors.

SME 5.0, also known as Tomorrow's SMEs or Hybrid SMEs, is a forward-looking concept invented, introduced, and developed by Professor Mattiello in 2015, building upon the foundations of SME 4.0. This evolution signifies a paradigm shift in the approach of SMEs towards sustainability, innovation, digitalization, and strategic planning. See Figures 5 and 8.

In the context of SME 4.0, businesses are already leveraging technologies like IoT and Industry 4.0 to enhance their operations and meet customer needs. However, SME 5.0 takes this further by emphasizing the integration of cultural, environmental, social, economic, technical, political, and educational goals alongside revenue-generating activities. This dual mission characterizes Hybrid SMEs, making them uniquely ambidextrous organizations capable of balancing social responsibility with economic success. See Figures 5 and 8.

Figure 13 illustrates the two wings of SME 5.0 organizations, highlighting their dual nature and ambidextrous approach to combining mission-driven goals and revenue-generating capabilities. This duality is central to the concept of Hybrid SMEs or Tomorrow's SMEs, as introduced by Professor Mattiello.

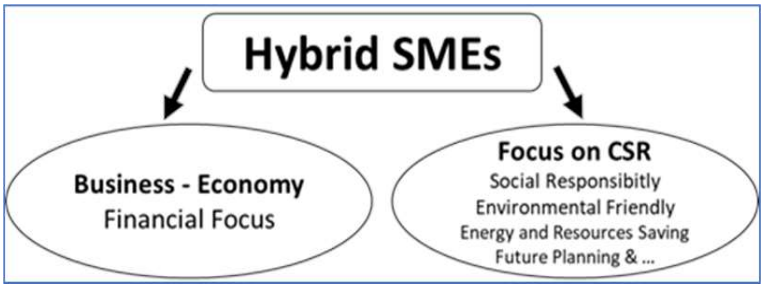

Figure 13. HYBRID SMEs/SME 5.0/Tomorrow's SMEs' two wings [5,6,29,30].

The two wings of SME 5.0 are characterized as follows:

1. **Mission-Driven Goals Wing**:
   - **Cultural Goals**: Promoting cultural enrichment and preserving cultural heritage.
   - **Environmental Goals**: Ensuring environmental responsibility through sustainable practices.
   - **Social Goals**: Fostering social cohesion and community engagement.
   - **Economic Goals**: Achieving economic efficiency while supporting broader economic development.

- **Technical Goals**: Leading in technical innovation and advancement.
- **Political Goals**: Engaging in policies that support sustainable development.
- **Educational Goals**: Enhancing educational opportunities and continuous learning.

2. **Revenue-Generating Capabilities Wing**:
   - **Business Activities**: Engaging in diverse business operations to generate income.
   - **Digital and Smart Technologies**: Utilizing IoT, digitalization, and smart technologies to enhance productivity.
   - **Innovation**: Driving product and service innovation to stay competitive.
   - **Market Participation**: Competing effectively in local, regional, and global markets.
   - **Sustainable Practices**: Integrating sustainability into core business strategies.
   - **Strategic Alliances**: Forming partnerships with industry stakeholders to foster innovation and growth.
   - **Human Resources**: Developing HR competencies to align with the demands of modern business environments.

The integration of these two wings enables SME 5.0 organizations to balance their social, environmental, and economic responsibilities with their business objectives, fostering a holistic approach to sustainable development and market competitiveness.

At the core of SME 5.0 are several key attributes and strategies: see Figure 14.

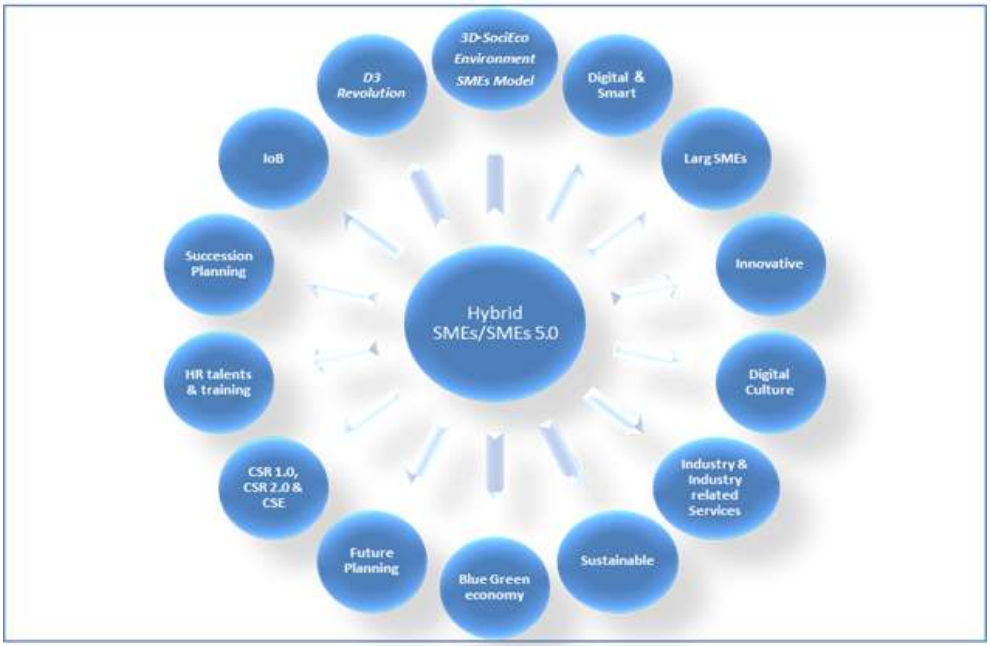

Figure 14. Hybrid SMEs/SMEs 5.0 or Tomorrow's SMEs are/have 14 points [5,6,29,30].

