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INNOVATION UNDER PRESSURE
NAVIGATING COMPLEXITY TO DRIVE CHANGE

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Navigating Complexity to Drive Change

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INTRODUCTION

Rapid, wrenching changes are a hallmark of life in the 21st century. Deep disruptions in technology, communications, finance, healthcare, work, and societal norms are reshaping our world at an unprecedented pace.

While massive change can provoke fear and uncertainty, much of this disruption is positive. From artificial intelligence (AI) to genome editing, lab-grown fabrics, and renewable energy technologies, bold innovations promise to solve some of humanity's most pressing problems and unlock opportunities for growth and development. The potential for groundbreaking technological advancements has never been greater. And yet, the complex dynamics of today's landscape pose equally significant challenges.

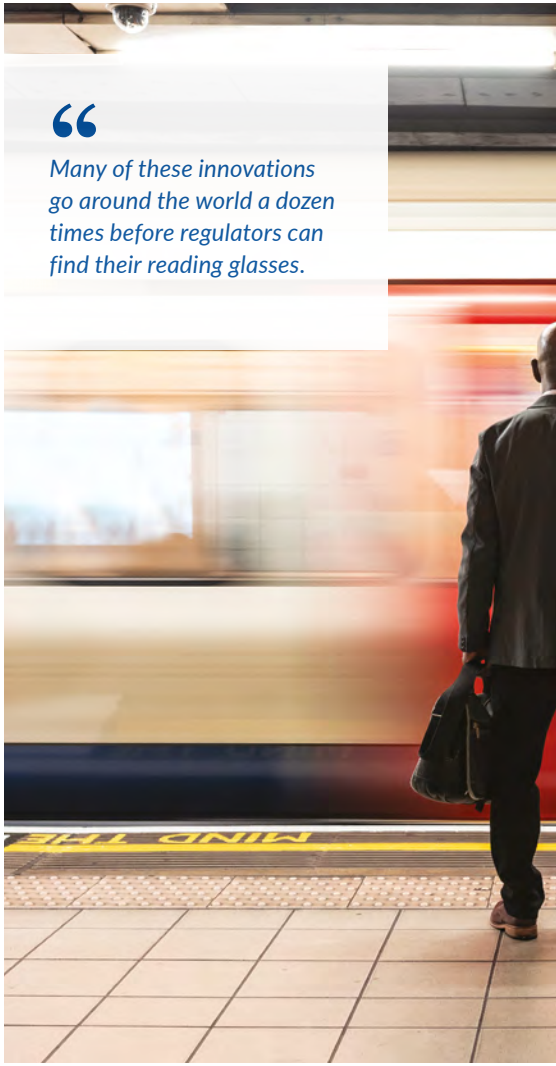
How do people perceive the potential of innovation today? What dynamics affect the uptake of new technologies? How can we collectively navigate this environment to realize a more innovative, prosperous, and equitable future? This paper attempts to answer these questions, examining the intricate dynamics at play, and offering insights intended to help businesses, policymakers, and society navigate this complex terrain.

With breakthroughs coming so thick and fast that they outpace society's ability to understand and integrate them quickly and mindfully, some people feel overwhelmed—even fearful about the direction of change. Others eagerly experiment with new offerings, driven by curiosity or expectations. Generative AI is a case in point. While pundits and even tech leaders were worrying out loud about the potential risks of this emerging technology, ChatGPT racked up 100 million active users within two months of being launched in late 2022. That's not surprising. The technology was designed to be useful and user-friendly, it received massive media coverage, and, for those connected to the internet, there were no barriers to accessing it.

Regulatory institutions, in contrast, take a more cautious approach. They struggle to understand innovations, think through their implications, and devise frameworks to govern them. To adapt a popular metaphor, many of these innovations go around the world a dozen times before regulators can find their reading glasses.

Further complicating matters, the environment in which innovation must thrive is increasingly polarized, and misinformation spreads rapidly. Transformational innovations can stoke anxiety, giving rise to debate over potential ethical dilemmas and leading policymakers to erect obstructive regulatory hurdles before all the facts are in. These factors complicate the adoption of innovative solutions, particularly in sectors deemed controversial.

The stakes are high. If we remain mired in these complexities, the risk is that vital innovations may not reach those who need them most. The lack of a balanced and fact-based debate on the benefits and risks of new technologies can hamper informed decision-making, limiting choices and stalling progress. It can sow confusion and distrust among the public, leading to unwarranted resistance and missed opportunities. Innovations that could improve our quality of life, enhance productivity, and solve critical global challenges may be delayed or rejected outright.



> *Many of these innovations go around the world a dozen times before regulators can find their reading glasses.*

Innovation offers much-needed opportunities to transform industries and improve lives. By better understanding what influences its uptake and overcoming counterproductive obstructions, we can unlock its full potential, ensuring it serves as a powerful catalyst for positive change.

Innovation Is Outpacing Regulation

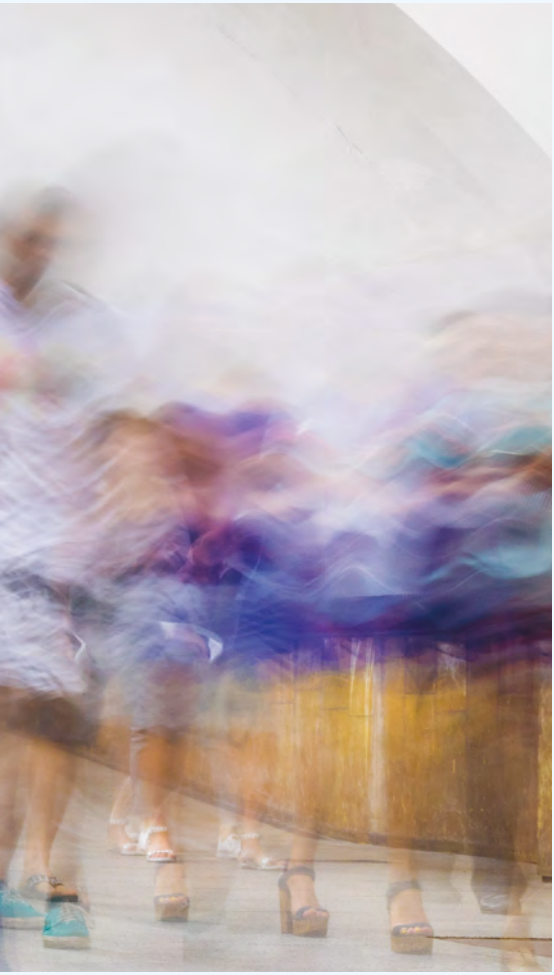
Many groundbreaking innovations—particularly in AI, biotech, and digital technologies—outstrip existing regulatory frameworks, leading to gaps in oversight and public trust.

Stakeholder Dynamics Are Complex

Innovators, regulators, and the public often operate with conflicting priorities, compounded by an inherent skepticism toward industries operating in controversial spaces.

Public Discourse Is Polarized

Emotional, simplified narratives dominate the public sphere, overshadowing nuanced, constructive discussions about the trade-offs of innovation.



Misleading Analogies Hamper Understanding

Oversimplifications and inaccurate comparisons fuel misunderstanding and resistance, making it harder to discuss innovation on its merits.

There's a Pressing Need for Positive Impact

From renewable energy to genetic engineering, from cloud-based learning to more accessible healthcare, innovations are essential and hold immense promise to address global challenges, but only if risks are responsibly managed and trust is secured.


ALL INNOVATION
IS CONTROVERSIAL

A complex interplay of cultural, economic, and personal factors influences how a particular innovation is perceived, discussed, and rejected or embraced.

An innovation may seem uncontroversial on its face—especially when it occurs on a limited scale within a popular, widely accepted industry. Dig beneath the surface in most business sectors, however, and some people will find cause for alarm. Consider changes in this century to the music industry. The internet has enabled musicians and music lovers to connect directly. Musicians can set up websites and social media accounts and directly promote their live shows, let people stream bits of their music, and sell their merchandise, from T-shirts to vinyl records. Meanwhile, streaming services offer an endless selection of music on demand for a relatively modest monthly fee. That's great for music lovers, who can hear their favorites and discover new artists anytime and anywhere. It's not so great for most musicians, who earn much less when their music is consumed this way.

There are also innovations that are uncontroversial today but were met with significant resistance and skepticism when introduced.

