In collaboration
with Accenture

WORLD ECONOMIC FORUM

Shared Commitments in a Blended Reality: Advancing Governance in the Future Internet

WHITE PAPER

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Contents

Foreword

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The current internet landscape faces challenges such as mistrust,[1] fractured governance[2,3] and often reactive policies[4] that may not be interoperable across jurisdictions.[5] Society is at a crucial inflection point where the convergence of emerging technologies, new industry players and evolving public expectations creates a unique opportunity to tackle these challenges. The metaverse offers a glimpse of what the future internet might look like – an immersive integration of digital and physical realities, propelled by advancements in extended reality (XR) technology and integration with technologies like artificial intelligence (AI) and distributed ledger technology (DLT). This includes blockchain, 6G, internet of things (IoT), quantum technologies, robotics, digital twins and more.[6] This transformation is not just a technological leap but an opportunity to explore how governance can develop securely and safely in digital spaces and affect the norms of physical reality.

In May 2022, the World Economic Forum launched the Defining and Building the Metaverse Initiative, an integrated approach to the development and governance of the metaverse. Its aim is to build a safer, more responsible, secure, equitable, inclusive, diverse, resilient and accessible metaverse through discussions with a wide array of stakeholders – including those from government, industry, civil society and academia. This paper builds on the initiative's work. In collaboration with Accenture, previous outputs include:

- *Interoperability in the Metaverse*
- *Privacy and Safety in the Metaverse*
- *Metaverse Identity: Defining the Self in a Blended Reality*
- *Demystifying the Consumer Metaverse*
- *Social Implications in the Metaverse*
- *Exploring the Industrial Metaverse: A Roadmap to the Future*
- *Metaverse Cybersecurity: Building Resilience in the Future Internet*

This white paper operates on the premise that the metaverse represents a critical opportunity to redefine the norms of today's internet and, specifically, internet governance. As technologies advance, these new innovations and their governance – across business units, geographies and jurisdictions – present an opportunity to redefine norms and create a safe, inclusive, accessible, resilient and equitable metaverse. This future state, however, can only be achieved if stakeholders from industry, government, academia and civil society align on a human-first approach, ensuring that the metaverse and its supporting technologies are socially and economically beneficial for everyone.

Achieving this vision requires technology-agnostic, durable commitments to implementing impactful future governance. This document outlines those commitments and calls for global multistakeholder collaboration to deliver them.

Executive summary

Blended reality demands governance through common commitments to bridge the gap between technological innovation and societal expectations.

The convergence and adoption of key emerging technologies – like extended reality (XR) paired with artificial intelligence (AI), 6G, internet of things (IoT), blockchain, robotics, digital twins, etc. – is propelling the internet into a new "blended reality" often referred to as "the metaverse" or the "future of the internet".

Some technologists believe that the metaverse is the experience layer[7,8,9] – or interface layer – of the future internet, which will be underpinned by scaling technologies like XR hardware, AI and distributed ledger technology (DLT) (including blockchain and other applications). This blended reality requires a cohesive governance approach that considers the expanding interplay between digital networks, hardware, software, data and the norms and expectations of physical reality. This report outlines a vision for how governance must evolve to meet the unique challenges posed by this new blended reality paradigm.

Today's internet governance can be fragmented across jurisdictions, leading to conflicting standards, gaps in regulation and barriers to equitable access. The future internet, with its deep integration of digital and physical realities, amplifies these challenges. Governance must, therefore, become more cohesive, adaptable and inclusive to support the safe, sustainable and socially responsible development of blended reality technologies. Key recommendations focus on establishing shared commitments across industries, governments, academia and civil society. These commitments prioritize human rights, accountability, safety, asset ownership and responsible data practices, all aimed at creating trust and security in the metaverse. By adopting these commitments, stakeholders can shape a future internet that balances innovation with responsibility.

The next steps involve aligning global standards and policies with these commitments and creating multistakeholder forums to drive collaboration. These actions will ensure that the future internet serves as a force for societal and economic benefit while protecting the rights and well-being of all users.

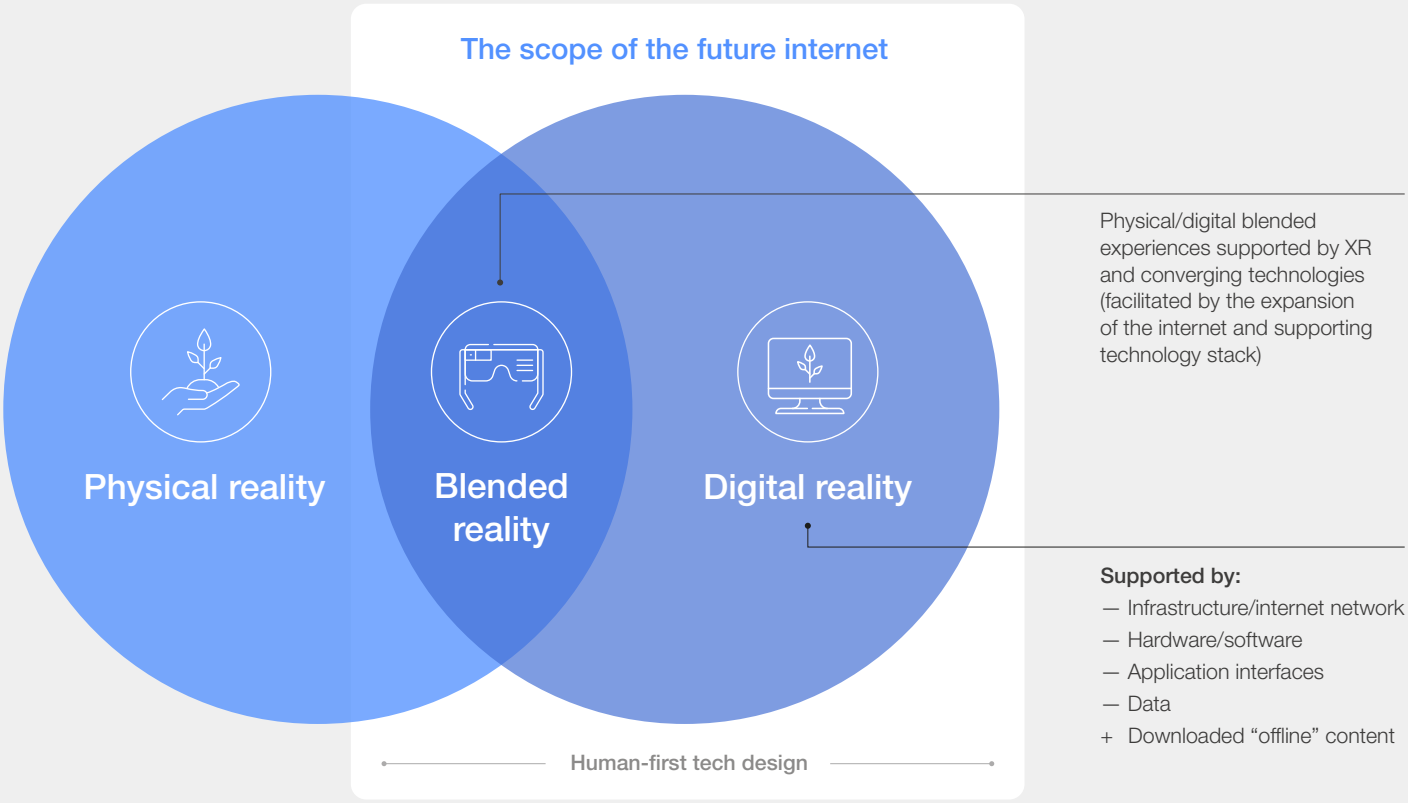
Introduction

As emerging technologies and expectations evolve, stakeholders must align on a common vision to address governance challenges.