1. **3D Socio-Eco-Environment Model**: Prioritizing responsibility towards the environment, fostering social cohesion, and ensuring economic efficiency. See Figure 15.
2. **Digital and Smart**: Embracing digitalization and smart technologies to enhance operations and offerings.
3. **Larger SMEs**: Representing Larger SMEs with expanded opportunities.
4. **Innovative**: Cultivating a culture of innovation and creativity within the organization.
5. **Industry and Industry-related Services**: Operating in industrial sectors or providing services closely linked to specific industries.
6. **SMEs' Culture/Digital Culture**: Nurturing a corporate culture that values digitalization and innovation.
7. **Sustainable**: Commitment to sustainable business practices and long-term viability.
8. **Blue Green/Clean Economy**: Focusing on environmentally friendly and sustainable practices.
9. **Future Planning**: Incorporating strategic planning for future growth and development.
10. **CSR Approaches**: Implementing corporate social responsibility strategies to promote social and environmental impact.
11. **HR Talents, Competencies, Qualifications, Skills, and Training**: Emphasizing the development of human resources with necessary skills and qualifications, including stress management.
12. **Succession Planning**: Ensuring a smooth transition of leadership and management within the organization.
13. **Focus on Internet of Business (IoB)**: Leveraging IoB to enhance business processes and connectivity.
14. **D3 Revolutions**: Addressing the trio of digitalization, decarbonization, and decentralization.

These characteristics define the roadmap towards SME 5.0, aligning businesses with sustainability, innovation, and digital transformation principles. By embracing this concept, SMEs can not only adapt to the demands of the digital age but also become influential drivers of global tech-sustainable governance, fostering inclusive growth and resilience within the digital ecosystem.

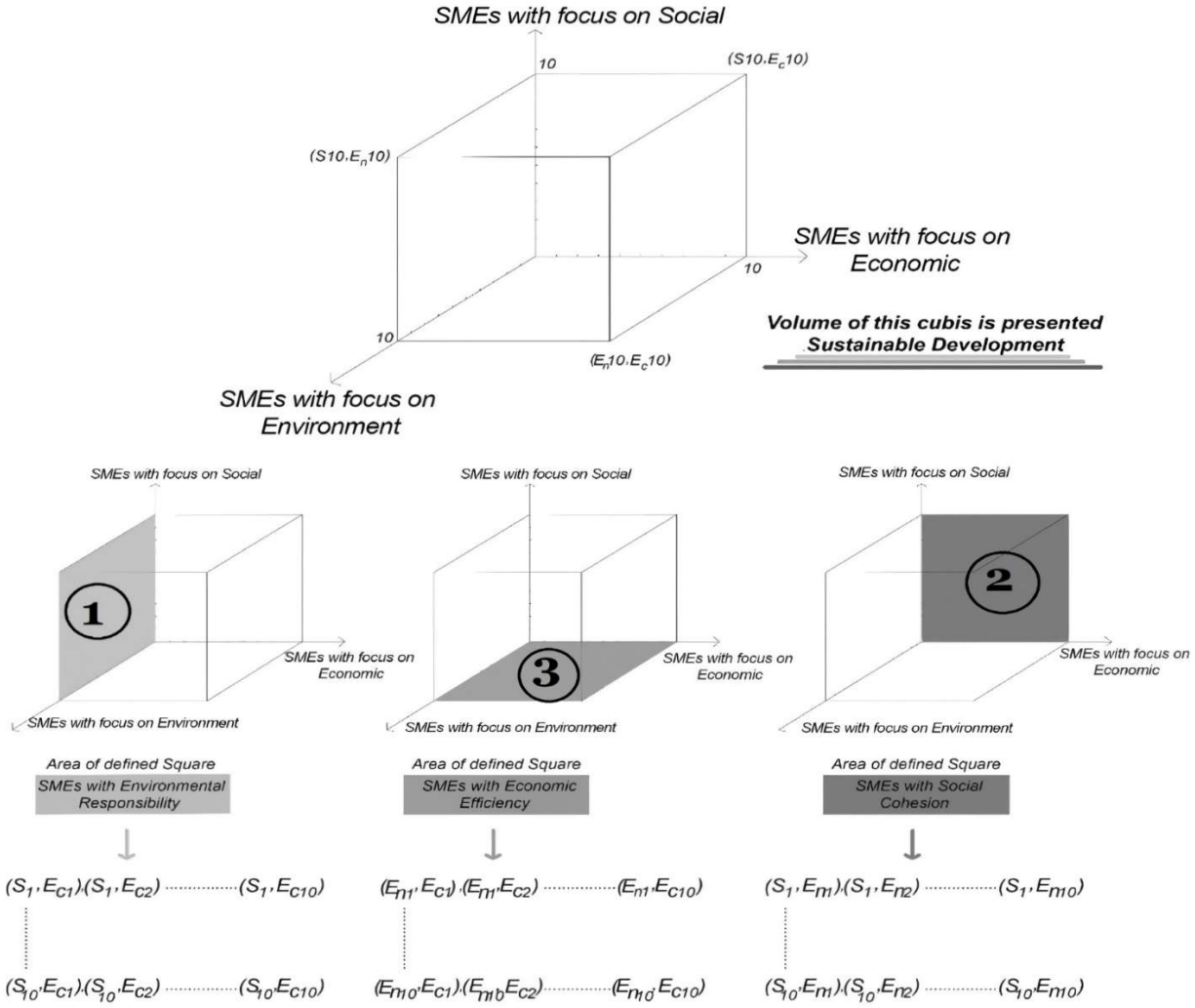

Figure 15. 3D Socio-Eco-Environmental SMEs model with three matrices [5,6,29,30].

