

**The Tortoise and the Hare: American and Chinese National and
Technological Cultural Values Influence on Sustainability Transition
Mechanisms**

A Research Paper submitted to the Department of Engineering and Society

Presented to the Faculty of the School of Engineering and Applied Science
University of Virginia • Charlottesville, Virginia

In Partial Fulfillment of the Requirements for the Degree
Bachelor of Science, School of Engineering

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Spring 2022

On my honor as a University Student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments

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"Do you ever get anywhere?" the Hare asked with a mocking laugh.

"Yes," replied the Tortoise, "and I get there sooner than you think. I'll run you a race and prove it." (Aesop, 540 BCE, n.p)

The arduous task of addressing climate change, energy security, and contemporary environmental issues has come to the forefront of investment and policy in leading countries around the world, including the United States and China. Paramount to solving these challenges is a technological and societal transition to sustainable practices in clean energy, transportation, agriculture, and consumer lifestyle. Many roadblocks present themselves in the transition including lobbying and misinformation, efficient legislation and regulation, lack of incentives, and public resistance. Nevertheless, both the United States and China have made great strides towards sustainability despite their systems and governments prioritizing different values and operating in starkly differing cultures. These contrasting cultures and values produce vastly dissimilar systems for developing and adopting new ideas and technologies, a concept encompassed by the term of technological culture. The notion of technological culture suggests an analysis of the entirety of a sociotechnical system – from government structure to cultural attitudes to the source and rate of innovation. This paper focuses on defining and identifying the salient features of American and Chinese technological cultures and sheds light on the dimensionality of the interactions between actors operating in each country. I argue that each technological culture consists of systems and organizations who play the role of the hare, and systems and organizations playing the tortoise. The hares encourage, enable, and run towards change, while the tortoises slowly churn their way towards the finish line. Further, I contend that neither technological culture possesses superior values or transition mechanisms, but that American and Chinese technological cultures' relative strengths and weaknesses lead each nation to thrive in ironically antithetical aspects of sustainability transitions. I hope my analysis will lead to further examination and discussion on

identifying and appropriately leveraging the tortoises and hares in the systems and attitudes connected with the ongoing transition to clean energy and sustainability.

Multidimensional Factors of Transition to Sustainability

As identified by British professor Frank Geels (2011), the transformation to sustainable practices in electricity generation, transportation, and agriculture presents a relatively unique transition (p. 25). First, Geels recognizes sustainability transitions as “purposive”, aiming to address a persistent and growing issue, rather than “emergent”, driven by an innovative disruption (i.e., iPhone, Model T). Secondly, Geels points out the transition to sustainability practices offers little incentives to individual actors, as the end goal is for the “collective good” (p.25). Hence, the most appropriate mechanisms and technologies in sustainability transitions typically yield lower profits and worse performance when compared to existing technologies. Rather, Geels claims changes to current policies, regulations, subsidies, and taxes set out by governments and civil authorities are required to provide necessary incentives to drive the transition. He recognizes these adjustments to come with political and power struggles and disagreement on the correct levers and mechanisms. In sum, Geels identifies transitions toward sustainability as multidimensional, involving the intricate interplay of *“technology, policy/power/politics, economics/business/markets, and culture/discourse/public opinion”* (p.26).

A Definition of Technological Culture and a Comparative Framework for its Analysis

In response to the tragedies of Hurricane Katrina, Wiebe E. Bijker, a Dutch professor, released an analysis titled “American and Dutch Coastal Engineering: Differences

in Risk Conception and Differences in Technological Culture”. He introduces the term and concept of ‘technological culture’: the principles and actors (organizations, governments, systems, and people) that *surround* the development and deployment of technology (Bijker, 2006, p. 7). Bijker’s work focuses on the histories of American and Dutch coastal engineering and the values and attitudes of the organizations and systems that surround this profession. For example, he contrasts American government and engineering concentration on developing emergency notification and evacuation systems, with the Dutch government and engineering focus on improving the construction of their levees. Bijker exemplifies this by comparing the accepted American risk for levee failure of 1:100 to the Dutch standard of 1:10,000. In essence, Bijker argues the principle of coastal engineering technological culture in the United States is to prevent flooding events from becoming catastrophic tragedies, while the guiding principle in the Netherlands is to prevent flooding events altogether. Emulating Bijker’s analysis, this paper will identify the most salient features of the sustainability technological cultures of the United States and China, and draw inferences and conclusions about their effects on the development and adoption of sustainable technologies and practices.