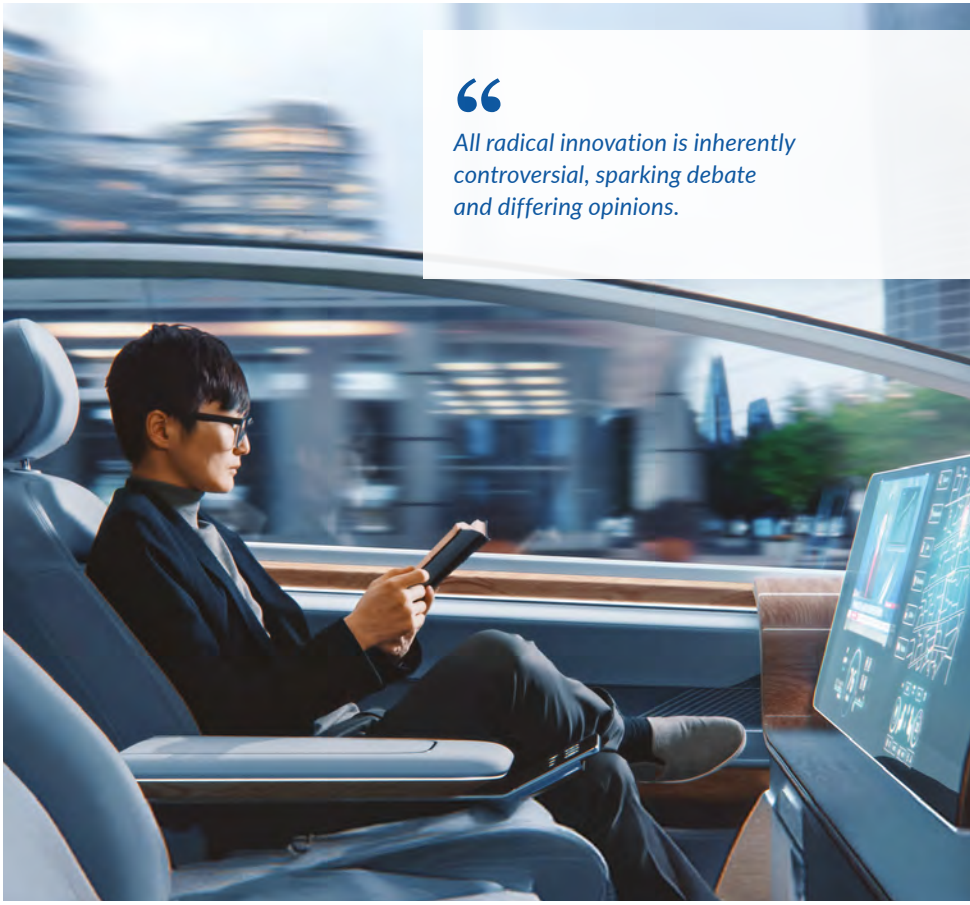
Take the printing press, for example. Invented by Johannes Gutenberg around 1440, it revolutionized the spread of information. Today, we take printed materials for granted, but at the time, the technology was considered highly controversial in some circles. Religious and political authorities feared that the dissemination of ideas could challenge their hold on power. These fears were not unfounded. The printing press played a crucial role in the Protestant Reformation, leading to widespread upheaval and significant societal change. Similarly, the introduction of electricity was met with considerable skepticism and fear. Competing work on electric power systems led to the "war of the currents," a fierce debate over the safety and efficiency of Thomas Edison's direct current (DC) versus Nikola Tesla's alternating current (AC). Public demonstrations were used to sway public opinion.

These and other examples remind us that innovations we now consider essential were once controversial. They faced resistance, skepticism, and fear, yet they ultimately transformed society.

This pattern of initial resistance followed by eventual acceptance underscores a critical point: All radical innovation is inherently controversial, sparking debate and differing opinions. The level of controversy depends on the perceived benefits and risks, ethical considerations, and anticipated societal impact. For instance, renewable energy sources are generally well-received due to their expected environmental benefits. In contrast, innovations such as generative AI and genetic modification tend to be more contentious due to privacy, safety, and ethics concerns. The potential for progress must be balanced against the potential for negative societal impacts.

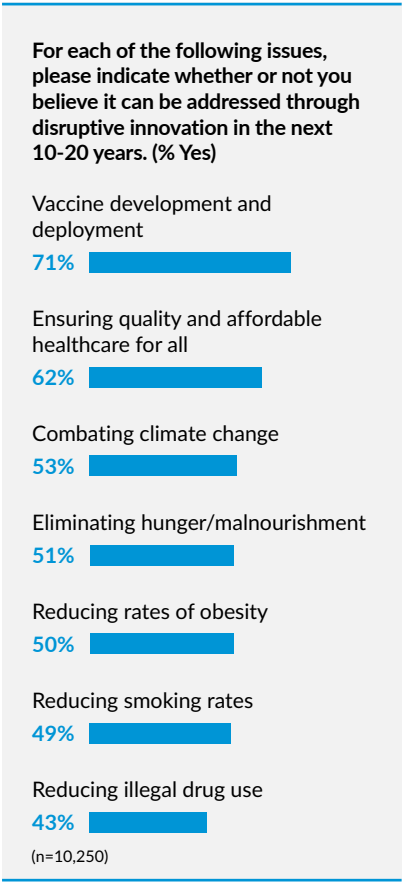
To better understand people's perceptions of innovation and explore how these views influence the adoption of new technologies, Philip Morris International (PMI) commissioned independent research firm Povaddo to conduct an international survey in December 2024.

Povaddo conducted the online survey on behalf of PMI between December 13 and 27, 2024. The survey was fielded among 10,250 general population adults aged 21 and older in 10 countries: Argentina, Brazil, France, Italy, Mexico, South Africa, South Korea, Spain, the United Kingdom, and the United States. Approximately 1,000 interviews were conducted in each country, with data weighted to reflect national population statistics. Results are accurate to a margin of error of ±1 percent at the overall level.



> *All radical innovation is inherently controversial, sparking debate and differing opinions.*

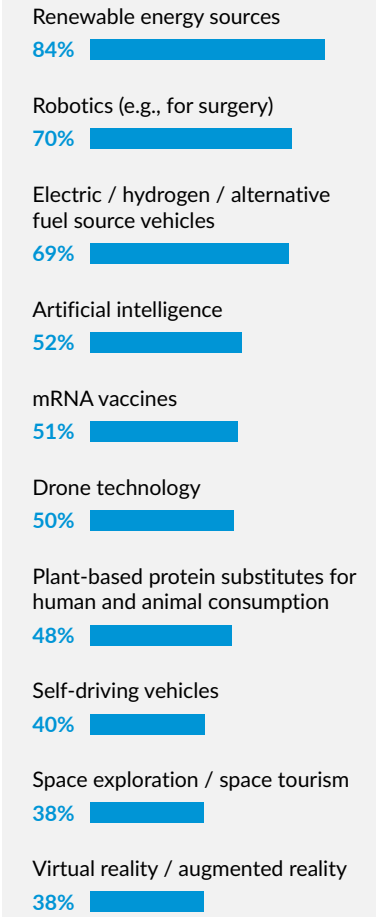
The survey explored whether people expect disruptive innovation to drive significant progress on various issues in the next 10–20 years. The results indicate a strong belief in innovation's potential. For instance, most people (71 percent) believe disruptive innovation can enable vaccine development and deployment. A clear majority (62 percent) believe innovation can ensure quality and affordable healthcare for all, while 53 percent are optimistic about innovation's potential to combat climate change. Fewer respondents expressed confidence in innovation's capacity to reduce smoking rates (49 percent) and illegal drug use (43 percent), reflecting the complexities and entrenched beliefs associated with these issues.



We also asked respondents whether various emerging innovations and capabilities will positively or negatively impact the world. Renewable energy sources were deemed to have a positive impact by the highest proportion of respondents (84 percent), followed by robotics (70 percent) and alternative fuel source vehicles (69 percent). In contrast, opinions were mixed on virtual/augmented reality, self-driving vehicles, and artificial intelligence, with 57 percent, 56 percent, and 45 percent, respectively, indicating these innovations would have a negative or neutral impact.

Despite some hesitation, it's clear that people's belief in the overall potential of innovation is solid. The challenge for everyone—from individuals to governments and transnational bodies—is to accurately identify, rationally discuss, and systematically evaluate and manage the risks of innovative products and services to benefit all.