4.6. SME X.0: Envisioning the Future of SMEs at the X.0 Wave/Tomorrow Age Theory

SME X.0 represents the next evolutionary stage in the development of SMEs, integrating the advanced concepts of Industry 5.0 and Society 6.0. Building on the foundations of Industry 4.0 and SME 4.0, this new paradigm embodies a combination of the future of Industry 4.0, termed Industry 5.0, as a symbol of Western culture and the future of Society 5.0, referred to as Society 6.0 in non-Western contexts by Professor Mattiello. This innovative framework integrates advanced digital technologies, sustainable practices, and forward-thinking business models to create agile, resilient, and future-proof organizations.

4.6.1. Key Characteristics of SME X.0

1. Advanced Digital Integration:
    - SMEs will leverage cutting-edge technologies such as artificial intelligence (AI), machine learning, blockchain, and the Internet of Things (IoT) to optimize operations, enhance productivity, and deliver personalized customer experiences.
    - Digital twins and predictive analytics will play a crucial role in real-time decision-making and proactive maintenance.
2. Sustainability and Circular Economy:

- Emphasis on sustainable business practices and the circular economy will be central to SME X.0. Companies will focus on minimizing waste, reducing carbon footprints, and maximizing resource efficiency.
- Sustainable supply chain management and eco-friendly product designs will become standard practices.

3. Smart Cyber Governance:
   - Robust cybersecurity measures will be integral, ensuring data integrity and protecting against cyber threats. Comprehensive cybersecurity governance policies will be developed and regularly updated.
   - Businesses will adopt smart cyber governance practices, including continuous monitoring, risk management, and employee training in cybersecurity best practices.
4. Agile and Resilient Operations:
   - SMEs will implement agile methodologies to adapt to market changes and disruptions quickly. This will involve flexible supply chains, responsive manufacturing processes, and adaptive business strategies.
   - Resilience will be enhanced through the diversification of markets and products and robust crisis management plans.
5. Human-Centric Innovation:
   - A strong focus on human resources will be paramount, with continuous learning and upskilling opportunities for employees. This will include training in digital skills, creativity, and problem-solving.
   - Organizational cultures will prioritize employee well-being, engagement, and collaboration, fostering a supportive and innovative work environment.
6. Collaborative Ecosystems:
   - SMEs will actively participate in collaborative ecosystems, forming strategic alliances with other businesses, research institutions, and technology providers. This will enable knowledge sharing, innovation, and access to new markets.
   - Open innovation platforms and co-creation initiatives will drive collective growth and development.
7. Customer-Centric Approaches:
   - Customer experience will be at the forefront, with SMEs using data-driven insights to understand and anticipate customer needs. Personalized marketing, products, and services will enhance customer satisfaction and loyalty.
   - Businesses will engage customers through omnichannel strategies, ensuring seamless interactions across physical and digital touchpoints.

4.6.2. Strategic Implementation of SME X.0

1. Digital Transformation Roadmap:
   - SMEs will develop a comprehensive digital transformation roadmap, outlining the integration of advanced technologies and digital processes.
   - Investment in digital infrastructure, cloud computing, and cybersecurity will be prioritized.
2. Sustainable Business Models:
   - Companies will adopt sustainable business models that align with environmental, social, and governance (ESG) criteria. This includes green financing, sustainable sourcing, and responsible production practices.
   - Circular economy principles will be embedded in product design, manufacturing, and end-of-life management.
3. Innovation and R&D:
   - Continuous innovation and research and development (R&D) will be key drivers of growth. SMEs will allocate resources to explore new technologies, products, and services.
   - Collaboration with universities, research centers, and tech incubators will facilitate innovation.
4. Workforce Development:
   - SMEs will invest in workforce development programs to equip employees with the necessary skills for the digital age. This includes technical training, leadership development, and soft skills enhancement.
   - Lifelong learning and career development opportunities will be provided to retain and attract talent.
5. Customer Engagement Strategies:

- Data analytics and customer relationship management (CRM) systems will be utilized to gain insights into customer preferences and behaviors.
- Businesses will implement personalized marketing campaigns and develop customer loyalty programs.

SME X.0 envisions a future where SMEs are at the forefront of technological innovation, sustainability, and customer-centricity. By embracing advanced digital integration, sustainable practices, and agile operations, SMEs will not only thrive in a competitive market but also contribute to a more sustainable and inclusive economy. The journey to SME X.0 requires strategic planning, investment in technology, and a commitment to continuous improvement, ensuring that SMEs are well-prepared to navigate the complexities of the future business landscape.