To complement and contextualize my analysis of the technological cultures of the United States and China, I will connect my arguments with the underlying national cultural values of the broader societies of these two countries. In this paper, national culture is quantized into six dimensions defined by Dutch social psychologist Geert Hofstede (2011): power distance, individualism, masculinity, uncertainty avoidance, long term orientation, and indulgence (p. 8). Hofstede Insights, an international consulting group built on analyzing the Hofstede’s work, has quantified numerous global cultures in these

dimensions, including that of the United States and China. Although these scores and dimensions cannot and do not reflect the deep intricacies of ‘culture’, they will be used as relative markers to juxtapose the American and Chinese national cultures. Figure 1 shows Hofstede Insight’s scores for the aforementioned countries in Hofstede’s six cultural dimensions.

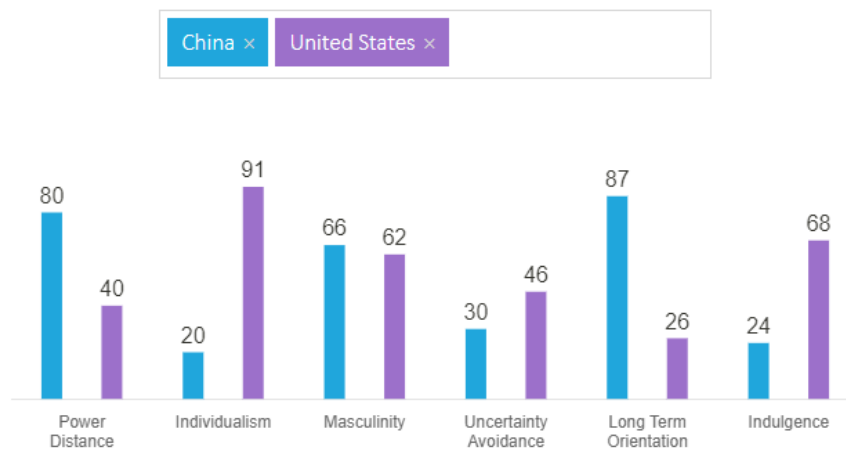


Figure 1. Scores for Chinese and American Culture in Hofstede Dimensions (Hofstede Insights, 2022, n.p)

This paper will cover the two dimensions with the largest numerical gap – individualism and long-term orientation. Additionally, these two dimensions seem to most influence and connect societal attitudes with technological culture.

Implications of the Disparity in the Individualism Dimension

According to the Hofstede Institute’s analysis, individualism/collectivism ranks as the most separable dimension between American and Chinese cultures, a 71-point gap. Hofstede (2011) describes the contrast between the individualistic and collectivistic cultures, stating:

“In individualistic cultures, one's identity is in the person. People are I-conscious and self-actualization is important. Individualistic cultures are universalistic, assuming their values are valid for the whole world. They also are low-context communication cultures with explicit verbal communication. In collectivistic cultures, people are ‘we’-conscious. Their identity is based on the social system to which they belong, and avoiding loss of face is important. Collectivistic cultures are high-context communication cultures, with an indirect style of communication.” (p. 11)

Cultural priorities in individualism/collectivism are strongly evident in how the United States and China treat ethnic diversity. China officially recognizes 56 different ethnic groups and has estimated hundreds of local dialects, many of which are mutually unintelligible (State Council of the People's Republic of China, 2014). However, this huge ethnic diversity in culture and language is widely suppressed in China. The hundreds of dialects are all written the same way, and people ethnically identify primarily as Chinese, with any other ethnic origin taking a backseat (Campbell, 2012). Although these commonalities in language and ethnicity are forced, Chinese citizens’ identity is largely based around their collective similarities.

The opposite is true in America, where ethnic minorities are defined first by their differences (African-American, Asian-American). The diversity of cultures in America is celebrated rather than suppressed. For example, ‘promotion of diversity and inclusion’ is a commonplace phrase in American government and industry mission statements. Further, affirmative action policies in the United States not only promote, but require diversity in the workplace, a celebration of the individual, their origins, background, and uniqueness.