You will be shown a list of emerging innovations and capabilities. For each, please indicate whether you believe it will have a positive or negative impact on the world. (% Positive)



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PMI Viewpoint

“The faster I move out of cigarettes, the more pushback I get.

—**Jacek Olczak**, CEO

Innovation has fundamentally transformed the businesses of Philip Morris International (PMI) and has the potential to improve public health globally, provided it is allowed to reach the more than 1 billion people worldwide who continue to smoke cigarettes.

Thanks to advances in science and technology and massive investment by PMI and others, smoke-free alternatives that are less harmful than cigarettes now exist. These innovations include nicotine-containing products such as heated tobacco, e-vapor, and oral smokeless products. While not risk-free, these better products have been found to emit significantly lower levels of harmful and potentially harmful constituents compared with cigarettes because they do not burn tobacco. Without question, the best way to avoid the harms of smoking is never to start or, for those who do smoke, to quit. However, for those adults who don’t quit, switching to a smoke-free product is a much better choice than continued smoking.

Smoke-free innovations offer immense promise for public health. And that promise is within sight: PMI believes that with the right regulatory encouragement and support from civil society, cigarette sales can end within 10 to 15 years in many countries. However, several gridlocks currently prevent these innovations from reaching those who need them most; chief among them are policies that deny adult smokers access to and accurate information about these better alternatives, misinformation and confusion regarding their benefits and relative risks, historical mistrust of the tobacco industry, and the ideological opposition of certain interest groups. As a result, some countries severely restrict or ban smoke-free innovations, leaving cigarettes—by far the most harmful way to consume nicotine—as

the only available option in those markets. Allowing only the most harmful products to be sold while restricting access to less harmful alternatives would be unthinkable in any other industry.

Overcoming these challenges is critical if we want to decisively address the issue of smoking and make cigarettes obsolete.

Transformed to Deliver a Smoke-Free World

At PMI, we have disrupted our business to develop, scientifically substantiate, and responsibly commercialize smoke-free products, with the aim of completely replacing cigarettes as quickly as possible. Powered by science and innovation—and an investment of more than USD 12.5 billion since 2008—our smoke-free products generate 38 percent of PMI's total net revenues,[1] up from virtually zero 10 years ago. There are an estimated 36.5 million adult users[2] of our smoke-free products in the 92 markets[3] worldwide where these products are sold.

Our ambition is to become predominantly smoke-free by 2030, with our smoke-free business generating over two-thirds of total net revenues. Our progress to date and the path we are on are possible because we fundamentally changed not only our product portfolio but also our purpose, business model, value chain, and practices.

We chose to change. And we changed. Now, we call on governments, public health authorities, and civil society to embrace positive change, too. By harnessing the power of innovation and engaging in good faith dialogue grounded in science and evidence rather than ideology and faulty assumptions, they can enable a profound transformation that will benefit adults who smoke and positively impact the trajectory of public health.

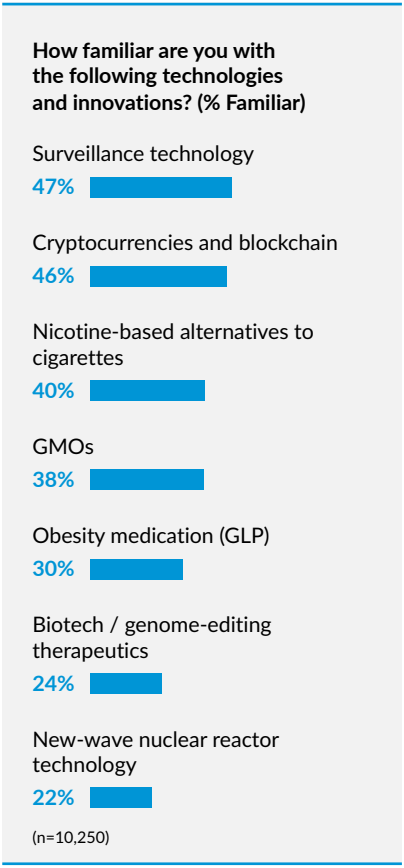
[1] As of Q3 2024
[2] As of June 30, 2024
[3] As of Q3 2024


WHO DECIDES
WHAT'S BENEFICIAL?

The call to limit innovations to those that are "beneficial" sounds obvious. It's not that simple. Few, if any, innovations are wholly beneficial or wholly harmful.

Most innovations involve a complex mix of upsides and downsides and require careful evaluation of potential immediate and longer-term impacts. Broad dialogue—incorporating diverse perspectives from the industry, scientists, policymakers, and the public—is essential to ensure well-rounded and informed decisions.

The Povaddo survey asked about innovations commonly perceived as contentious; among them, biotech / genome-editing therapeutics, new-wave nuclear reactor technology, GMOs, nicotine-based alternatives to cigarettes, cryptocurrencies and blockchain, surveillance technology, and obesity medication (GLP).

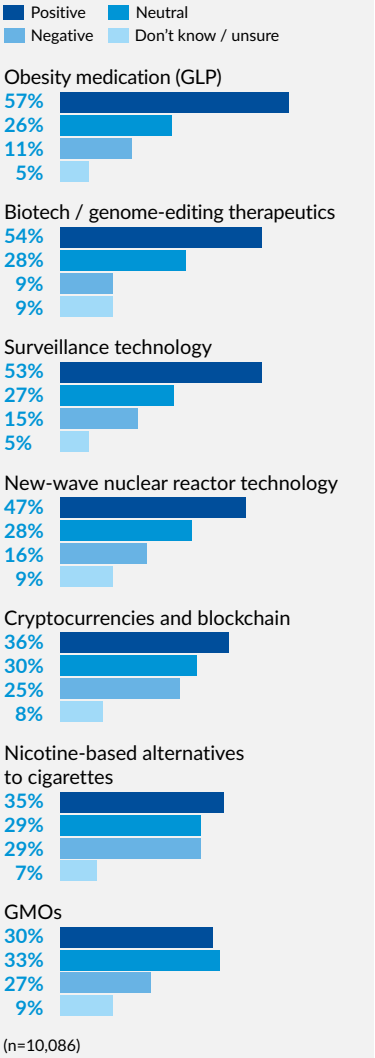


Respondents showed varying levels of awareness of these technologies and innovations, with 47 percent being familiar with surveillance technology, 46 percent with cryptocurrencies and blockchain, and 40 percent with nicotine-based cigarette alternatives. Respondents were least familiar with genome-editing therapeutics (24 percent) and new-wave nuclear reactor technology (22 percent).

When asked their overall opinion of the societal impact of these innovations, more than half of respondents who were aware of these technologies had a positive response to obesity medication (57 percent), biotech / genome-editing therapeutics (54 percent), and surveillance technology (53 percent). GMOs' societal impact, on the other hand, was viewed as positive by 30 percent, while 33 percent viewed it as neutral, and 27 percent as negative. Regarding nicotine alternatives to cigarettes, 35 percent of respondents believe these innovations will have a positive impact on society, 29 percent viewed them as neutral, and another 29 percent as negative.

These mixed perceptions underscore the complexities surrounding the trajectory of certain innovations today.

What is your overall opinion on the impact of these innovations on society?



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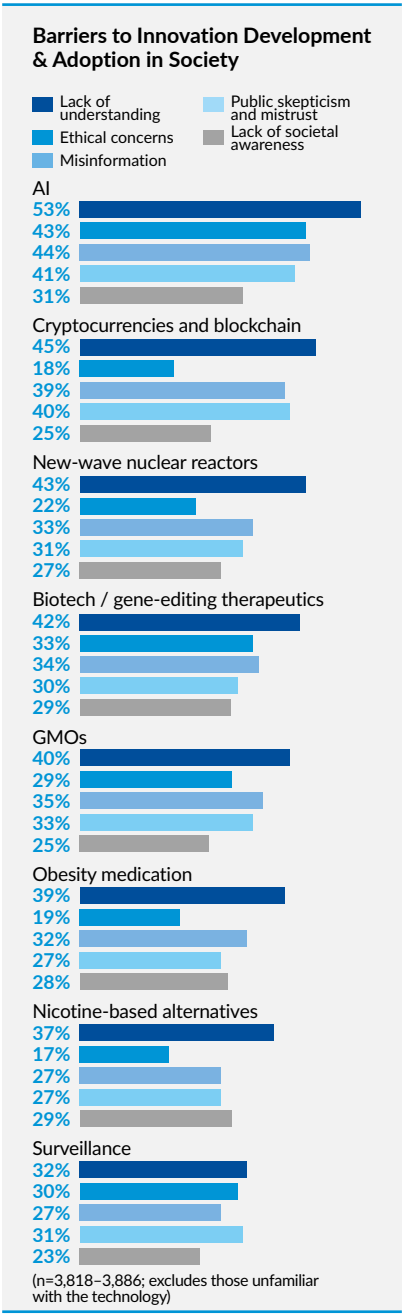
To better understand this phenomenon, the survey asked participants about the barriers that slow innovation development and adoption in their countries.