4.7. Balancing Digital Transformation with Human Values

While these technologies offer immense potential to improve various aspects of life, it is crucial to remember the importance of maintaining a human-centric approach. The slogan "Go digital without losing humanity" serves as a reminder to integrate empathy, ethics, and social responsibility into technological advancements. Figures 10 and 11 highlight the potential concerns associated with unchecked digital transformation, emphasizing the need to prioritize the human factor amidst technological progress.

- ✓ **Peace and Love as Integral Values:** Integrating these values into the technological framework promotes a holistic approach to sustainability, fostering harmony and well-being in society.
- ✓ **Ethical AI:** Ensuring that AI systems are transparent, fair, and accountable.
- ✓ **Digital Inclusion:** Bridging the digital divide to ensure everyone benefits from technological advancements.
- ✓ **Data Privacy:** Protecting individuals' data and ensuring it is used ethically.
- ✓ **Sustainable Development Goals (SDGs):** Aligning technological innovations with the SDGs to ensure they contribute to a better world.

The application of advanced technologies in line with the 7PS model and the D3 revolutions holds great promise for making the world a better place. However, it is imperative to proceed with caution, ensuring that these advancements enhance rather than compromise our humanity.

By prioritizing these technologies and embedding the values of peace and love, the X.0 Wave Theory envisions a future where technological advancements not only address today's challenges but also pave the way for a sustainable, equitable, and prosperous world for future generations.

The Figure 16 outlines a cyclical process leveraging advanced technologies and theoretical frameworks to forecast, prevent, and address tomorrow's crises while creating a sustainable and livable future:

1. **Forecasting, Prevention, and Identification of Tomorrow's Crises**:
   - Uses AI, predictive analytics, and risk mitigation strategies to identify and address emerging crises (e.g., climate change, pandemics).
2. **X.0 Wave Theory (X.0 = 5.0)**:
   - Integrates digital, high-tech, and blue-green technologies to enhance transport, logistics, and supply chains while reducing emissions.
3. **Creating a Sustainable (a Livable and High Qualiy of Life) World**:
   - Focuses on livability and quality of life using models like 7PS (Seven Pillars of Sustainability) and KTB (Knowledge, Technology, Balance).
4. **Improvement and Recycling**:
   - Continuously refines the process to build a better, sustainable future.

Significance:

This model enables a proactive approach for organizations and governments, fostering resilience, innovation, and balance between human well-being, environmental preservation, and technological progress [45–48].