Individualism in American culture is further exemplified through the concept of ‘American exceptionalism’ and the vast export of American culture and democracy, a paradigm for Hofstede’s “*universalistic [culture], assuming their values are valid for the whole world*” (p. 11)

Implications of the Disparity in the Term Orientation Dimension

Term orientation ranks the second-most separatable dimension between American and Chinese national cultures, a 61-point difference. Hofstede defines the long-term orientation dimension, in his context, as:

“The extent to which a society exhibits a pragmatic future-orientated perspective rather than a conventional historic or short-term point of view. Values included in long-term orientation are perseverance, ordering relationships by status, thrift, and having a sense of shame. The opposite is short-term orientation, which includes personal steadiness and stability, and respect for tradition. Focus is on pursuit of happiness rather than on pursuit of peace of mind. Long-term orientation implies investment in the future.” (p. 13)

American normative culture is exemplified by the robust American nationalist ethos, an unchanging belief in ‘the American Way’. The original text of the Constitution of the United States has not been altered in its 250-year history, even the outdated Third Amendment, forbidding the quartering of soldiers, a specific grievance from the late 18th century. The 250-year-old document is the most significant authority in American judicial proceedings, even though its original authors had no intention of predicting or judging society nearly 3 centuries into the future. Further, the Constitution’s authors are dubbed the coveted

moniker of 'Founding Fathers' and are some of the most highly praised American politicians, despite their beliefs on now obsolescent practices like slavery. Additionally, America's Declaration of Independence declares all men the rights to "*Life, Liberty, and the Pursuit of Happiness*", a direct connection to Hofstede's definition of a short-term oriented culture (The United States of America, 1776).

By comparison, The Constitution of the People's Republic of China has a complicated past, with 4 distinctly different documents since the creation of the nation in 1949 as leaders and their philosophical thought rose and fell from power. The current version, penned in 1984, is reviewed and amended every 5 years by the Chinese legislative body, the National People's Congress (Diamant, 2021). As social context and dominating philosophy change, the pragmatic culture of China calls for an adaption of their traditions.

Further, a study by Don Lee and Philip Dawes (2005), shows Chinese businesses prefer working with active players in their network, with reputation and relationships even trumping monetary incentives (p. 34). This reflects the importance of personal trust and reputation in Chinese business culture, expounded from Hofstede's "*ordering relationships by status*" (p. 13). This is starkly contrasted to America, where a large portion of businesses chose to export their manufacturing to countries like China and India, where labor and costs are cheaper, even though no prior relationship has been established.

A Framework for Analysis Using Hofstede National Culture and Bijker Technological Culture

In this paper's analysis, I connect Bijker's ideas of technological culture with Hofstede's analysis of national culture to frame and define the attributes and implications

of Chinese and American technological culture. Replicating Bijker's framework, I will compare two contemporaneous national action and policy plans defining legislature, attitudes, and actions towards the transition to sustainability in the United States and China. My analysis will focus on the themes, syntax, and semantics of the two documents to flesh out a definition of the two nations respective technological cultures. The structure, priorities, and attitudes of each nation's technological culture give insights into their relative strengths and weaknesses in sustainability transitions. As stated by Bijker, *"The core of my analysis, however, is aimed at the styles of coastal engineering. In this paper I am not interested in blaming artefacts or humans."* The same holds true for this paper. Respecting Geels' notion of the uniqueness of sustainability transitions, the intent of this analysis is not to hold one sociotechnical system and technological culture over the other, but rather to analyze their particular styles and the consequential implications for sustainability transitions. I hope to broaden the narrative and illuminate the multi-dimensionality of the varying global approaches to clean energy and sustainability.

"China's Policies and Actions for Addressing Climate Change", released in 2017 by China's National Reform and Development Commission, will represent Chinese directives and cultural attitudes in this analysis. This particular document was chosen for its specificity in actions the government, industry, and public will take during the indicated transition. It's important to acknowledge the original text of the document is written in Mandarin, and this analysis uses an English translation released by the Chinese government. "The President's Climate Change Action Plan", released by the White House on behalf of President Obama in 2013, will act as the American counterpart in the analysis. Similar to the Chinese document, the Climate Change Action Plan insights the who, why,

what, and how of America's schemes and mechanisms to address sustainability and climate change.