A lack of understanding and insufficient information on the benefits and risks of a particular innovation, public skepticism and mistrust, and misinformation were among the barriers most cited by respondents.

A deeper look into the dynamics that shape the debate around some of these innovations follows.



(*What are the barriers that slow each of the following innovations and technologies in their development and adoption in society? Respondents were asked about additional barriers. A selection of the most common responses is displayed here.*)

Energy

Many countries are keen to shift from fossil fuels to renewable energy sources, with a global target of tripling renewables capacity by 2030. The potential rewards of innovation in this sector have driven significant progress. Despite an impressive compound annual growth rate of 10 percent between 2017 and 2023, however, the world is on track to fall 13.5 percent short of the target. Meanwhile, over 82 percent of world energy comes from coal, oil, and gas. Most countries, even major oil producers such as Saudi Arabia, the UAE, and Qatar, recognize the imperative to transition away from fossil fuels. Nevertheless, there is a significant risk of a gap between the phasing out of fossil fuels and the full-scale deployment of sufficient renewable energy capacity. This gap could lead to energy shortages, price volatility, and increased reliance on less sustainable energy sources.

How can we best bridge that gap? Some argue that nuclear energy would be the most pragmatic solution. This energy source provides constant, reliable baseload power without the

atmospheric pollution emitted by fossil fuels. It's also a very dense fuel, meaning nuclear power plants require much less fuel volume to generate the same amount of electricity as fossil fuel power plants. One kilogram of uranium provides the same amount of energy as 2.7 million kilograms of coal. Another argument in favor of nuclear energy centers on recent innovations in small modular reactors, which are quick to deploy, easy to refuel, and can be built underground.

So, most would agree that nuclear energy makes sense, at least as an interim solution, right? Not so fast. Nuclear energy is one of those topics people find hard to discuss dispassionately. The problem is not the reputation of companies involved in the sector. Most people would be hard-pressed to name even one nuclear energy company. The nub of the problem is the word *nuclear* and the scary associations it carries. It triggers thoughts of atomic bombs, mutually assured destruction, and accidents such as those experienced at Three Mile Island (United States, 1979), Chernobyl (Ukraine, 1986), and Fukushima (Japan, 2011). It prompts questions about the disposal of radioactive waste, the strain on water resources needed to cool reactors, and the risks of terrorism and sabotage.

These points must be considered when measuring public assessment of the pros and cons of nuclear power versus the risks of not covering the transition gap. Public acceptance of nuclear energy depends on a careful balance of factors, including safety, environmental impact, economic viability, and trust. The last one is arguably the toughest. It's one thing for authorities and nuclear specialists to provide assurances and quite another for the public to trust those assurances.

Biotech

Nuclear technology has existed for decades—long enough for many people to have developed opinions about it. Genetic engineering is much newer. It burst into public awareness in the early 2000s, and the heated controversy over genetically modified organisms (GMOs) continued well into the 2010s and beyond. Alarmed by the prospect of "Frankenstein foods," many people avoided products containing GMOs and even demanded that the technique be banned. As of year-end 2024, GMOs were indeed banned in 26 countries.

More recently, the stormy waters of biotech have been further roiled by CRISPR (clustered regularly interspaced short palindromic repeats) technology, a molecular biology tool that has revolutionized how scientists edit genes, the source code of living organisms. CRISPR is a type of genetic modification that cuts specific DNA sequences and then removes, adds, or replaces DNA. Genetic engineering, in contrast, introduces a foreign gene from a different species into the target organism's genome. Both techniques modify genes, but CRISPR offers a more precise and targeted approach, often resulting in changes that could occur naturally through mutation.

The range of possible beneficial uses of innovations in biotech is dizzying. They could treat or prevent human genetic disorders such as cystic fibrosis, sickle cell disease, and Huntington's disease. They could be used to engineer human immune cells to combat cancer and viruses. With CRISPR, scientists could improve crop resilience and yields by altering plant genes for better resistance to pests, disease, and environmental stresses.

The technology could even suppress the scourge of disease-bearing mosquitoes, which the U.S. Centers for Disease Control and Prevention has labeled "the world's deadliest animal."

In short, genetic engineering innovations have the potential to address a vast range of problems that occur in living organisms or are caused by living organisms. Yet biotech in general, and genetic engineering in particular, also raises the specter of real harm—whether deliberate or accidental.

One area raising ethical red flags is selective breeding or eugenics. The ability to alter DNA in human embryos to prevent genetic diseases also implies the potential to introduce traits deemed desirable. Currently, this involves genetic screening to assess whether an embryo is genetically likely to develop certain diseases or traits. Prospective parents can then select the most desirable embryo to be used for pregnancy, a possibility with ethical and regulatory implications.

Going Cashless

A couple of decades ago, spending money involved paper checks, coins, and banknotes. It meant standing in line at the bank or ATM. No longer. Over the past 20–30 years, financial transactions have inexorably moved online. Digital banking has become the norm, offering more convenience to customers and reducing overhead for financial institutions. Debit cards joined credit cards as alternatives to cash payment. And now, contactless technology has made it even easier to pay by card, smartphone, or wearable. The transactions are usually quick and easy and can be tracked in online apps.

Access to new financial technology (fintech) hasn't been limited to the citizens of wealthy societies. There was a crying need for innovative approaches to money in Africa, for instance, where bank branches are few and far between and many people don't have a bank account. The innovative M-PESA mobile payment system pioneered money going cashless. The system doesn't require users to have a bank account and works on the most basic mobile phones. Users' money is deposited into an account stored on and transferred to and from their phones.

M-PESA is the primary means of transactions for millions, to the extent that it is the conduit for 53 percent of Kenya's GDP.

There are pitfalls to fintech, of course. Digital and cashless payments aren't private. They leave a trail that anybody with the right technology and know-how can follow. They are vulnerable to system outages and cyberattacks. They may be challenging for the non-tech-savvy to use. Some people even see cashless economies

as a dangerous step toward totalitarianism as they make it easy for governments to track citizens' movements and transactions. It's not surprising, therefore, that a recent survey conducted in the U.S. found that nearly 70 percent of Gen Zs and 80 percent of baby boomers don't want society to go entirely cashless. Even in high-tech Japan, cash is still the most typical payment method.

Cryptocurrencies are also part of this debate. Proponents argue that Bitcoin and similar products offer a decentralized and secure alternative to traditional currencies, potentially reducing transaction fees and providing financial inclusion for the unbanked. Critics highlight cybercurrency's volatility, association with illicit activities, and environmental impact due to high energy consumption. The debate reflects broader societal concerns about the balance between innovation and regulation in the evolving financial landscape.

An Unbalanced Debate Leading to Missed Opportunities

Nicotine-containing alternatives to cigarettes are another innovation met with strong opinions—even outright resistance—across public and policy debates. Of course, we cannot dismiss the legitimate concerns around preventing minors from using these products or the historic distrust toward the tobacco industry. Nonetheless, these innovations have been around long enough now that the discussion should no longer be about whether they should be made available to the more than 1 billion people who smoke; instead, the focus should be on how fast and within what regulatory framework we can maximize their adoption while minimizing unintended use.

The beneficial impact of these innovations can be seen in the markets that have embraced them. Consider, for example, Sweden, a country that today boasts one of the developed world's lowest smoking rates, at 5.4 percent. That's less than half a percentage point away from achieving "smoke-free" status. In this market, snus—a noncombustible form of moist tobacco placed between the lip and gums—has been the most commonly used alternative to cigarettes for decades and is particularly popular among men. The impact of this shift alongside traditional tobacco control measures? Male death rates from lung and oral cancer are much lower in Sweden compared with other EU countries, where this product is banned.