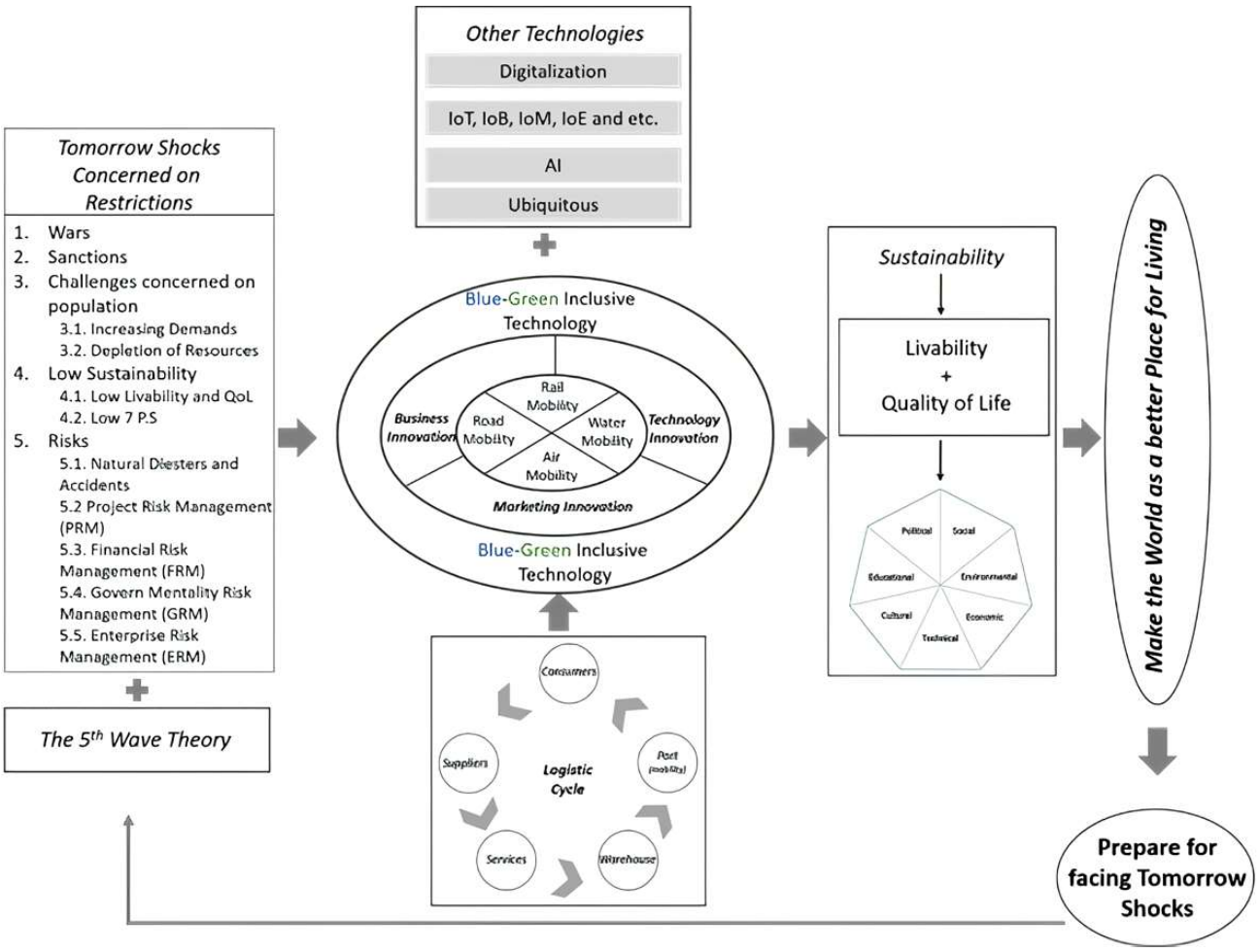

Figure 16. Technologies at the X.0 wave/Tomorrow Age Theory (X.0 = 5.0) for making the World a Better Place for Living [14,15,38,39,45–48].

5. Conclusions

This article concludes with reflections on the transformative potential of the X.0 Wave/Age Theory, inviting diverse stakeholders to contribute research and insights toward navigating tomorrow's knowledge, technological, and business landscape.

The X.0 Wave/Age Theory emphasizes the importance of innovation and technological progress in shaping human history. It suggests that each wave builds upon the achievements of the previous one while introducing new challenges and risks. This framework highlights the need for businesses to adapt to new technologies to thrive in an evolving landscape. It underscores the significance of responsible innovation to ensure these advancements benefit humanity as a whole.

By understanding and anticipating the potential impacts of technological advancements, the X.0 Wave/Age Theory encourages individuals and organizations to embrace change and prepare for future challenges and opportunities. This articleseeks to explore these themes, providing insights into the ongoing and future transformations driven by the X.0 Wave/Age Theory.

This theory supports the comprehensive framework and detailed analysis presented in this theory, illustrating the interconnectedness of sustainability pillars and the evolutionary stages of human civilization.

This article concludes with a reflection on the transformative potential of the X.0 Wave/Age Theory, positioning it as a comprehensive framework for understanding the future trajectory of human civilization through advancements in Knowledge, Technology, and Business (KTB). The X.0 Wave Theory not only illuminates the evolution of these domains but also provides critical insights into their intersection with sustainability, ethics, and future societal structures. The theory underscores that each wave of human development builds upon previous achievements, introducing both opportunities and challenges that shape societies, industries, and technologies. As businesses and industries face the increasing pace of technological advancements, the X.0 Wave Theory calls for an adaptive mindset that emphasizes responsible innovation. It highlights the need for businesses—especially Small and Medium Enterprises (SMEs)—to

integrate new technologies while safeguarding ethical standards and sustainability principles to thrive in a rapidly evolving global landscape.

By leveraging the X.0 Wave Theory, organizations can anticipate future technological shifts, prepare for inevitable disruptions, and foster innovation in alignment with the 2030 Sustainable Development Goals (SDGs). The theory equips businesses with the tools to forecast challenges, prevent risks, and face the uncertain future with resilience. It advocates for the integration of Industry 5.0 and Society 6.0 paradigms, reflecting both Western and non-Western cultural perspectives, and stresses the importance of building a Hybrid SME model—a hybrid of cutting-edge technologies, sustainability, and inclusivity.

5.1. Key Takeaways

- The Theory of Comprehensive Everything offers a critical framework to assess readiness for the future, particularly focusing on SMEs' resilience to emerging challenges.
- The X.0 framework predicts key transitions within Industry 4.0 and Society 5.0, while exploring the evolution toward Industry 5.0 and Society 6.0 and prepares organizations to embrace the societal and technological shifts that lie ahead.
- SMEs can leverage this framework to forecast, prevent, and navigate future disruptions by integrating the KTB model's principles to foster innovation, resilience, and sustainability.
- A call for international cooperation in navigating the digital transformation era and post-pandemic recovery is emphasized, with an urgent need for global collaboration to ensure an inclusive, sustainable future.

5.2. Embracing the X.0 Wave Theory for a Sustainable and Resilient Future

Main Point:

- The Theory of Comprehensive Everything acts as a critical test to assess readiness for the imminent era.
- It encapsulates the essence of contemporary and future-proof business paradigms.
- It foresees and prepares for imminent challenges and disruptions, particularly within the 2020–2030 timeframe.

By merging the trajectories of Industry X.0 and Society X.0, representing Western and non-Western cultural paradigms respectively, it steers the course toward Hybrid SMEs or Tomorrow's SMEs.

What:

Is invented, introduced, and improved to support all businesses, especially SMEs to:

1. ***FORECAST***
2. ***PREVENT***
3. ***FACE***

- The Theory of Comprehensive Everything equips businesses, especially SMEs, to forecast, prevent, and navigate today's challenges and tomorrow's crises.
- It operates at the confluence of Knowledge, Technology, and Business (KTB) dynamics, as described by the KTB model.

Where:

- The impacts of today's challenges and tomorrow's crises reverberate across the spheres of knowledge, technology, and business landscapes.

Why (Aims):

- It aims to foster blue-green sustainability, global, innovative, and digital readiness, and resilience through recovery and Corporate Social Responsibility (CSR) strategies.