Disparity in Hofstede Scores and Differences in Technological Culture Affect Source and Rate of Innovation

One of the defining traits of American technological culture is its ability to rapidly develop disruptive innovations. The United States' free-market, capitalistic economic system encourages the 'survival of the profitable' and allows individuals and private investment groups to funnel capital and resources into emerging innovations. In 2017, private and public R&D investments in the United States totaled a world-leading \$511 billion (Organization for Economic Co-Operation and Development, 2022). American government organizations, industry, and consumers are capable and vigorous economic forces with considerable human, monetary, and scientific resources. However, American national culture's high priority in individualism suggests these formidable players act primarily for their own interests and gains. Hence, economy and industry in the United States is primarily driven by exceptionally innovating individuals. Elon Musk, an ordinary, albeit exceptional, citizen, is causing unprecedented, rapid technological advancement in the space and electric vehicle industries. Other individuals such as Henry Ford, Andrew Carnegie, JD Rockefeller, Bill Gates, Steve Jobs and Jeff Bezos have all played central and vitalizing roles in creating and furthering American innovation. The individualistic, capitalistic core of the American economy manifests a technological culture suited best for Geels' 'emergent' transitions. In purposive and collective transitions, Geels reminds us the most appropriate transition mechanisms typically do not offer great monetary or tangible

returns (Geels, 2011, p. 8). The American individualistic culture implies, during purposive transitions, actors develop and promote mechanisms best for themselves. Additionally, they often assume these mechanisms to be best for the entire society. For example, while wind, solar, and hydropower electricity generation systems are clearly the most appropriate mechanisms for the transition to energy sustainability from a technical perspective, their deployment in America has been dwarfed by the outburst of natural gas projects in the past decade. Natural gas offers higher profitability and a simpler integration into the systems of incumbent energy companies. Despite gas being transitionally less productive than renewable energy, these incumbent energy giants spend enormous resources to shape policy, legislation, and regulation to allow and encourage the deployment of additional natural gas projects. In 2009, over \$176 million was spent lobbying American leaders on behalf of oil and gas companies, compared to just under \$30 million for renewable energy (OpenSecrets, 2022). The question remains: How can powerful, yet self-interested, technological cultures and actors adopt the most productive solutions in purposive, collective transitions?

A significant emphasis on the cost and consequences of a lack of action towards the transition to sustainability characterizes the foreword of the American document, titled *"The Case for Action"*. The foreword recognizes the *"12 hottest years on record have all come in the last 15 years"* (Executive Office of the President, 2013, p. 4). It also claims *"Asthma rates have doubled in the past 30 years and our children will suffer more asthma attacks as air pollution gets worse."* Going beyond health and climate conditions, the American document spells out consequences of environmental concerns in monetary terms stating,

“Last year alone, there were 11 different weather and climate disaster events with estimated losses exceeding \$1 billion each across the United States. Taken together, these 11 events resulted in over \$110 billion in estimated damages, which would make it the second-costliest year on record.” (p. 5)

The diverse and dramatic representations of the real and present consequences of climate change and unsustainable energy practices reflect the creation of a sense of urgency.

American corporations, government, and citizens relinquish their priority for individual gain when they coalesce to face an urgent, real issue. The 2020 SARS Covid-19 pandemic displays this perfectly. Historically, effective vaccines take around 10+ years to develop and become approved (Ball, 2020). However, shutdowns, dramatic lifestyle changes, and severe economic consequences during the 2020 pandemic united American industry, government, and public actors to develop a vaccine to end the pandemic, and quickly. Unprecedented in the American pharmaceutical industry, intellectual property claims were postponed and companies assiduously shared critical information (Ball, 2020). Government and non-government organization funding allowed pharmaceutical companies to manufacture their vaccines “at-risk” - before clinical trials had finished. This unparalleled cooperation allowed for fastest vaccine rollout in history. Similar to the transition to clean energy, the development of the Covid-19 vaccine was purposive and for the collective good, rather than for the benefit of any actor. However, the inherent level of urgency present during the pandemic activated cooperation mechanisms central to the success of American technological culture during purposive transitions. It's important to note that urgency is not the only solution to American success in these purposive transitions. Rather than adjusting the typical practices of American actors, emergent technologies that prove to be

both an effective transition lever and a profitable endeavor provide an alternative societal and technological transformation process well suited to American technological culture. However, there is no guarantee such an innovation arises.