Another example is Japan. Newly released public health data by the National Health and Nutritional Survey (NHNS), an annual study conducted since 1948 by the Japanese Ministry of Health, Labour and Welfare, shows a 45 percent decrease in cigarette-smoking prevalence, dropping from 19.6 percent of all adults in 2014, the year heated tobacco products were introduced in that market, to 10.8 percent in 2023. This decline correlates with the widespread

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adoption of heated tobacco products by millions of adults who smoke. New Zealand, which has adopted smoke-free products to help adults abandon cigarettes, has also seen smoking rates decline by more than 50 percent over the past decade. In contrast, smoking declines are stubbornly slower in countries such as Turkey, the Netherlands, and Brazil, where smoke-free alternatives are banned.

So, who gets to decide what is beneficial for smokers?

In an ideal world, the way forward would be defined through an open, balanced debate—involving governments, scientists and health authorities, smokers and other members of civil society, as well as the industry—on how to maximize the benefits of these innovations for public health while minimizing unintended consequences. Regrettably, we are faced with a starkly different reality. At present, certain highly vocal organizations and stakeholders are influencing the debate against these innovations for no reason other than that they come from the tobacco industry. This is nonsensical. Hundreds of independent studies now show that smoke-free alternatives are demonstrably better than cigarettes.

In any other industry, embracing these innovations and allowing them to displace more harmful products would be considered common sense. While some skepticism toward the tobacco industry is to be expected, unwarranted, knee-jerk opposition by a small chorus of voices should not be allowed to hinder progress for millions of adult smokers and public health.

FROM HYPE TO HESITATION

With new technologies and innovations coming in fast and furiously, the trajectory from product introduction to widescale adoption is no longer a straight line.

In 2016, BBC TV gave a British family and the viewing public a chance to live in the past. The series *Back in Time for the Weekend* turned the family's home into a time machine, transporting them back to a different decade each week, from the 1950s to the 1990s. The show spotlighted just how much innovation changed life in those five decades. From our current vantage point, even the 1990s look positively quaint.

Today, initial enthusiasm and high demand—often driven by compelling marketing and early media hype—are frequently followed by waves of skepticism and uncertainty. Concerns about potential long-term effects begin to surface alongside uncertainty over whether the product or service is worth the price (financial or otherwise).

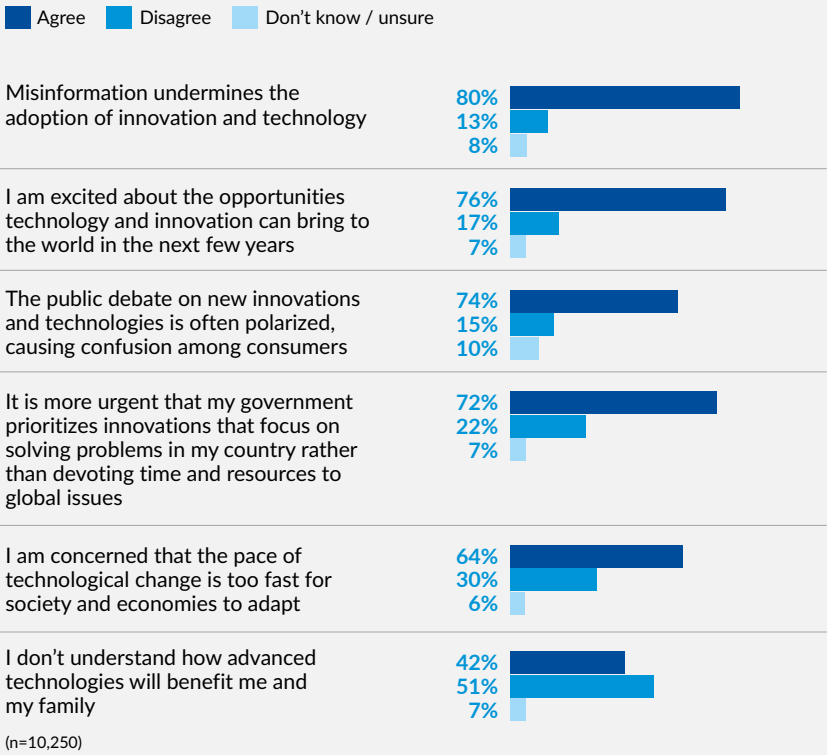
This dynamic does not apply only to new entrants. Long-established innovations can reenter the public debate, stirring concern, confusion, and polarized viewpoints. For example, the debate over per- and polyfluoroalkyl substances (PFAS)—aka "forever chemicals"—has gained significant traction in recent years, even making it into the conversations surrounding the most recent U.S. presidential election. PFAS, which have been used in many consumer products since the 1950s because of their water-, grease-, and heat-resistant properties, face mounting concerns over their potential impact on human health and the environment. Rising concern has led to increased regulatory action, such as

the U.S. Environmental Protection Agency's efforts to set stricter limits on PFAS in drinking water. Public awareness has also grown, influencing consumer behavior and prompting the research and development of PFAS-free solutions—for example, alternative coatings for food packaging and textiles that have similar water-and grease-resistant properties without the harmful environmental impact of PFAS.

In the opinion survey conducted by Povaddo, we asked participants several questions related to opportunities, priorities, and barriers regarding new technologies and innovations. Around three in four respondents (76 percent) were excited about the opportunities technology and innovation are poised to bring to the world in the next few years, and 72 percent agreed it is more urgent for their government to prioritize innovations that solve problems in their country rather

than devoting time and resources to resolving global issues. Around two-thirds (64 percent) expressed concern that the pace of technological change is too fast for society and economies to adapt. Survey respondents also recognized detrimental barriers that can slow progress. For instance, a strong majority (80 percent) agreed that misinformation undermines the adoption of innovation and technology, while 74 percent agreed that the public debate on new technologies and other innovations is often polarized, seeding confusion.

To what extent do you agree or disagree with the following statements?



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The Role of Media and Information Overload

The media play a crucial role in shaping public perceptions of technologies—and the sheer volume of information they make available can overwhelm. News outlets, social media platforms, and online forums bombard individuals with messaging, frequently sowing confusion as people struggle to discern credible sources from unreliable ones. Additionally, sensationalist reporting and clickbait headlines often exaggerate the benefits or risks of new technologies, further muddying public understanding.

At the turn of this century, most people got their news through traditional media (e.g., printed newspapers, television, radio broadcasts). It was delivered at specific times by a few big organizations. People consumed the news passively, with limited opportunities for interaction or feedback. Now, we get our news primarily through online news websites, mobile apps, and social media. News is updated in real time and available on demand from a vast array of sources. Audiences can comment on articles, share news, and engage

in discussions with other readers. On the negative side, this shift has profoundly disrupted the business model and financial standing of traditional news organizations, undermining their ability to conduct in-depth investigative journalism and uphold quality standards.

Amplifying the complexity, the proliferation of AI has added a new dynamic to this landscape. Algorithms curate content based on user preferences, which can create echo chambers in which individuals are exposed only to information that reinforces their existing beliefs. This can exacerbate misinformation and reduce exposure to more informed (and less biased) perspectives. Moreover, AI-generated content, such as deepfakes and automated news articles, can blur the lines between reality and fiction, making it even more challenging for the public to distinguish between credible information and falsehoods.

The Rise of the Individual

The new, people-centered sociocultural power that has emerged in the digital age has forever changed the dynamics of public debate. As explored in our 2024 white paper *The Rise of the Fifth Estate*, this new force—comprising independent commentators, podcasters, citizen journalists, grassroots advocates, and every individual with a smartphone and access to a social media platform—is siphoning control and influence away from the traditional centers of power (i.e., government, business, mainstream media).

The impact of this dramatic power shift on news consumption and opinion-making cannot be overstated. Some scoffed at Elon Musk's "You are the media now" statement to his millions of followers on X following the U.S. 2024 presidential election, but as exaggerated as it sounds, it speaks to a real trend that sees more and more people turning to alternative sources to get their news and inform (or perhaps just reinforce) their perspectives and choices. People are choosing to hear real conversations and engage with "ordinary" people rather than tuning into sources once deemed "authoritative."

The *Wall Street Journal* found, for instance, that many "news influencers" on TikTok generate more viral posts than do mainstream media outlets.Unquestionably, peer-to-peer messaging is ascending as an information source. And it's trusted, in some cases perhaps more than it ought to be. Edelman's 2024 Trust Barometer found that "people like me" are now on par with scientists when it comes to whom people trust to tell the truth about innovations and technologies. Both groups scored highest (74 percent), followed by company technical experts (66 percent). Tellingly, journalists and government leaders were at the bottom of the list, trusted by just 47 percent and 45 percent of respondents, respectively.