Society is at a pivotal moment. The convergence of emerging technologies and individuals' evolving expectations presents a unique opportunity to address nascent governance challenges. To align and expand on how governance should be approached, it is necessary for all stakeholders to establish a common vision to drive distinct and tailored action.

This paper focuses on setting a vision for advancing future internet governance. Given the blending of realities and technology convergence, it defines common commitments and goals that should be shared by all stakeholders to enable cohesive governance.

FIGURE 1 **Blended reality:** Governing the future of the internet



BOX 1 **Commitment language**

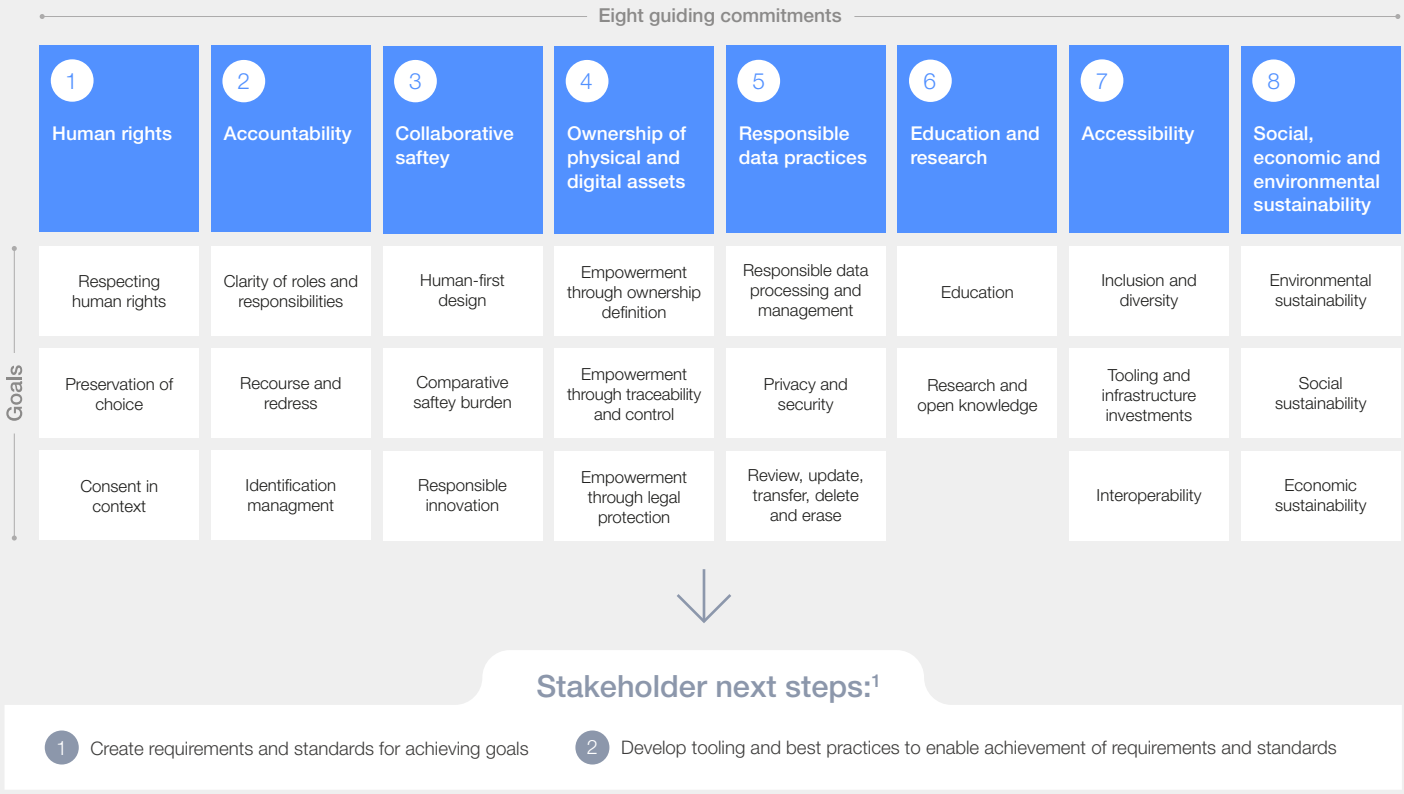
Throughout this paper, the term "commitments" refers to a set of concepts offered to guide stakeholders in developing good governance practices rather than specific obligations adopted by stakeholders.

With these principles in mind, stakeholders across academia, government, industry and civil society can determine preferred global, regional, national and local methods for meeting goals through law, policies, standards, tooling and best practices.

FIGURE 2 | **The vision for advancing the future of the internet**

The vision for advancing future internet governance

The following commitments and goals are necessary to further develop requirements, standards, tooling and best practices



Note: 1. Outside of the scope of this paper/to be described in the future by individual stakeholders.

To understand the vision for the future, it is necessary to understand the successes and shortcomings of the current internet governance landscape and how technology convergence is delivering a blended reality. Foundational governance successes have enabled the internet's expansion, but critical areas still require attention. Commitments can address these critical areas and deliver social and technical value.

The current internet landscape

The internet today stands as a vast global network supported by a sophisticated and complex technological infrastructure that transcends geographical boundaries. It connects 5.35 billion individuals globally[10] as a tool for communication, work and commerce, as well as political, cultural and social engagement.

Originally created as a knowledge-sharing network for academic and research institutions, the internet has evolved into a vibrant innovation network for connectivity that now serves a multitude of personas and purposes. This impressive transformation signals the beginning of the next era of internet's evolution, one that holds immense potential for today's generations. As noted in the *Edison Alliance 2024 Impact Report*, considerable progress has been made in expanding digital access,[11,12] yet significant opportunities for improvement remain.

The dawn of a new era – blended reality

Technology writ large is undergoing a profound transformation.[13] The internet is entering what many consider an experiential and spatial next iteration.[14,15] This new era is characterized by the arrival of a "blended reality" – a convergence of physical and digital worlds, driven by rapid advancements in extended reality (XR), artificial intelligence (AI), Internet of Things (IoT), blockchain, robotics, digital twins and emerging technologies like quantum computing. This evolution promises immersive experiences, hyper-scale connectivity and unprecedented computational power.

Hardware devices – such as smartphones, biometric and IoT sensors, and XR headsets – play a pivotal role in this transformation by reshaping how individuals interact with the internet and each other. These technologies are blurring the line between online and offline lives, creating new challenges and opportunities that require a coordinated and informed approach from stakeholders for effective navigation and governance.

The fractured landscape

While significant progress has been made, the current internet and technology landscape remains fragmented, revealing opportunities for more cohesive governance.

Challenges such as the digital divide, segregated stakeholder actions and demand for responsible growth underscore the need for greater collaboration opportunities.

TABLE 1 **Opportunities for greater collaboration**

Digital divide	Segregated stakeholder actions	Responsible growth
Today, the internet's physical reach is only 66% of people globally[16] – reflecting an ongoing digital divide. Around one-third of the world's population, or about 2.6 billion people, remain offline.[17] Content reach can be enhanced through improved infrastructure, application delivery and accessibility opportunities like language localization and addressing vernacular disparities. These challenges signal room for growth in the creation of a more inclusive and connected landscape.	The governance landscape is often marked by fragmentation, with a multitude of stakeholders, regulatory bodies and technical standards often operating in isolation. While there are groups that make an effort to coordinate,[18] as society moves towards a more immersive and pervasive internet experience, the need for cohesive, forward-thinking governance has never been more pressing. To achieve this, existing stakeholders, bodies and forums should convene individuals from academia, industry, civil society and government and cultivate coordinated knowledge sharing.	When considering how to facilitate responsible growth, society is faced with the reality that there are hundreds or even thousands of governance authorities and structures that both support and conflict with one another. Each body is, within their own means, guiding the growth and evolution of the future internet. This paints the picture that internet governance is not one system, one control point, or one institution.[19] Instead, responsible growth should be enabled through collaboration across these bodies.