How:

- Leveraging innovative digital infrastructures fosters innovation and the adoption of future technologies, reshaping education, training, and societal norms.

Background:

- Rooted in a multitude of theories, methodologies, and models, such as the 7PS model, the 3D Socio-Eco-Environmental SMEs Model, and the concept of Industry 5.0 and Society 6.0.

Impact (Expected Impact):

- Envisions a future where education, healthcare, and economies are fortified and societies and SMEs thrive sustainably.

- Anticipates tangible improvements in HR competencies, societal well-being, economic resilience, and technological innovation.

Results:

- Communities (Urban 6.0/Utopia), Societies (Society 6.0),
- Cities (Tomorrow's Cities), Businesses (SME 5.0) capable of:
- Mapping a Sustainable Future
- Aspires to foster communities, societies, cities, and businesses capable of mapping a sustainable future, navigating future concerns, and enhancing global livability
- TACKLING FUTURE CONCERNS
- Make the World a better place to live. See Figure 15.

Conclusions:

- Proposes the concept of Hybrid SMEs or Tomorrow's SMEs, prioritizing environmental responsibility, social cohesion, and economic efficiency.
- Portrays the evolution of the world economy from traditional paradigms to data-driven economies.

Cooperation in New Conditions:

- Advocates for international cooperation through conferences, workshops, and collaborative research projects to navigate the post-COVID-19 era and the digital transformation landscape.

Final Thoughts:

The X.0 Wave Theory proposes that understanding and preparing for these transformative shifts will enable businesses, especially SMEs, to not only adapt but also lead in creating a more inclusive and resilient global economy. By adopting this comprehensive framework, organizations will be better equipped to tackle the challenges and opportunities that lie ahead. Embracing digital transformation, fostering resilience, and integrating sustainability is imperative for the successful evolution of businesses, societies, and economies.

This theory thus lays the foundation for a Sustainable Future, where organizations can anticipate future needs, adapt to new cultural and technological paradigms, and actively contribute to shaping a resilient and prosperous world.

- Illuminates the imperative of embracing digital transformation, fostering resilience, and steering humanity towards a better, more sustainable future.
- Foresees a world where technological advancements, cultural shifts, and global cooperation converge to address pressing challenges and propel humanity forward.

By adopting the principles outlined in the X.0 Wave Theory, businesses, especially SMEs, can prepare for and thrive in an era marked by rapid technological advancements, cultural integration, and a commitment to sustainability. This comprehensive approach ensures that SMEs are not only equipped to handle current and future challenges but also positioned to lead in fostering a more inclusive and resilient global economy.

SME X.0 embodies a holistic approach to the evolution of small and medium-sized enterprises, leveraging cutting-edge digital technologies, sustainable principles, and forward-thinking business strategies. This paradigm shift empowers SMEs to adapt quickly, withstand disruptions, and thrive in an ever-changing global environment. By embracing SME X.0, businesses can position themselves as leaders in driving sustainability, innovation, and inclusivity, paving the way for a brighter future for both themselves and the broader economy.

Suggestions for Future Research: [45–48]

- **Exploration of Cultural Impacts**: Future studies could explore how different cultural contexts (e.g., Western *vs.* non-Western) influence the implementation and outcomes of the X.0 Wave Theory, particularly in the adoption of Industry 5.0 and Society 6.0.
- **Empirical Validation**: Empirical research could test the X.0 Wave Theory within different industry sectors, evaluating its practical applications and outcomes in fostering sustainable business practices, especially in SMEs.
- **Technological Innovation**: Research could investigate how emerging technologies like Artificial Intelligence, Biotechnology, and Virtual Reality will shape the X.0 waves, particularly in the context of Industry 5.0.

Ethics Statement

Not applicable.

Informed Consent Statement

Not applicable.

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Declaration of Competing Interest

No potential conflict of interest.