This trend reflects a desire for relatable and accessible sources of information. However, it also means misinformation and unverified claims spread more easily, compounding the public's confusion and uncertainty around technological and other advancements. The exponential growth and democratization of AI tools add an extra layer of complexity to this phenomenon. Could AI help by curating and verifying information shared by the Fifth Estate voices, ensuring accurate and reliable content reaches the public? Or might it amplify misinformation if not properly managed?

Misinformation

Misinformation poses a significant challenge to innovation awareness and adoption, particularly in the digital age, when false or misleading content can spread rapidly across online platforms—potentially stoking unwarranted fears or encouraging unrealistic expectations. For instance, numerous conspiracy theories emerged during the rollout of 5G technology, falsely linking it to health risks and even the spread of COVID-19. These claims led to public

> *"Discerning fact from fiction is becoming increasingly tricky, further eroding trust in legitimate sources of information.*

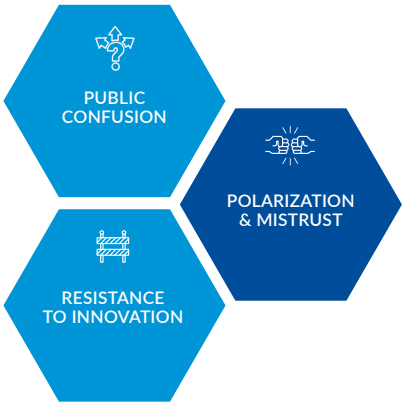
resistance, including protests and vandalism of 5G infrastructure, despite scientific evidence supporting the safety and benefits of the technology.

With the advent of generative AI, the dangers of misinformation are amplified by sophisticated deepfakes and automated bots that can create and disseminate false content on an unprecedented scale. Discerning fact from fiction is becoming increasingly tricky, further eroding trust in legitimate sources of information. This complicates efforts to combat false narratives and poses a significant threat to public discourse and democratic processes.

The public's reliance on peer-to-peer networks further exacerbates the risk of misinformation, as we saw in response to the rapid development of vaccines at the height of the COVID-19 pandemic. With tensions running high, anti-vax sentiment became socially charged and politically polarized, with various stakeholders, including some media personalities and politicians, questioning the underlying science and the motives of pharmaceutical companies, health authorities, and governments.

On the flip side, misinformation can generate irrational enthusiasm for unproven technologies. We've seen, for example, exaggerated claims and downright falsehoods fuel the hype around certain cryptocurrencies and blockchain projects. This has led to speculative investment and market bubbles, where individuals invest heavily based on misleading information only to face significant financial losses when the reality does not meet the inflated expectations.

THE CONSEQUENCES OF MISINFORMATION



Nicotine: The Misunderstood Molecule

Nicotine is addictive and not risk-free, but its role in smoking-related diseases is often misunderstood.

In the past, cigarettes, tobacco, smoking, and nicotine were inextricably linked. Nicotine was consumed primarily by lighting up a cigarette and inhaling the smoke. This led to a simplification: People conflated the effects of nicotine with the far more harmful effects of cigarette smoke. Today, while innovation has enabled us to separate nicotine from cigarette smoke, this simplification remains, causing consumer confusion and misunderstanding of the benefits and relative risks of using nicotine-containing smoke-free alternatives compared with continued cigarette use.

As multiple public health organizations around the world have stated for years, nicotine is not the primary cause of smoking-related diseases.[4] The highest risk of harm comes from burning tobacco. Tobacco smoke contains more than 6,000 chemicals. Of these, around 100 harmful or potentially harmful constituents have been classified by public health agencies as contributing to smoking-related disease. As noted, for example, by the U.S. Food and Drug Administration (FDA): *"This toxic mix of chemicals—not nicotine—cause the serious health effects among those who use tobacco products, including fatal lung diseases, like chronic obstructive pulmonary disease (COPD) and cancer."* In Europe, the Royal College of Physicians has concluded: *"Current evidence suggests nicotine itself confers little risk to health, though acute exposure at typical levels from consumer nicotine products can result in addiction, short-term enhanced cognitive effects, elevated heart rate and systolic blood pressure."*

Such misunderstandings aren't limited to consumers and public opinion at large; some professionals also wrongly attribute the harmful effects of cigarette smoke to nicotine. For instance, a survey published in the U.S. in 2020 revealed that 80.5 percent of physicians "strongly agreed" that nicotine directly contributes to the development of cancer. This misperception persists despite numerous public health authorities, including the World Health

[4]US FDA "Nicotine Is Why Tobacco Products Are Addictive" (accessed: Sep 2024); Royal College of Physicians 2024 "E-cigarettes and harm reduction: An evidence review"; National Health Service "Vaping myths and the facts."

Organization, the U.S. FDA, and the International Agency for Research on Cancer, having looked extensively at the components of cigarette smoke and consistently concluded that nicotine is not a carcinogen.

The existing misinformation on nicotine perpetuates consumer confusion and skepticism around smoke-free innovations, hindering adult smokers' ability—and right—to make better choices than continuing to smoke.

The Extinction of Nuance

In this era, intense polarization has infiltrated many aspects of life. It's evident in the news we consume, with clickbait headlines crafted to trigger strong emotions such as curiosity, fear, outrage, and anger in an ever-escalating cycle. The stories have to hold attention and deliver on the emotion of the headlines, so they tend to be punchy rather than nuanced. Similarly, there is little room for nuanced opinions and discussions on social media. Everyone is expected to be either pro or against any given topic. Pick a side and stick to it. Ideas deemed controversial within a particular media sphere are frequently suppressed, and "canceling" or "deplatforming" individuals for dissenting opinions is commonplace. Public policy debates, too, have devolved into exchanges of catchy sound bites rather than meaningful discussions.

Against this backdrop, it is unsurprising that public debate around the benefits and risks of innovations can be polarized, lacking nuance and a balanced view of each innovation's potential. There is a tendency to overestimate some perceived risks and downplay or discount others. For example, in the renewable energy sector, the potential hazards of wind turbines, such as noise pollution and harm to bird populations, are often highlighted, while the significant benefits of reducing greenhouse gas emissions and decreasing reliance on fossil fuels are sometimes underappreciated. This imbalance in risk perception can hinder the adoption of technologies that may offer substantial long-term benefits.

THE PARADOX OF CHANGE

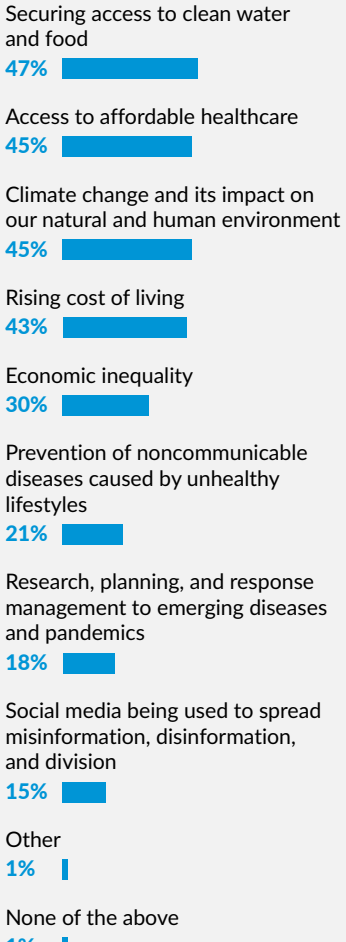
A widespread desire for change was palpable during the first years of the COVID-19 pandemic. For many, the global crisis brought everyday life to a standstill, presenting a unique opportunity for a collective reset.

Many saw the enforced downtime of the pandemic as a chance to pivot and build a more sustainable and equitable world. A survey conducted by Ipsos across 27 countries in September 2020 revealed that nearly nine in ten respondents wanted significant changes rather than a return to the pre-pandemic status quo.

While the world did not achieve a reset, much has changed since 2020. Some changes have been for the better (e.g., increased scientific collaboration, the spread of technology that keeps people connected, and improved work-life balance with remote or hybrid work models becoming mainstream). Still, many of the most critical global issues remain unresolved, which explains why a profound public appetite for transformative change persists.