The need for commitments

The convergence of powerful technologies, coupled with the current fragmentation in internet governance, presents a challenge and an opportunity. This critical juncture demands a refreshed view of "what good looks like" today and what it will look like in the future as technology continues to evolve in the context of immersive, spatial, AI-driven internet experiences.

This paper aims to bridge the gap between the technical realities of today's internet governance and the aspirational vision for a "blended reality" future. By examining the current state of internet governance, it lays the foundation for understanding the challenges and opportunities ahead.

Building on this understanding, this document proposes a set of commitments that serve as crucial inputs for shaping the governance of tomorrow's internet. These commitments, developed through a multistakeholder process, are not governance structures themselves but rather a guiding vision that can inform the development of robust, adaptable and inclusive governance approaches, frameworks and best practices.

By articulating these commitments, the aim is to catalyse a global conversation on how stakeholders can collectively ensure that the future internet remains a force for positive change, cultivates innovation and promotes the well-being of all users in an increasingly blended reality.

1 Current state of internet governance

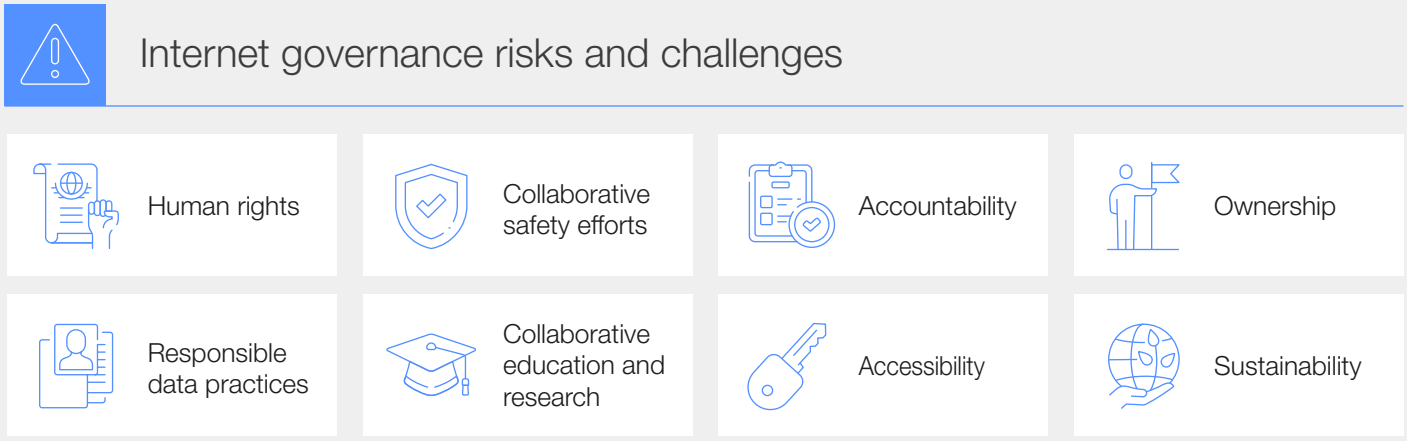
Current internet governance is decentralized and fragmented, highlighting the urgent need for collaborative global governance frameworks.

The world is at a crossroads in the design, development and governance of the future internet and the blended reality it delivers. Yet, to understand what is needed next, it is necessary to understand today's internet governance efforts.

Today's internet governance efforts have aimed to enable scalability and security. This has caused many unsettled risks and challenges.[20] However, as recommendations are made for identifying and implementing governance commitments to guide the future of the internet, it is important to outline:

1. The foundational multistakeholder model
2. The stability of technical standards
3. Governance fragmentation

FIGURE 3 **Internet governance risks and challenges**



1.1 The foundational multistakeholder model

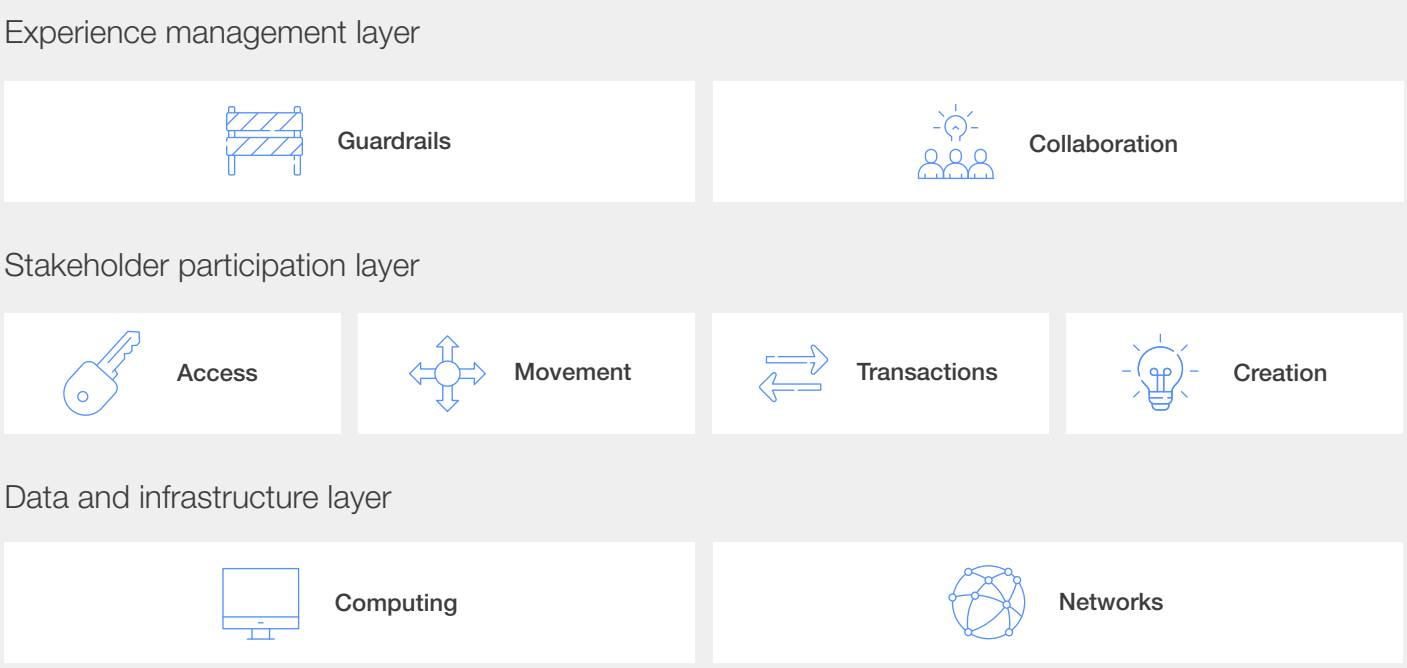
The governance of the internet is not a single function. Rather, it is an entire network of distinct roles, responsibilities and discrete tasks executed by separate stakeholders and multistakeholder groups.

These governance tasks are supported by technical and jurisdictional guardrails – spanning regulation, public policy, standards and enforcement – that apply to infrastructure (such as networks, hardware and software) and the experiences delivered via this infrastructure.

A previous Forum paper, *Interoperability in the Metaverse*,[21] described distinct layers of the metaverse that require governance:

- **Experience management layer**: This encompasses the administrative tasks that dictate how ethics, principles and diverse stakeholder input translate into hardware and software requirements.
- **Stakeholder participation layer**: This includes the content and interfaces provided over the connected network and the experience delivery mechanisms that enable everyone to participate via accessing, communicating, moving, transacting and creating on the network.
- **Data and infrastructure layer**: This includes the physical computing and networking operations that enable connectivity.