References

1. Mohammadian HD, Langari ZG, Kamalian AR, Yaghoubi NM, Aramesh H. Promoting sustainable global innovative smart governance through the 5th wave theory, via Fuzzy AHP for future SMEs (SME 5.0/hybrid SMEs). *AIMS Geosci.* **2023**, *9*, 123–152.
2. Mohammadian HD. MOOCs policies on national and international level regarding best practices in German educational SMEs through the 5th wave theory and 9PSG model. In Proceedings of the 2022 IEEE Learning with MOOCS (LWMOOCS), Antigua Guatemala, Guatemala, 29–30 September 2022.
3. Doost SME Ranking Model (DSRM) for the Edu. SMEs Development, based on Guter Mittelstand, MOOCs & Related Projects as German Best Practice Towards: Future Edu Readiness to Achieve SME 5.0. In Proceedings of the 2022 IEEE Learning with MOOCS (LWMOOCS), Antigua Guatemala, Guatemala, 29–30 September 2022.
4. Mohammadian HD, Ghasabzadeh Langari Z, Castro M, Wittberg V. A Study of MOOCs Project (MODE IT), Techniques, and Know How-Do How Best Practices and Lessons from the Pandemic through the Tomorrow Age Theory. In Proceedings of the 2022 IEEE Learning with MOOCS (LWMOOCS), Antigua Guatemala, Guatemala, 29–30 September 2022.
5. Mohammadian HD. Mapping the future sustainable, through the 5th wave/Tomorrow Age Theory or theory of comprehensive everything with a focus on educational SMEs. In Proceedings of the 2022 IEEE conference, Global Engineering Education Conference (EDUCON), Tunis, Tunisia, 28–31 March 2022.
6. Mohammadian HD, Ghasabzadeh Langari Z, Castro M, Wittberg V. Smart Governance for Educational Sustainability: Hybrid SMEs & the 5th wave theory Towards Mapping the Future Education in Post-Covid Era. In Proceedings of the 2022 IEEE Conference, Global Engineering Education Conference (EDUCON), Tunis, Tunisia, 28–31 March 2022.
7. Mohammadian HD, Ghasabzadeh Langari Z, Wittberg V. Cyber Government for Sustainable Governance: Examining Solutions to Tomorrow's Crises and Implications through the 5th wave theory, Edu 5.0 concept and 9PSG model. In Proceedings of the 2022 IEEE Conference, Global Engineering Education Conference (EDUCON), Tunis, Tunisia, 28–31 March 2022.
8. Mohammadian HD, Castro M, Wittberg V, Brüggemann T, Kiani Bakhtiari A. The Development of a Readiness Assessment Framework for Tomorrow's SMEs for Adopting the Educational Components of future of I4.0. In Proceedings of the 2022 IEEE Conference, Global Engineering Education Conference (EDUCON), Tunis, Tunisia, 28–31 March 2022.
9. Mohammadian HD, Assante D, Capasso C, Veneri O, Castro M, Martin S. Internet of energy: New scenarios, opportunities, challenges, and educational solutions. In Proceedings of the 2021 IEEE Conference, Global Engineering Education Conference (EDUCON), Vienna, Austria, 21–23 April 2021.
10. Mohammadian HD. A multidisciplinary study of the 5th wave theory and the related theories and models in management and humanities. In Proceedings of the International Research Conference on Management & Humanities (IRCMH) 2020, Boston, MA, USA, 27–28 November 2020.
11. Mohammadian HD. Urban Mobility Planning, Environmental challenges, and Digitalization-key to Blue-Green Smart City & Mobility as a new concept with Using the i-Sustainability Plus and 5th Wave Theories (Case study: South Korea and Germany). In Proceedings of the 8th World Sustainability Forum 2020, Basel, Switzerland, 15–17 September 2020.
12. Mohammadian HD. Sustainable clean mobility and urban planning—Responses to sustainable development in social responsibility as a readiness for facing tomorrow's world crises. In Proceedings of the 8th World Sustainability Forum 2020, Basel, Switzerland, 15–17 September 2020.
13. Mohammadian HD. Comprehensive Urban Plan and Mobility Risk Mitigation for Transforming to Blue-Green Sustainable Mobility to create Modern Liveable Urban Setting (Case: Global, Europe and Iran). In Proceedings of the 8th World Sustainability Forum 2020, Basel, Switzerland, 15–17 September 2020.
14. Mohammadian HD, Castro M, Merk, Shahhoseini HS. Digital Transformation in Academic Society and Innovative Ecosystems in the World beyond Covid19-Pandemic with Using 7PS Model for IoT. In Proceedings of the 2020 IEEE conference LWMOOCS VII, Learning with MOOCS 2020, Antigua Guatemala, Guatemala, 30 September–2 October 2020.
15. Mohammadian HD, Castro M, Wittberg V, Bolandian GH. The 5th Wave and i-Sustainability Plus Theories as Solutions for SocioEdu Consequences of COVID-19. In Proceedings of the 2020 IEEE Conference LWMOOCS VII, Learning with MOOCS 2020, Antigua, Guatemala, 30 September–2 October 2020.