In the international survey PMI commissioned from Povaddo, participants were asked to identify the world's most pressing issues. Atop the list for 47 percent of respondents was securing access to clean water and food, followed by affordable healthcare and climate change (both selected as most urgent by 45 percent) and the rising cost of living (43 percent)—reflecting widespread global concern regarding economic pressures and quality of life. Nearly a third of the sample cited economic inequality as the most urgent issue to address, while around a fifth pointed to the prevention of noncommunicable diseases and coordinated disease mitigation efforts.

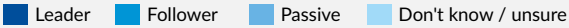
Which, if any, of the following global issues do you think are the most URGENT?



(n=10,250)

The survey then asked respondents about their country's role in addressing these issues. Most people want their countries to play a leading role in matters such as securing access to affordable healthcare (80 percent) and to clean water and food (78 percent). Respondents also expect their governments to lead in addressing the rising cost of living (76 percent) and economic inequality (75 percent). (Only a small minority of respondents believe their governments are taking a leadership role currently.)

Thinking specifically about the issues you defined as most urgent, what role do you believe your country should play in tackling this topic?



Access to affordable healthcare
80%
10%
6%
4%

Securing access to clean water and food
78%
14%
5%
3%

Climate change's impact on our natural and human environment
74%
18%
5%
3%

Research, planning, and response to emerging diseases and pandemics
71%
20%
5%
4%

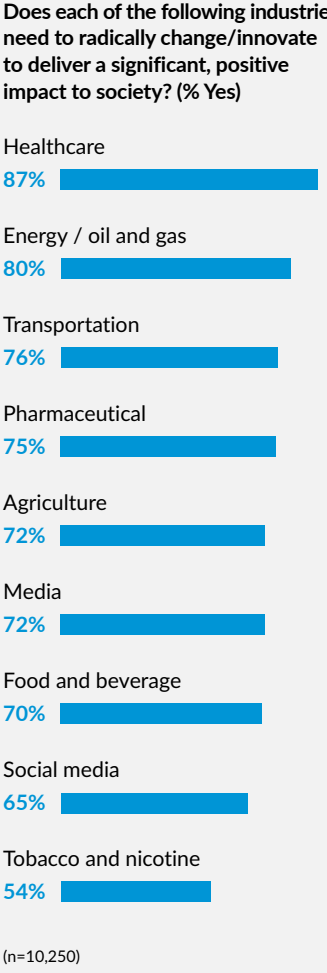
Social media spreading misinformation, disinformation, and division
69%
18%
9%
5%

Prevention of noncommunicable diseases caused by unhealthy lifestyles
67%
20%
9%
4%

(n=1,530–4,867; based on issues respondents defined as urgent)

Additionally, significant percentages of respondents favor disruptive change within specific industries and sectors. According to our global sample, the healthcare (87 percent) and energy (80 percent) sectors are most in need of radical transformation to ensure a significant, positive societal impact. Transportation and pharmaceuticals also require significant change, according to around three-quarters of respondents. Sectors such as tobacco and nicotine and social media saw a more divided response, with 54 percent and 65 percent of respondents, respectively, agreeing that these sectors need to innovate radically. Taken as a whole, the survey responses point to a significant and consistent appetite for change.

Despite the public's sense of urgency, innovative solutions often face significant resistance. This is particularly pronounced in controversial sectors, where there's inherent skepticism. This dynamic creates a paradox: The greater the need for change, the more pushback it encounters. Too often, some combination of fear of the unknown, a reluctance to alter behaviors, and



the influence of entrenched interests hinders progress. This is the case even when the most potent risk stems not from innovation but from inaction.

We can see this paradox in attitudes toward artificial intelligence. AI innovations promise to revolutionize industries, improve efficiency, and solve complex problems across a wide range of sectors—including healthcare, where the technology has the potential to improve diagnostics, personalize treatment plans, and predict disease outbreaks. Despite such benefits, there is significant hesitation concerning the integration of AI into healthcare systems. Concerns about patient privacy, ethical issues, the accuracy of AI-driven diagnoses, and the potential for AI to displace human healthcare providers contribute to this reluctance.

The Critical Role of Policymaking

Policymaking can play a vital role in overcoming societal resistance and speeding the adoption of innovations.

Effective policies can create an environment that encourages the development and implementation of new technologies while also addressing the concerns that often accompany significant change. By establishing clear regulatory frameworks and providing incentives for innovation, policymakers can mitigate the risks associated with new technologies and ensure their benefits are widely distributed. Moreover, by fostering transparent and open dialogue, policymakers can educate consumers to help them make informed choices.

This is an ideal scenario. Too often, it is not the reality. In the Povaddo survey, most respondents (56 percent) said their government moves too slowly in embracing technological breakthroughs and innovation, while 26 percent said it is moving at about the right speed.

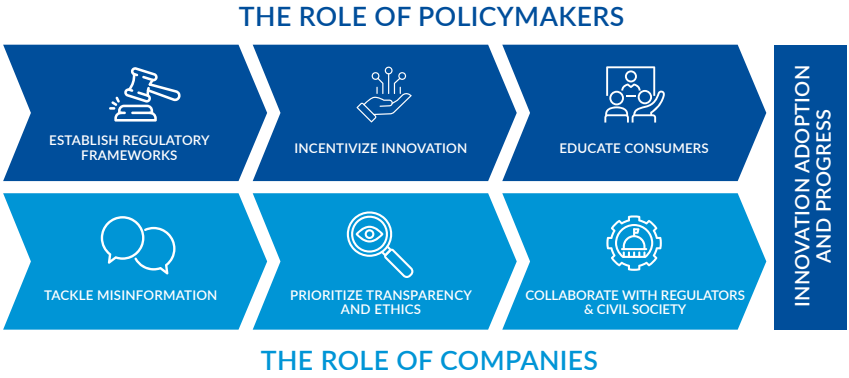
In some cases, regulatory procedures are in place to evaluate the benefits and risks of innovations. Too often, such procedures are inadequate or nonexistent, especially when groundbreaking developments are involved. In the case of AI, for example, regulatory bodies are still at the stage of talking about developing governance even as the technologies race ahead.

We have seen the ineffectiveness of this process in adjacent fields: social media and smartphones. These technologies have been in widespread use for well over a decade and constitute the most massive unsupervised social and psychological experiment involving billions of people ever carried out. Despite widespread alarm about impacts on attention spans and both mental and physical health, as well as warnings from industry insiders (e.g., in *The Social Dilemma*) and prominent researchers (e.g., Jean Twenge and Adam Alter), there is virtually no coherent, universally accepted regulation of these technologies.

No wonder. The pace of technological development is such that regulators struggle to acquire the needed depth of expertise to grasp the implications fully. This can lead them to slow-walk tackling difficult new areas and instead focus their energies on familiar territories where regulatory frameworks are already in place. As Nobel laureate Daniel Kahneman noted: *"When faced with a difficult question, we often answer an easier one instead, usually without noticing the substitution."*

The predictable consequence of uncertainty is that policymaking frequently relies on the precautionary principle, prioritizing safety and risk avoidance over innovation and progress. This approach can be regarded as protecting public welfare; however, when used in lieu of a considered and science-based regulatory framework, it can hinder the adoption of technologies that could offer significant benefits. Striking a balance between caution and innovation is crucial to effective policymaking.

Also at play is the tension between the Global North and Global South,[5] which significantly impacts the regulation of emerging innovations. In general, the adoption of beneficial technologies tends to be slower in developing countries due to disparities in economics and political influence as well as regulatory frameworks that do not address these markets' unique needs. These factors also result in decisions favoring wealthier nations. For instance, the Global North's dominance in AI research and development can result in regulations prioritizing these countries' ethical standards and technological capabilities, potentially overlooking challenges and opportunities in the Global South. Bridging these divides through equitable dialogue and inclusive policies is essential to ensure innovations are globally accessible and beneficial.



[5] These terms are used to divide the world's countries based on their economic development and relative power, with the Global North consisting of countries that are generally wealthy, technologically advanced, and politically stable and the Global South made up of countries considered less advanced.


INNOVATION
UNLEASHED

The trajectory of innovation—from market entry to widespread adoption and social acceptance—is fraught with complexity.

Controversial sectors, in particular, face challenges that can hinder progress and require a strategic approach that balances the urgency of innovative solutions with the need to address legitimate concerns and build broad-based support. In this section, we delve into key considerations and principles for businesses, policymakers, and civil society to consider as they seek ways to embrace and accelerate innovation to drive progress.

We'll start by exploring what people expect governments and businesses to do to speed the adoption of critical innovations and ensure their positive societal impact.