FIGURE 4 **Layers of interoperability and considerations**



Source: World Economic Forum. (2023). *Interoperability in the Metaverse.*

These layers are being addressed through existing and emerging approaches led by entities like the International Telecommunications Union (ITU),[22] the Internet Corporation for Assigned Names and Numbers (ICANN),[23] the Organisation for Economic Co-operation and Development (OECD)[24] and the Metaverse Standards Forum,[25] among others. Such entities have convened diverse groups – from governments, the private sector, civil society and the technical community – in an open dialogue to make consensus-based decisions and take responsibility for functions like:

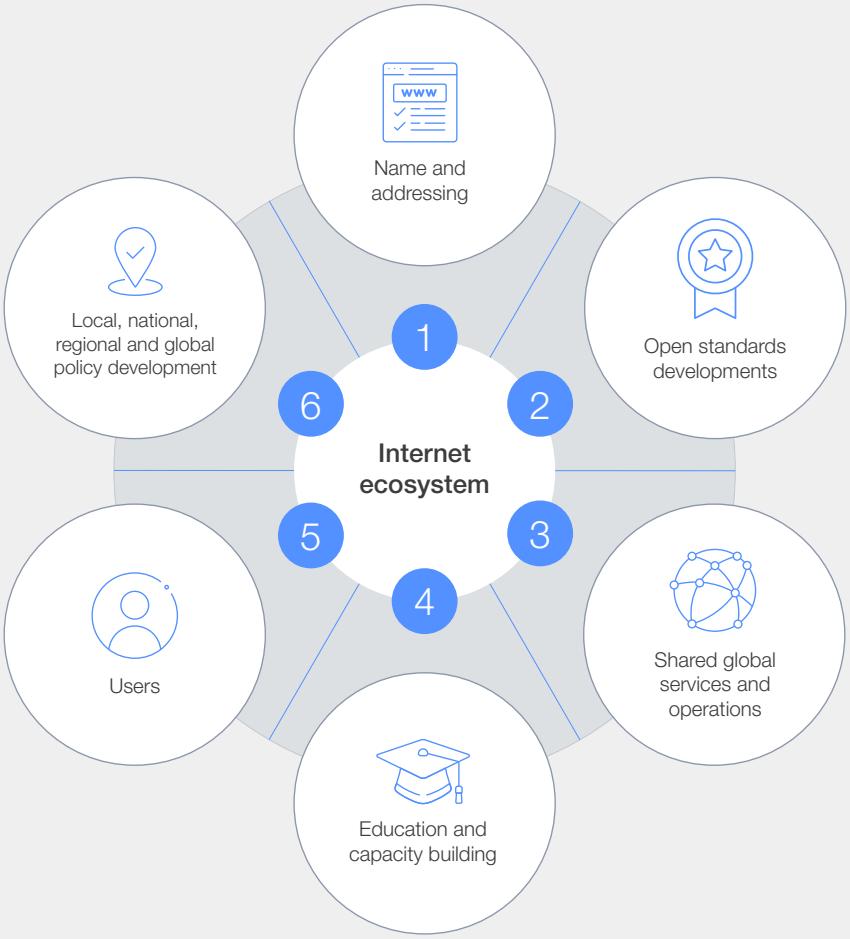
1. **Naming and addressing**: A system for uniquely identifying and locating resources or entities within a network or environment, such as IP addresses or domain names on the internet
2. **Open standards development**: The collaborative process of creating and maintaining technical specifications that are publicly available and can be freely adopted, implemented and extended by anyone

3 **Shared global services and operations**: Infrastructure, resources or functions that are jointly managed and applied on a global scale, often to support common goals or provide consistent services across different regions or organizations

4 **Education and capacity building**: The process of enhancing the knowledge, skills and abilities of individuals or organizations, often to improve their capacity to understand, implement or manage specific technologies, processes or systems

While these championing bodies may be unifying voices, the degree of overlap in subject matter results in potentially contradictory standards across bodies, creating further need for collaboration and coordination.

FIGURE 5 **Example of multistakeholder bodies**: The internet's governance arrangements are a network



Source: Internet Society. (2016). *Internet Governance – Why the Multistakeholder Approach Works.*

Additionally, the distributed architecture, computing activities and internet traffic are subject to statutory contexts.[26] For example, national governments exert jurisdiction using so-called data localization laws,[27] often framed in terms of data sovereignty. As such, regulations like the European Union's (EU's) General Data Protection Regulation (GDPR)[28] set a precedent for strict data privacy practices that differ significantly from practices in other regions, such as the US or parts of Asia, where data regulation may be less stringently defined and enforced. This divergence of statutory approaches underscores the challenges of applying a uniform governance model across differing legal and cultural landscapes.

This fragmentation of national frameworks can hinder the efficiency and effectiveness of global internet governance and the ability to address transnational issues such as cybercrime, digital trade, online harms, secure and trusted cross-border data flows, and the protection of intellectual property.

To address these challenges, it is imperative to establish a common set of governance commitments that all stakeholders can execute via tailored strategies, approaches and policies that are aligned with jurisdictional values and establish common objectives for cooperation.

1.2 The stability of technical standards

> The success of these multistakeholder efforts in managing the internet's backbone illustrates the power of coordinated, technical governance.

The internet's technical infrastructure, encompassing both architectural design and connectivity standards, has been crucial to its rapid expansion. This foundation has enabled global connectivity, cultivated interoperability and supported the growth of the digital economy.

The stability and reliability of the internet are a testament to multistakeholder governance and standards setting by distinct organizations such as the Internet Engineering Task Force[29] (IETF), the World Wide Web Consortium[30] (W3C), ICANN, Internet Society[31] (ISOC), the ITU and the International Organization for Standardization[32] (ISO). Notably, these organizations helped guide the technical delivery of the networks and infrastructure supporting internet invariants,[33] or properties that do not change even as the internet does, such as:

1. **Global reach and integrity**: Any internet endpoint can communicate with any other endpoint globally, ensuring consistent and reliable data transmission.

2. **General purpose**: The internet supports a wide range of applications and services without inherent limitations.

3. **Permissionless innovation**: Anyone can create and deploy new services on the internet without needing special approval, cultivating continuous innovation.

4. **Accessibility**: Anyone is free to consume or create content on the internet, set up servers and establish networks.

5. **Interoperability and mutual agreement**: Open standards and agreements between network operators enable seamless inter-networking.

6. **Collaboration**: Effective internet governance relies on cooperative efforts among diverse stakeholders to solve emerging issues.

7. **Reusable building blocks**: Technologies developed for specific purposes on the internet can be repurposed for new applications.

8. **No permanent favourites**: The success of the internet depends on continued relevance and utility, not on maintaining a favoured status.

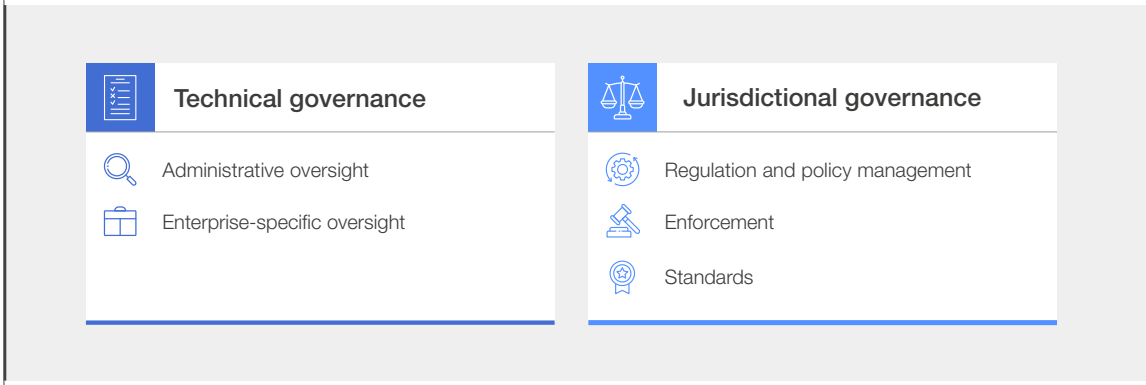
While these shared expectations have effectively guided the development of the technical delivery of protocols and standards, maintaining the robust, borderless nature of the internet has presented challenges in terms of policy-making, enforcement and multi-jurisdictional coordination. This highlights the importance of continuous multistakeholder collaboration and international cooperation,[34] especially when looking towards developments in the metaverse and other forms of emerging technology.