16. Hamid DM, Fatemeh R. Blue-Green Smart Mobility Technologies as Readiness for Facing Tomorrow's Urban Shock toward the World as a Better Place for Living (Case Studies: Songdo and Copenhagen). *Technologies* **2020**, *8*, 39.
17. Mohammadian HD, Fatemeh R. The role of IoE-Education in the 5th wave theory readiness & its effect on SME 4.0 HR competencies. In Proceedings of the 2020 IEEE Global Engineering Education Conference (EDUCON), Porto, Portugal, 27–30 April 2020.
18. Mohammadian HD. IoT-Education technologies as solutions towards SMEs' educational challenges and I4.0 readiness. In Proceedings of the 2020 IEEE Global Engineering Education Conference (EDUCON), Porto, Portugal, 27–30 April 2020.
19. Mohammadian HD, Assante D, Doost F. IoT-education policies on national and international level regarding best practices in German SMEs. In Proceedings of the 2020 IEEE Global Engineering Education Conference (EDUCON), Porto, Portugal, 27–30 April 2020.
20. Hamid DM, Fatemeh R. i-Sustainability Plus Theory as an Innovative Path towards Sustainable World founded on Blue-Green Ubiquitous Cities (Case Studies: Denmark and South Korea). *Inventions* **2020**, *5*, 14.
21. Hamid DM, Fatemeh R. Sustainable Innovative Project Management: Response to Improve Livability and Quality of Life: Case Studies: Iran and Germany. *Inventions* **2019**, *4*, 59.
22. Innovation under Restriction: Holding a Discussion with Giving two Innovative Military based Models, towards Innovative Sustainable Solutions for Challenges (Case study: Iran 8 years' War, 40 years sanctions and Germany after Second World War). In Proceedings of the International Congress on Engineering, Technology and Innovation, Darmstadt, Germany, 1–2 August 2019.
23. Giving three Practical Innovative Models Based on IMP3rove and TRIZ in Smart Mobility: Key towards Blue-Green Sustainable Livable Urban Areas. International Congress on Engineering, Technology and Innovation, Darmstadt, Germany, 1–2 August 2019.
24. Global SME Management as Innovative Sustainable Practical Solutions to improve Sustainability, Quality of Life and Livability (Case: Iran & Germany). In Proceedings of the International Congress on Engineering, Technology and Innovation Darmstadt, Germany, 1–2 August.2019.
25. Mohammadian HD. IoE—A solution for Energy Management Challenges. In Proceedings of the EDUCON Global Engineering Education Conference 9–11th of April 2019, American University in Dubai, Dubai, United Arab Emirates, 9–11 April 2019.
26. Mohammadian HD. IoT—A solution for Educational Management Challenges. In Proceedings of the EDUCON Global Engineering Education Conference 9–11th of April 2019, American University in Dubai, Dubai, United Arab Emirates, 9–11 April 2019.
27. Mohammed EAA, Asma S, Atilla A, Samia CG, Hamid DM. *Smart Cities for Sustainability: Approaches and Solutions*; Emerald Publishing Limited: Bingley, UK; ISBN 1804559032, 9781804559031.
28. Doost MH, Alijani O, Rahimi MM, Ameri B. Navigating the future by fuzzy AHP method: Enhancing global tech-sustainable governance, digital resilience, & cybersecurity via the SME 5.0, 7PS framework & the X.0 Wave/Age theory in the digital age. *AIMS Geosci.* **2024**, *10*, 371–398.
29. Novak D, Doost MH. Risks and forecasts of global temperature increase and climate challenges: Insights from the 5th wave theory and Novak triangle. *Progress Energy Fuels (PEF) J.* **2023**, *12*, 3316.
30. Novak D, Doost MH. Challenges of a sustainable energy and vehicle-related value chain for BEVs and FCEVs through the 5th wave theory. *Progress Energy Fuels (PEF) J.* **2023**, *12*, 3308.
31. Klaus S. *The Fourth Industrial Revolution*; Crown Business: Milton Keynes, UK, 2017.
32. Byron R. *The Fourth Age: Smart Robots, Conscious Computers, and the Future of Humanity*; Atria Books: New York, NY, USA, 2018.
33. Ray K. *The Singularity Is Near: When Humans Transcend Biology*; Penguin Books: London, UK, 2006.
34. Max M, Natasha V-M. *The Transhumanist Reader: Classical and Contemporary Essays on the Science, Technology, and Philosophy of the Human Future*; Wiley-Blackwell: Hoboken, NJ, USA, 2013.
35. Ray K. *The Age of Spiritual Machines: When Computers Exceed Human Intelligence*; Penguin Books: London, UK, 2000.
36. Ray K, Erik B, Andrew M. *The Second Machine Age*; W. W. Norton & Company: New York City, NY, USA, 2016.
37. Carl BF, Michael AO. *The Future of Employment: How Susceptible are Jobs to Computerisation*? The University of Oxford: Oxford, UK, 2013.
38. Shi L, Han L, Yang F, Gao L. The evolution of sustainable development theory: Types, goals, and research prospects. *Sustainability* **2019**, *11*, 7158.
39. Porter ME, Linde Cvd. Toward a new conception of the environment-competitiveness relationship. *J. Econ. Perspect.* **1995**, *9*, 97–118.
40. Tang M, Walsh G, Lerner D, Fitza MA, Li Q. Green innovation, managerial concern and firm performance: An empirical study. *Bus. Strategy Environ.* **2018**, *27*, 39–51.
41. Dempsey N, Bramley G, Power S, Brown C. The social dimension of sustainable development: Defining urban social sustainability. *Sustain. Dev.* **2011**, *19*, 289–300.

42. Takalo SK, Tooranloo HS. Green innovation: A systematic literature review. *J. Clean. Prod.* **2021**, *279*, 122474.
43. Alvin T. *The Third Wave*; Bantam Books: New York, NY, USA, 1980.
44. Alvin T. *Future Shock*; Random House: New York, NY, USA, 1970.
45. Machado CF, Davim JP. *Industry 5.0: Creative and Innovative Organizations*; Springer: Berlin, Germany, 2023; doi:10.1007/978-3-031-26232-6.
46. Machado C, Davim JP. *Industry 4.0: Challenges, Trends, and Solutions in Management and Engineering*; Taylor & Francis: Oxfordshire, UK, 2022. Available online: https://www.routledge.com/Industry-40-Challenges-Trends-and-Solutions-in-Management-and-Engineering/Machado-Davim/p/book/9780367494834?srsltid=AfmBOorKDvG6YhNBxd6JlVpMk0bg2IgwUOS5Vd4PPcxArP961mBuZdeZ (accessed on 29 November 2024).
47. Davim JP. Perceptions of Industry 5.0: Sustainability Perspective. *BioResources* **2025**, *20*, 15–16. doi:10.15376/biores.20.1.15-16.
48. Davim JP. Sustainable and Intelligent Manufacturing: Perceptions in Line with 2030 Agenda of Sustainable Development. *BioResources* **2024**, *19*, 4–5. doi:10.15376/biores.19.1.4-5.