On the other hand, Chinese technological and economic culture is defined by a dominant central authority and top-down planning. Notably, Chinese government ministries release '5-Year Plans', laying out objectives for nearly every industry and aspect of the Chinese economy. These ministries concurrently release various guiding opinions, work plans, standards, legislatures, and regulations to direct industrial and organizational action toward the goals of the 5-Year Plan. In the Chinese Climate Action Plan document analyzed, 127 of these complimentary documents were acknowledged and referred to, showing the impressive scope and depth of Chinese central planning. This encompassing, comprehensive top-down planning, where industries and organizations play cogs in the wheel, exemplify Hofstede's collectivistic definitions of "*identity is based on the [economic] system to which they belong*" (p.8). Additionally, the 5-Year Plans are structured to build upon and adjust where necessary, the work of its predecessor, exhibiting Hofstede's "*pragmatic future-orientated perspective*" and "*investment in the future*" (p. 13). Further, Hofstede reminds us long-term oriented cultures typically "*order relationships by status*", and exhibit a "*pursuit of peace of mind*" (p.13). Translating these values to technological culture, I argue the incentive for Chinese industries and society to act in transitions is the culture of respect and obedience to authority, trusting those above them to lead society in the appropriate direction. This is exemplified by sections in the Chinese document entitled "*Adjusting the Industrial Structure*", "*Low Carbon Action in Sectors*", and "*Optimizing the Energy Structure*", which give compliance directives to numerous and various Chinese

industries. However, the system of top-down planning and culture of obedience has resulted in some misallocation of resources in China, as the government commands and funds unproductive projects. This misallocation is exemplified by Chinese ghost cities. In the past decades, China has emphasized urban development, and consequently, urban land area has increased nearly 400% from 1990 to 2010 (Jin et.al, 2017, p. 99). However, some of these development projects do not correlate with residential demand, leading to large housing vacancies in some Chinese cities.

Further, typical to the economies of socialist cultures and command economies, where authority-based directives and incentives drive technological advancement, individual actors are less motivated to strive for exceptionalism (Kornai, 1980: p. 149). Harvard Business School professors Regina Abrami, William Kirby, and Warren McFarlan (2014) point out the majority of the technological innovation in China is a result of the replication of foreign products or foreign partnerships. Further, they argue the controlled, bounded political world in which Chinese universities and businesses operate stunts Chinese innovative capacity. Abrimi, Kirby, and McFarlan evidence their claim by reporting, *“The [Chinese] Communist Party require[s] a representative in every company with more than 50 employees”* (n.p). As a result, the Chinese technological machine exhibits more sluggish innovation compared to its’ American counterpart.

Authority and Political Structure Translate to Differences in Mechanism Adoption Speed

Another salient difference between American and Chinese technological cultures lies in the breadth and constancy of political authority. In China, the most prominent

political figure is the Paramount Leader, an informal term usually referring to the General Secretary of the Chinese Communist Party (CCP) (Mai, 2021). It's important to note, unlike the two-party system in America, the CCP is the single dominant political party in China. The Paramount Leader, although unofficial, wields strong influence over the direction and decisions of the Chinese machine. Further, the Paramount Leader defines the leading ideology behind Chinese domestic actions and international relations. Since the official creation of the People's Republic of China in 1949, there have been only 5 Paramount Leaders (Mai, 2021). By comparison, there have been 14 American presidents in this same time period. Additionally, unlike American presidency, the Paramount Leader has no specified term lengths or limits. The expansive, unchecked central authority in Chinese technological culture is both powerful and dangerous. China's first Paramount Leader, Mao Zedong, led what he called his 'Cultural Revolution', a political movement meant to preserve and advance Chinese communism. However, this was a time period characterized by violence and chaos. Further, Mao released his "Directive on Elimination of Bandits and Establishment of Revolutionary New Order", leading to the suppression or elimination of nearly 3 million people who expressed opposing political beliefs. However, when this power is exercised benevolently, centralized authority allows Chinese government to enact swift, productive adaptations in times of transition. For example, the Chinese Climate Change Action Plan introduces and enacts new legislation, a:

"Required strict law enforcement to slash the coal consumption of overcapacity industries, including strict control (ban) on new capacity, accelerated elimination of backward capacity and reduction of overcapacity in (potential) overcapacity"

industries, such as iron and steel, coal, cement clinker, plate glass, and coal power.” (p. 10)

This ban on new industry coal projects demonstrates the centrality in legislation, regulation, and enforcement defining Chinese technological culture.