The success of these multistakeholder efforts in managing the internet's backbone illustrates the power of coordinated, technical governance. This work has sustained the internet's foundational elements, ensuring its continued growth and stability.

1.3 Governance fragmentation

Current multistakeholder efforts have created a fragmented and decentralized governance environment across technical and jurisdictional domains.

FIGURE 6 **Technical and jurisdictional governance**



Keeping the internet technically operational relies on governance stakeholders executing complex technical management. This can be broken down into bespoke groups:

- **Administrative oversight**: Today, a large cadre of mostly private companies and institutions perform various administrative oversight functions[35] – such as the IETF, the W3C and the ICANN, among others. This structure provides robust and adaptive management – however, its decentralized nature can also introduce challenges in coordination, timeliness and uniformity.

- **Enterprise-specific oversight**: After various administrative bodies provide guardrails, individual companies administer individual governance over their own infrastructure, architecture, applications, devices and vendor choices (should the organization be using third-party technologies).

Internet governance also involves navigating across jurisdictions due to the network's geographical reach. These jurisdictions, influenced by local culture, needs and values, include consideration around the governance of regulations and policy management, standards and enforcement:

- **Regulations and policy management**: Nation states govern public and private institutions that deliver and provide services over the network. Illuminating the complexity, this governance extends across federal, state and municipal levels. This further creates jurisdictional barriers and geographically disparate enforcement of regulations and policies.

- **Enforcement**: With sovereign boundaries often dictating responsibility and accountability for monitoring, reporting and adjudicating jurisdictional expectations, stakeholders experience varying degrees of enforcement. As a result, there may be unclear expectations for how international law enforcement agencies such as the International Criminal Police Organization (INTERPOL) may engage in the support of metaverse governance.

- **Standards**: Standards development organizations (SDOs) – such as ITU (through its focus group on the metaverse)[36] and the Global Initiative on Virtual Worlds: Discovering the CitiVerse[37] – provide informal governance structures, at times aligning best practice with individual standards. Even this landscape, however, is split into global-, regional-, country- and industry-specific levels.

Such diversity across technical management and jurisdictional consideration creates a series of risks. Moreover, as technologies converge, their respective risks may also converge.

Fragmented governance structures could lead to:

1. Undermined ability to address global challenges (such as safety, privacy, security and equitable access) effectively and cohesively

2. A complicated, interwoven, sometimes contradictory tapestry of guidance goals

3. Increased complexity as technologies that are individually governed converge

Given the crucial role of the internet in delivering information and allowing people to access basic utilities that empower them to live, work and engage in leisure activities, it is imperative that stakeholders strive for and align on shared common ground. This convergence should build upon existing governance structures, best practices and established standards.

1.4 The impact of governance

Governance models play a pivotal role in creating an environment that empowers individuals, cultivates innovation, enables capital investment and sets appropriate guardrails.

BOX 2 **Good governance may be executed through adaptive policies and regulatory sandboxes.**

Adaptive policy-making: Adaptive policy-making involves a proactive and iterative process that emphasizes learning and adaptation. Adaptive policies are designed to be responsive to emerging challenges and opportunities.

Regulatory sandboxes: Establishing regulatory sandboxes allows start-ups and innovators to test new technologies and services in a controlled environment

Note: Illustrative, non-exhaustive.

Done correctly, the impact of good governance may enable approaches for:

- Brokering agreements
- Socializing disparate approaches across diverse groups and territories, etc.
- Providing flexibility for collaboration and cooperation, considering diverse regional differences and needs

A shared set of commitments, rooted in current frameworks and legislative guidance, can augment existing governance mechanisms and guide the development of the technologies, products and services in the future blended reality.

This approach will enable stakeholders to address points of divergence and the associated risks more effectively by providing a common baseline. By applying a foundation of shared commitments, stakeholders can develop distinct jurisdictional and technical strategies, approaches and policies while respecting local and regional differences.

2

Shared commitments for guiding governance in blended reality

A cohesive set of commitments will guide governance as emerging technologies create a blended physical-digital reality.

BOX 3 **New experiences, same issues**

Digital spaces have long been a forum for pronounced cyberbullying, harassment, abuse, exploitation, privacy violation, etc.

Physical-digital blended spaces will see exacerbated forms of thse issues.

BOX 4 **Blended reality commitments**

In blended reality, people cannot "unsee" or "un-experience" interactions.[38,39] While people cannot unsee or un-experience reality today, the types of spatial experiences[40,41] an individual could be exposed to bring dynamic, evolving, palpable and visceral experiences. This underscores the urgency of refining and implementing a set of guiding commitments.

The need for a coordinated governance approach in the digital spaces – i.e. social media, internet chatrooms and content platforms – has long been recognized, with various standards, frameworks and best practices already in place. As digital and physical realities increasingly become blended, however, particularly in XR environments, cohesive governance becomes even more critical.

These commitments are based on the work of the multistakeholder community constituted by the World Economic Forum's Defining and Building the Metaverse Initiative, consolidating and building upon existing principles and shared values and adapting them to address the unique challenges posed by emerging technologies. By synthesizing established guidelines with forward-thinking approaches, these commitments aim to create a robust foundation for governing the evolving digital landscape.

These commitments align with other established frameworks, like the Digital Trust Framework,[42] which emphasizes security, accountability and responsible technology use as essential components for cultivating trust in digital systems.

The eight commitments and supporting goals displayed in Figure 7 are intended to function as a guide for common outcomes and goals for a shared vision of the future of the internet.

FIGURE 7 | **Shared commitments for guiding governance in blended reality**

To guide the future of the internet, the following commitments are necessary

1 Human rights

The consideration for protecting and respecting individuals' rights within both digital and physical reality.

- Respecting human rights
- Preservation of choice
- Consent in context

2 Accountability

The consideration and protection of society through mechanized structures to enable appropriate levels of identification, enforcement, recourse and redress. This must be secure, privacy preserving and minimally viable.

- Clarity of roles and responsibilities
- Recourse and redress
- Indentification management

3 Collaborative safety

The consideration and protection of society, particularly vulnerable populations, through diverse, and adaptive multistakeholder collaborations to understand varied perspectives that shape and refine safety regulations, standards and governance practices.

- Human-first design
- Comparative saftey burden
- Responsible innovation

4 Ownership of physical and digital assets

The consideration and protection of physical and digital assets– inclusive of data, identity, IP etc. – to enable possession, access, transactions, transferability and accountability.

- Empowerment through ownership definition
- Empowerment through traceability and control
- Empowerment through legal protection

5 Responsibile data practices

The consideration for creating and refining regulatory measures aimed at establishing and maintaining data stewardship, enabling privacy and security, and other actions, to deliver the future internet.

- Responsible data processing and management
- Privacy and security
- Review, update, transfer, deletion and erasure

6 Education and research

The consideration for exploring accessible and inclusive educational and research avenues that empower the broader community, inclusive of knowledge sharing across academia, government, civil society and industry.