A strong majority (90 percent) of respondents to the international opinion survey conducted by Povaddo indicated that it is important for governments to ensure public access to accurate information about these innovations and to establish clear and fair regulations, while 89 percent

*AI, biotech / genome-editing therapeutics, new-wave nuclear reactor technology, GMOs, nicotine-based alternatives to cigarettes, cryptocurrencies and blockchain, surveillance technology, obesity medication (GLP)

stressed the need to ensure ethical standards are met. Additionally, 87 percent emphasized the importance of governments tackling misinformation. Finally, 83 percent highlighted the criticality of collaboration between the private and public sectors, while 82 percent believe fostering an open and balanced public debate on emerging innovations is important.

In terms of the public's expectations of business, most respondents (91 percent) cited the importance of ensuring transparency and ethical practices, highlighting the need to operate with integrity and openness. Almost as many respondents (88 percent) deemed it important for companies to invest in innovation. Tackling misinformation also was seen as crucial by 88 percent, reflecting concern about the spread of falsehoods and misleading information. Finally, collaborating with regulatory bodies and engaging openly with stakeholders were considered important by 87 percent, underscoring the need for companies to work closely with authorities to ensure compliance and foster trust.

*AI, biotech / genome-editing therapeutics, new-wave nuclear reactor technology, GMOs, nicotine-based alternatives to cigarettes, cryptocurrencies and blockchain, surveillance technology, obesity medication (GLP)

These survey results underscore the critical actions governments and companies must take to support the successful integration of new technologies and other innovations into society. We'll now look at key principles that can help leaders in business and government better navigate innovations' complexities and address stakeholders' concerns.

Respect

All too often, progress is impeded not because of objective concerns over an innovation's efficacy or safety but because vital stakeholders automatically oppose the emerging product or service without fully understanding it and its potential. Sometimes, this opposition is rooted in history; other times, it's simply that a technology is so novel and complex that policymakers don't feel equipped to assess its potential impact (good or bad). In a deeply polarized world, it's critical that all parties respect three things: science, facts, and the principle of open dialogue and debate. Even when parties fundamentally disagree on specific aspects of an industry or technology, respecting one another's right to hold different opinions and valuing the scientific method and factual evidence can lead to productive exchanges. This approach can mitigate the impact of misinformation and emotional biases, ensuring that discussions remain focused on verifiable data and rational arguments. By maintaining a respectful discourse, stakeholders can work through their differences more effectively and identify common goals and values that drive progress.

Respect for due process is also vital, ensuring innovation is pursued within a framework of fairness and accountability. This means adhering to established protocols, regulatory standards, and ethical guidelines, which helps to build trust among all parties. When businesses and policymakers demonstrate a commitment to due process, it reassures the public that innovations are being developed and implemented responsibly. This trust is crucial for gaining societal acceptance and support. Ultimately, by embedding respect into their interactions, organizations can navigate the complexities of innovation more successfully, fostering an environment where progress is not only possible but also sustainable and inclusive.

ADVANCING INNOVATION AND TRUST

Constructive Skepticism

Skepticism about controversial industries is understandable and can be a powerful lever of beneficial change if accompanied by constructive intent. It can incentivize a company to address issues surrounding its products, activities, or practices, both past and present. It's a different story when skepticism is entrenched in hostile intent. In such cases, no amount of positive action by the company can shift perceptions. This form of unyielding skepticism can stifle innovation and progress, discouraging efforts that might offer valuable societal benefits. Companies can find themselves in a catch-22, where they are criticized for past actions—or current perceptions of the past—and simultaneously hindered in their attempts to chart a better course. Professor David W. Miller, Director of the Princeton Faith & Work Initiative and an external ethics adviser to PMI, explores this interplay in his paper *The Ethics of Organizational Change*.

If regulatory bodies and the broader public cannot see beyond entrenched misperceptions, they risk disregarding or blocking valuable innovations. While it is crucial to scrutinize emerging innovations and the companies behind them, it is equally essential to allow space for transformation and progress. Constructive skepticism should guide companies on what they need to do to change for the better rather than serving as an insurmountable barrier to growth. By fostering an environment where constructive criticism is welcomed, stakeholders can encourage continuous improvement and innovation that offers valuable societal benefits.

Recognition That "Similar To" Does Not Mean "The Same As"

To understand complex innovations, people inevitably look for simple analogies and comparisons. This is why early automobiles were often called "horseless carriages." This term gave people a way to envision that groundbreaking innovation, but it did nothing to prepare their thinking for the technology's massive impacts. Simplistic or inaccurate analogies often impede innovation by blurring critical distinctions between technologies. This can lead to misguided expectations and fears. By failing to recognize and articulate the differences between similar but fundamentally distinct concepts,

society risks hampering advancements that could offer significant benefits.

Looking at examples discussed earlier in this paper, nuclear power and nuclear weapons both involve nuclear reactions, but they have vastly different purposes and implications. Equating them can lead to fear and misunderstanding of nuclear power's potential benefits in providing electricity without emitting greenhouse gases. Perhaps trickiest of all, artificial intelligence is not the same as human intelligence, although many worry it is or will be. Humans have an almost irresistible tendency to anthropomorphize: to treat nonhuman entities as human. We give names to machines and pets, talk to them, and ascribe human emotions to them. And let's face it: When we hold conversations with chatbots today, it's hard to remember that it's just a sophisticated machine on the other end of the exchange.

Misleading analogies often hinge on triggering associations of a single word or phrase, as with *nuclear* and *intelligence* above. Among other examples, we have come to associate *chemical* with harmful substances, but in fact, everything is made up of chemicals. Water, air, and even our bodies are composed of chemical compounds. In the minds of some, *synthetic* implies something is unnatural, automatically less desirable (and inherently more dangerous) than natural counterparts. Yet synthesis is the process of creating chemical compounds from simpler substances through chemical reactions. Some products, such as synthetic insulin, can offer higher purity, consistency, and reliability than the natural product.

As these examples show, navigating the complexities and controversies of innovation requires a multifaceted approach grounded in respect, constructive skepticism, and a clear understanding of the nuances that differentiate similar concepts. By fostering an environment in which open dialogue and evidence-based decision-making are prioritized, businesses and policymakers can build the trust necessary to drive progress.

CHAMPIONING AN INNOVATION OUTLOOK

Innovation is the engine of progress, but the more significant the innovation, the more likely it is to draw concern and resistance.

As this paper has explored, the rapid pace of change often outstrips our collective ability to assess, regulate, and integrate new technologies effectively. The result is a landscape where stakeholders clash over priorities and public discourse frequently defaults to polarization and misunderstanding. Addressing these challenges requires a structured, collaborative approach that balances urgency with prudence.

Essential for Innovators

Innovators and changemakers must be bold in proactively calculating and communicating their innovation's rationale, risks, and benefits. This means sharing progress and challenges openly, particularly with skeptical stakeholders. It means engaging with stakeholders—regulators, community representatives, and critics—as early as possible in the innovation process to identify concerns and build collaborative solutions.

Essential for Policymakers

Given the rate at which problems and potential solutions are emerging and the challenging landscape innovations face, it's essential to create flexible, principle-based regulations that can evolve alongside technological advancements rather than relying on rigid policies tethered to a no longer relevant past. It's critical for regulatory bodies to have the expertise and resources needed to understand complex innovations and evaluate their impacts effectively.

Essential for the Public and Civil Society

Civil society has the right and the duty to hold innovators and regulators accountable for tackling problems, delivering on promises, and addressing risks. In doing so, the world's citizens must recognize their responsibility to engage meaningfully in public debates and develop critical skills to evaluate information in a spirit of constructive skepticism.

Essential for All

Innovating to address pressing problems is a serious team undertaking for bold leaders in business, government, and society more broadly. Ensuring those innovations make a difference in the wider world requires much more than the hard work of the people and enterprises behind these innovations.

It requires dialogue and person-to-person contact among innovators and members of stakeholder groups, including policymakers and civil society.

It requires a public sufficiently informed and engaged to participate responsibly in the societal discourse.

Innovation is not just the work of inventors—it is a shared enterprise that demands collective commitment, dialogue, and earned trust. Only by being bold and willing to find ways of working together can we harness the transformative potential of innovation to address the pressing challenges of our time.

> *Innovation is not just the work of inventors—it is a shared enterprise that demands collective commitment, dialogue, and earned trust.*

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