By contrast, the robust system of checks and balances and division of power in the United States’ government structure requires much greater bureaucratic discourse and ‘red tape’, before swift and strict changes can be implemented. This is acknowledged in the US document, which states

“There are no federal standards in place to reduce carbon pollution from power plants. In April 2012, as part of a continued effort to modernize our electric power sector, the Obama Administration proposed a carbon pollution standard for new power plants.” (p. 6)

The Clean Power Plan, containing the aforementioned carbon pollution standard, was not passed until late 2015, after over 3 years of intense litigation in Congress (U.S. Environmental Protection Agency, 2017). In 2017, less than a year since Donald Trump assumed Presidency, he signed an executive order for an investigation into the legality of the Clean Power Plan, which was ultimately repealed by Congress in 2019 (U.S. Environmental Protection Agency, 2021). On the other hand, the American democratic political system obligates policymakers to make educated and informed decisions by regarding and respecting varying perspectives and allocating appropriate time for dialogue. The democratic process for ratifying legislation, where listening to diverse voices and opinions is required, highlights the American value in individualism.

Hand-in-hand with the division of power in governing and technical systems, an expanding division in ideology defines American political and technological culture. Fewer and fewer legislative or executive actions have bipartisan support, and public officials lean farther towards their party's ideals (DeSilver, 2022). Additionally, American political tribalism and universalism has discouraged open discourse; instead, opposing political groups increasingly vilify their counterparts. A 2018 study found a 61% increase in negative ad campaigns in just the 4 years from the previous election cycle (Wesleyan Media Project, 2018). Regardless of the root cause, the differing ideology and increasing animosity between the two political parties in the United States make tangible and responsible action an arduous process, now requiring years of negotiations, lobbying, and litigation. However, as previously mentioned with the Covid-19 pandemic, in urgent circumstances, American political actors can forgo party lines and individual opinions to propel change. Langbart (2015) highlights American bi-partisanship during the World War II period, with notable successes including *"U.S. membership in the United Nations, the implementation of the Marshall Plan for European recovery, and the creation of NATO"* (n.p).

Conclusion: The Roles of Hares and Tortoises of Technological Culture in Sustainability Transitions

In the ongoing transition to energy independence, sustainable industry practices, and climate change mitigation, nations around the world face a unique challenge requiring transformative adaptations in government, economy, and culture. An analysis of the national and technological culture - the attitudes, organizations, and systems *surrounding* technology, of China and the United States insights the complex dimensionality and mosaic

interactions between their societal and technical players. In this analysis, I conclude Chinese and American technological cultures excel or fall behind at very different parts of the transition to sustainability. I argue Chinese technological culture does not properly reward innovation, and consequently, bears a relative inability to innovate and develop disruptive technology. However, the Chinese centralized authority structure allows important legislature and systemic change to be implemented and integrated swiftly. Additionally, I conclude the underlying national cultural values in pragmatism and collectivism dictate this Chinese technological culture and society adept, whether by choice or force, at making considerable transformations and sacrifices to drive change. By comparison, I contend American normative and individualistic national cultural values mold a technological culture antithetical to the Chinese, defined by rapid and formidable innovation, but slowed by political tribalism and a cultural resistance to change. However, as shown, urgency unites American actors and activates hidden co-operation mechanisms central to past successes of American technological culture in purposive transitions. I argue, in the complex, purposive, systemic changes to governments, organizations, attitudes, technologies, economies, and lifestyles necessary in the transition to a sustainable future, each nation must work to understand the circumstances and mechanisms their technological culture inhibits or encourages. By analogy, America and China must identify, accept, and leverage their hares and their tortoises. I contend proper identification and leverage of hares and tortoises as essential to an efficient transition to sustainability: both are needed to drive, analyze, debate, philosophize and balance how to correctly develop, leverage, and adopt disruptive and purposive technology.

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