- Education
- Research and open knowledge

7 Accessibility

The consideration for focusing on the advancement, interoperation, and protection of tooling and infrastructure which supports inclusive and diverse participation and representation, ensuring widespread access for individuals and organizations.

- Inclusion and diversity
- Tooling and infrastructure investments
- Interoperability

8 Social, economic and environmental sustainability

The consideration for acting on the crucial need to protect and nurture society's blended reality, factoring in economic, social and environmental factors.

- Environmental sustainability
- Social sustainability
- Econonmic sustainability

Coordinated governance commitments must inform broader action, as stakeholders are making decentralized regulatory and organizational decisions today about the future blended physical-digital reality. Rallying behind these governance commitments will enable technically and jurisdictionally appropriate governance guardrails to be put in place as individuals[43] start to engage in blended reality experiences and move around immersive spaces – bringing with them their identity, money and digital objects.

Each stakeholder is uniquely positioned to strive for and uphold the above commitments and supporting goals through their unique roles. For example, stakeholders should consider how these commitments cascade to/for:

- The design, development, deployment and monitoring of technology
- The creation of regulation, policies and guidance
- Enforcement actions
- Research, collaboration and knowledge sharing
- Participation and enabling feedback loops for experiences in blended reality

It is recognized that the strategies and approaches used to execute these commitments will differ across jurisdictions and that each stakeholder will have differing power, privileges and available resources to facilitate change. Irrespective, when operationalized across industry, government, academia and civil society, these convergent commitments will maximize the chance of delivering a metaverse that prioritizes privacy, safety and security, and is socially and economically viable for all.

2.1 Human rights

Protecting and respecting individuals' rights in both digital and physical realities is essential. Technological progress must enhance human dignity, personal autonomy[44] and individual agency rather than infringe upon it.[45] This extends universally across all cultures and societies, affirming the importance of diverse and inclusive practices.

Respecting human rights: This involves extending universally recognized human rights[46] across the blended physical and digital reality via hard law and standards to fortify civil rights and guide business activity (via Ruggie Principles)[47] at the nation-state level.

- Aiming to cultivate an environment that's conducive to safety, individual well-being, mental health and autonomy through the advancement of privacy, security and responsible design
- Enabling technology to serve as a tool for human dignity and personal empowerment across cultures and societies
- Upholding human rights in a global context while respecting considerations for local and regional civil rights differences, interpretations and priorities

This may be achieved by:

- Evolving and aligning with international human rights standards – including engagement on and access to political processes like migration, the right to privacy, the right to basic government services, etc. – to enable human rights evolution
- Strengthening and enforcing existing policies to ensure accountability
- Respecting the principles of necessity, proportionality and legality
- Providing scope for contextualization and diversity in prioritization, relative emphases and implementation
- Engaging with diverse stakeholders – including from industry, academia and civil society – in the decision-making process to enable inclusivity and comprehensive policy-making

Preservation of choice: This involves endorsing the development of governance that respects digital autonomy, emphasizing that everyone has the fundamental option to limit or abstain from digital engagement without facing exclusion from essential services[48] such as healthcare, education, utilities, means of communication, emergency response, transport, etc.

- Championing the dignity of choice for non-digital interactions and ensuring that this choice does not preclude access to essential services – this may be accomplished through modernizing infrastructure for processes that enable members of society to reap the benefits of emerging technologies without necessarily needing to interact with them
- Implementing technologies that allow users to limit data sharing or interface with XR systems through less "advanced", less immersive systems/platforms
- Recognizing and affirming the rights to autonomy, agency, mobility and access to information as fundamental human rights in both digital and physical spaces. This includes the right to move and choice of residence, and the ability to seek and impart information through any media, regardless of frontiers (Article 13 and Article 19 of the United Nations Universal Declaration of Human Rights)[49]

Consent in context: This involves supporting the continuous improvement of consent mechanisms – respecting different legal bases of data processing – to enable context-aware,[50] transparent mechanisms to provide individuals with clear choices and control over their personal data, intellectual property and interactions.

2.2 Accountability

It is essential to establish strong mechanisms that clearly define responsibility and accountability, ensure safe and secure processes, empower enforcement, and provide effective pathways for recourse and redress.

Clarity of roles and responsibilities: This involves encouraging the pursuit of clear frameworks for accountability that delineate obligations, defined roles, and responsibilities of discrete stakeholders. This will ensure that each stakeholder meets their specific roles and responsibilities while collaborating on a common vision.

- Undertaking education efforts to gain a better understanding of accountability and responsibilities
- Describing unambiguously transparent, timely and effective processes for issue escalation and resolution
- Describing roles and responsibilities of law enforcement and other parties

Recourse and redress: This involves emphasizing the importance of adopting adaptive approaches (enforcing rules) and corresponding support (cultivating digital environments where recourse and redress are accessible, efficient and effective).

- **Establishing transparent procedures** for individuals to report concerns – such as those related to safety, privacy, security, etc. – and enabling appeal on moderation and enforcement decisions, ensuring expedited and equitable resolutions
- **Calibrating targeted and clear enforcement standards** within communities and across platforms to enable trust that codified expectations will be enforced with appropriate remedies
- **Enabling appropriate and effective legal processes** that facilitate the investigation of, and response to, harmful content or conduct online – ensuring that investigation and response are informed by the diverse experiences and needs of involved parties
- **Facilitating access to support services, as well as recourse and redress forums**, tailored to the needs of vulnerable groups (e.g. children and young people, women, LGBTQIA+ people, journalists, Indigenous communities, etc.) to enable their perspectives and lived experience to inform suitable access, processes and outcomes

Identification management: This involves enabling appropriate and suitable identity access management measures of individuals interacting with information technology (IT) systems to enable governance through such systems. This might include, as necessary, aspects of personal identity, digital identity, entities or digital assets and their associated ownership:

- Employing traceability and visibility mechanisms to implement appropriate enforcement, redress and remediation
- Operating on the principle of data minimization and being adaptable to serve individuals, collective entities and societies effectively

2.3 Collaborative safety

It is essential to explore considerations around protecting individuals and groups, particularly communities most at risk, also termed vulnerable populations[51] (including but not limited to individuals from low-income backgrounds, people with limited literacy, older adults, minors, individuals with disabilities and others). This would help to enable protection through diverse and adaptive multistakeholder collaborations that shape and refine safety regulations, standards and governance practices.

Human-first design:[52] This involves prioritizing an individual's safety, privacy, security and other fundamental rights throughout the design, development, deployment and ongoing delivery of products and services – as described in previous works.[53,54,55] This is underpinned by recognizing that the burden of safety, privacy, and security should not fall solely upon the person using the product or service.

Comparative safety burden: Individuals and organizations may contribute to the marketplace (in defining, meeting and complying with safety measures) to differing extents. Governing bodies should recognize that the creation of and an expectation of meeting regulatory obligations may place an undue innovation burden on new or small players who wish to enter and participate in the marketplace.

Responsible innovation: Innovation[56] should be harmonized with safety and follow guidance from diverse governance mechanisms. When formulating regulatory approaches, it's important to ensure they are evidence-based, contextual, proportional and appropriately use-case specific.

This may be delivered through agile, collaborative efforts to understand diverse perspectives and appropriately fortify, create, implement and augment existing regulations, standards, guidance, best practices and forms of self-governance. Specifically, this could be accomplished via community guidelines and internal company policy to appropriately protect members of society.

- **Inclusive protection**: Cultivating an inclusive environment that safeguards all individuals, with additional considerations for those who may be more susceptible to harm, such as those from vulnerable populations
- **Experience moderation**:
  - **Content and conduct moderation**: Prioritizing thoughtful content and conduct moderation[57] that respects human expression while addressing the challenges of harmful content, harassment, misinformation and disinformation, and other harms while ensuring user safety and championing algorithmic accuracy and transparency
  - **Spatial moderation**: Enabling the moderation of XR content[58,59] delivered vis-a-vis an immersive experience (this includes interactive content that is spatially aware and/or includes static projections in physical reality)

2.4 Ownership of physical and digital assets

It is crucial to explore considerations around addressing the provenance, authenticity and protection of physical and digital assets. This includes data, identity and intellectual property (IP), and other forms of assets to ensure possession, access, transactions, transferability and accountability for individuals, entities and common resources.

Empowerment through ownership definition: This involves supporting the advancement and definition of ownership and/or ownership rights and recognizing the need to define agency and control over an entity's or one's own:

- Identity: as characterized through representation, data and credentials
- IP: including globally recognized copyrights, patents and trademarks
- Financial resources: including financial realization or benefits received through monetization
- Digital assets: including but not limited to a range of asset types like digital art or cryptocurrency

Empowerment through traceability and control: This involves enabling the attribution of lineage and authenticity of digital and physical interactions and assets.

1. Provenance and authenticity

- Lineage: tracing the ownership and transfer history of assets through mechanisms like distributed ledger technology or digital certificates, creating a chain of custody
- Authenticity:[60] establishing proof of personhood and humanity, especially in the context of AI-generated assets and digital representations
  - Proof of value: establishing verifiable and quantifiable value for both physical and digital asset
  - Proof of ownership: clear assignment and verification of ownership
  - Proof of transaction: comprehensive records for transaction history and settlement

2. Enabling technical controls

- Automating and enforcing ownership rights, distributing payments to owners, and enforcing transactions – potentially with smart contracts
- Establishing ownership protocols within individual platforms, or those spanning multiple platforms and digital networks
- Implementing preventative measures to mitigate theft and destruction of assets, as well as mechanisms to correct errors and reverse fraudulent transactions
- Developing technical standards for the attribution of authenticity and provenance
- Ensuring compliance with international standards and enabling interoperability between different systems and jurisdictions

Empowerment through legal protection: Enabling stakeholders, including individuals and entities, to benefit from protections allows them to assert, verify and enforce their ownership rights. This requires:

- Assessing the differences in copyright, and other IP laws, and fair use across jurisdictions while evaluating the following:
  - International agreements on ownership and provenance
  - Frameworks for the monetization of digital or intangible assets
- Harmonizing existing works to facilitate a legal means of verifying and authenticating provenance for digital assets and additionally supporting the enforcement of ownership rights
- Consumer protection through recourse and the provision of international or centralized law enforcement capabilities

2.5 Responsible data practices

It is crucial to explore considerations around creating and refining regulatory measures to establish and maintain data stewardship and enable safety via privacy and security (concerning data processing and management). This is required as a principal component to manage the dynamic forms and types of data[61,62] that will be created, collected and applied to deliver the future internet.

Responsible data processing and management: Upholding responsible data stewardship is essential for establishing trust throughout the data life cycle.

Key practices include:

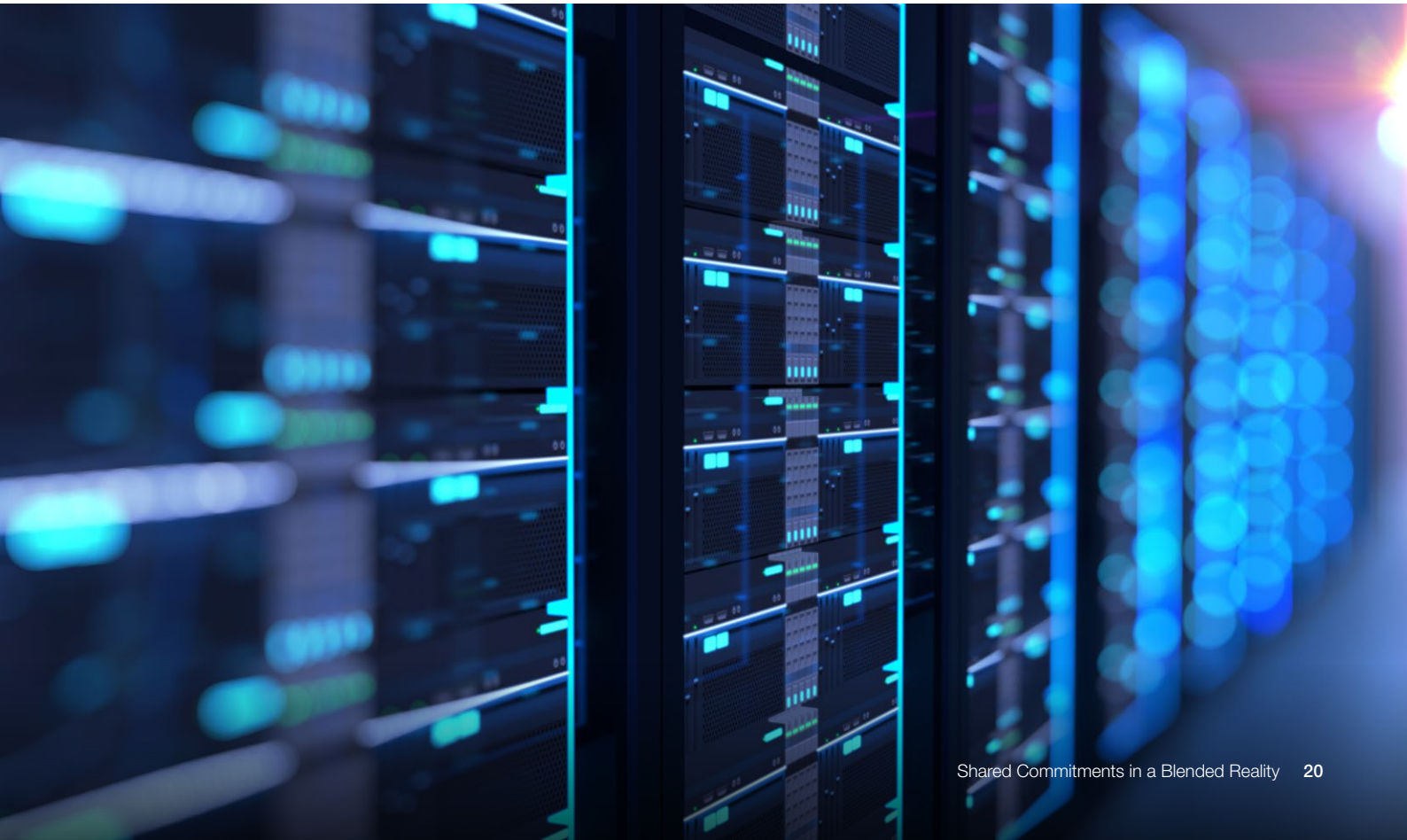
- Standardizing data management processes to confirm reliability, accuracy and accessibility
- Developing clear and consistent data definitions and classifications[63,64]
- Implementing effective data governance[65,66]
- Practising responsible data modelling and building responsible AI systems[67]
- Identifying and making use of infrastructure and architecture that enables clear and transparent practices

Privacy and security: Supporting the delivery of privacy and security facilitates robust protection of data and the infrastructure that processes and maintains that data.

- Developing comprehensive policies, standards and practical guidance that address collection, access, control and use of data with consideration for various legal bases of data processing[68]
- Conducting regular activities to safeguard data against unauthorized access and emerging threats while future-proofing for technological advancements
- Cultivating transparency in data practices and allowing users to understand how their information is used and protected

Review, update, transfer, deletion and erasure (RUTDE): Enabling comprehensive architecture, processes and privacy controls facilitates:

- Building IT systems to support the review, update, transfer, deletion and erasure of individuals' information[69]
- Providing documentation, structured processes and supporting information for individuals to manage their digital footprints, including the option to request, review, update, transfer and delete personal data from platforms



2.6 Education and research

It is crucial to explore accessible and inclusive educational and research avenues that empower the broader community while considering knowledge sharing across academia, government, civil society and industry. Such education could allow society to contribute to, benefit from and enable responsible future advancements.

Education: Advocating for and providing education, capacity-building and continuous learning enables collective and individual advancement in society. This encompasses:

- Facilitating digital, technology and media information literacy[70] for all individuals, especially vulnerable populations – (for example, literacy training should include methods on how to combat social engineering and other manipulation threats)
- Providing developers and content creators with the training and tools to understand and measure the broad impact of their design decisions[71]
- Promoting reciprocal education among stakeholders – i.e. regulatory bodies, academia, industry and civil society – via iterative feedback loops to facilitate responsible design decisions
- Encouraging and supporting ongoing professional development and skill enhancement to align the workforce with the dynamic nature of technological progress
- Providing special considerations and attention to those most at risk, such as vulnerable populations, and how their specific educational needs should be addressed

Research and open knowledge: Affirming the dedication to supporting and collaborating on ongoing research unlocks deeper comprehension of emergent technologies and their societal impacts. Funding continuous research promotes better understanding of the enabling metaverse technology and the impacts of its use. Sharing information freely would lead to:

- Emphasizing the democratization of power and decision-making in literacy efforts, ensuring that all stakeholders have a voice and role in sharing technological advancements
- Promoting open-source design and development to further cultivate accessibility, collaboration and innovation
- Ensuring that insights derived from research are openly disseminated and made widely accessible to the public to enable the democratization of knowledge

The insights from such research should be openly disseminated among all stakeholders to cultivate a collaborative and informed network.

2.7 Accessibility

It is crucial to focus on the advancement, interoperation and protection of tooling and infrastructure that support inclusive and diverse participation and representation, ensuring widespread access for individuals and organizations.

Inclusivity and diversity: This involves cultivating an environment that celebrates and amplifies diversity while actively promoting inclusivity across cultural, social, jurisdictional and economic dimensions. This commitment further entails:

- **Championing representation**: Advocating for and implementing strategies, policies and standards that enable diverse representation in decision-making processes, technology development and access, as well as in the representation of digital entities. For example, this may include targeted initiatives to involve underrepresented or marginalized groups in the creation, governance and evolution of technologies and experiences

- **Creating forums for participation**: Establishing accessible and safe platforms where individuals can safely voice their opinions, share their experiences and contribute to the ongoing development of technologies and governance processes. These forums should be designed to facilitate meaningful interactions and respect differences, value distinct perspectives, promote mutual understanding and encourage collaborative problem-solving

- **Advocating and designing for vulnerable populations**: Ensuring that these promotions for inclusion and diversity place special attention on vulnerable populations

- **Recognizing community access**: Ensuring that blended reality experiences accommodate the unique needs of global communities and Indigenous peoples, particularly those in remote areas who often share a single point of access. This includes supporting communal access points and cultivating participation from those who live differently than the majority

Tooling and infrastructure investment: Encouraging and supporting investments in infrastructure and tooling broadens social, economic and online access to existing and future technologies and experiences, promoting inclusive growth:

- Developing and maintaining secure, robust and resilient infrastructure to enable the open, interoperable and accessible delivery of blended reality experiences and technologies for the public good

- Enhancing connectivity for underserved and marginalized communities to bridge the digital divide

- Investing in infrastructure that supports shared access points for communities, ensuring that even those in remote locations with limited individual access can participate fully in XR experiences

Interoperability:[72] This involves supporting the establishment of standards that facilitate data transfer – including identity, financial resources and digital assets – across platforms and services. This effort aims to improve individual choice, enhance competition, reduce barriers and bolster usability.

- Recognizing that interoperability is not limited to technical interoperability but extends to the supporting mechanics, including:
  - Use interoperability: prioritizing human-centric design to ensure that diverse groups can participate in the future blended reality experiences, promoting inclusivity and accessibility
  - Jurisdictional interoperability: navigating the complexities of differing regulatory requirements across jurisdictions to ensure lawful metaverse activities
- Enabling users to have consistent and engaging experiences across various virtual environments by addressing technical, use and jurisdictional interoperability, allowing for interconnectedness and maximizing network effects.
- Acknowledging that different standards-setting bodies are addressing interoperability while recognizing these bodies should be seeking greater participation from a wider array of stakeholders[73] to reduce barriers and enhance data transfer usability

2.8 Social, economic and environmental sustainability

It is crucial to protect and nurture society's blended physical and digital reality across economic, social and environmental factors.

This involves developing and implementing sustainable practices across all technological and operational processes to support economic viability and environmental health for future generations.

Environmental sustainability: This involves recognizing the significant environmental costs of building, using, deploying and maintaining technology.

- Acknowledging the impact of bespoke layers of the tech stack – such as manufacturing hardware, training and tuning AI models, and operating software platforms at scale
- Committing to eco-friendly development and operational strategies for emerging technologies to mitigate their environmental impact
- Reducing the energy footprint of data centres, devices and networks while taking responsibility for pursuing societal and economic benefits that justify environmental trade-offs
- Implementing open forums and tracking systems to evaluate and make informed decisions on such trade-offs for XR experiences versus environmental impact

Social sustainability: This involves developing technology that supports societal cohesion and advancement, considering physical, economic and mental well-being. Prioritizing transparency cultivates societal understanding of technology development and delivery, including feedback channels and redress mechanisms.

- Ensuring ethical design and deployment of technologies – such as AI – to avoid bias, promote fairness, increase societal cohesion and provide value to society and end-users of the technology
- Implementing digital inclusion initiatives to ensure equitable access to technology for all, including underrepresented, marginalized and vulnerable groups
- Developing and promoting mental health support tools within technological platforms to enhance user well-being

Economic sustainability: This relies on cultivating an inclusive digital economy. This includes promoting business models that encourage long-term economic health over short-term gains and investing in initiatives that promote economic resilience and diverse marketplace opportunities.

- Encouraging the adoption of sustainable business models that prioritize environmental stewardship and long-term economic resilience
- Providing support for start-ups and innovation to drive economic growth, promote competition and choice, and cultivate a diverse and resilient marketplace
- Promoting local economies and fair-trade practices to ensure equitable distribution of economic benefits, including cross-border arrangements in both developed and developing economies

Call to action

As the world stands at the nexus of technological innovation, convergence and social impact, it is imperative that these commitments are used to guide a future internet that is not only safe, inclusive, and socially viable but also cultivates societal and economic well-being.

The role of regulators, industry leaders, academics and civil society becomes crucial in:

- Formalizing the adoption of these commitments through forums, such as coalitions, to advance shared commitments and goals
- Shaping the best practices, standards and regulations to enable the delivery of these commitments and goals
- Reviewing existing local, national, regional and global legislation initiatives to find opportunities to harmonize with these commitments and goals
- Developing means of measuring progress on commitments and goals to promote transparency and adoption

The ethos of stewardship articulated in these commitments should motivate each stakeholder to function as a guardian and collaborator. It is imperative that diverse stakeholders come together and cooperate, acknowledging that while no single entity can supervise and provide oversight to every aspect of the internet, a collective approach with agreed-upon shared commitments and interests can effectively oversee and guide the evolution of a future physical/digital blended reality. This stewardship is not merely a passive role but an initiative-taking engagement that involves continuous monitoring, reassessment and adaptation of strategies to align with emerging technologies and societal needs, including those that emerge from engagement with technologies.

By recognizing, championing and acting on these commitments, stakeholders galvanize a global movement towards governing and building a responsible blended reality. This will cultivate societal, economic and individual benefits and allow investments in technology to yield positive outcomes for all.

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