



THE AI BUBBLE: BETWEEN TECHNOLOGICAL PROMISES AND ECONOMIC REALITY

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ABSTRACT

This study examines the phenomenon of the artificial intelligence (AI) bubble through an integrated economic and technological lens, contextualizing the recent surge in AI development—particularly generative models like ChatGPT and Midjourney—within broader cycles of financial speculation and innovation hype. Drawing on classical economic theories of bubbles (Kindleberger, Minsky, Shiller) and contemporary reports from institutions such as the OECD, World Economic Forum, and McKinsey, the research examines whether current investment patterns and market valuations in the AI sector reflect sustainable growth or speculative excess. The study highlights parallels with previous episodes of technological overvaluation, such as the dotcom and cryptocurrency bubbles, and identifies behavioral and structural indicators of potential market distortion. While acknowledging the transformative potential of AI, the study argues that inflated expectations may obscure underlying risks, particularly for emerging economies vulnerable to global financial shocks. It concludes that the AI bubble, if managed prudently, could serve as a corrective phase that redirects innovation toward long-term sustainability. Policy recommendations include diversifying funding sources, safeguarding labor markets, strengthening regulatory frameworks, and investing in human capital to ensure a responsible and inclusive transition toward humane artificial intelligence.

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1 INTRODUCTION

Since the beginning of 2022, the world has witnessed a radical shift in the technological and economic landscape, embodied by the unprecedented boom in artificial intelligence applications, particularly generative AI models, which have been widely discussed in scientific, economic, and media circles. The launch of tools such as OpenAI's ChatGPT, the image generation platform Midjourney, and the emergence of many other smart solutions have marked a pivotal turning point in the human relationship with technology. This technological revolution has not only accelerated the pace of scientific research and improved productivity, but has also sparked widespread economic activity, reflected in growing investments, rising market values of companies operating in this field, and increasing bets by governments and major financial institutions on this technology as the primary driver of the Fourth Industrial Revolution.

Amid this momentum, ambitious predictions have emerged that view artificial intelligence as the key to a prosperous economic future, capable of reshaping value chains, stimulating innovation, reducing production costs, and improving resource allocation. Many countries have adopted national strategies for artificial intelligence, considering it a pillar of future economic development. However, this rapid boom has been accompanied by significantly inflated expectations, prompting a growing number of experts and analysts to warn of the potential emergence of an "AI bubble." This is an economic phenomenon characterized by an unjustified increase in market and investment values compared to the actual economic value of technology. This phenomenon is strikingly like what occurred during the Internet bubble of the late 1990s and early 2000s, and the cryptocurrency bubble of 2017.

Talk of an "AI bubble" does not necessarily mean downplaying the importance of technology. Rather, it reflects the need for objective and balanced reading between the true potential of new technologies and exaggerated expectations that could lead to unsustainable investment waves. This issue is doubly important for emerging economies and developing countries, which can be directly or indirectly affected by

global market fluctuations. Excessive investment in AI could lead to unstable economic consequences in the event of a sharp correction or bubble burst. From this perspective, it is imperative to study the phenomenon from a comprehensive economic-technological perspective, linking global transformations with their local repercussions, while analyzing quantitative and qualitative indicators that may indicate investment inflation or overvaluation. This phenomenon also requires a deep understanding of market dynamics, investor behavior, the strategies of major corporations, and government trends, enabling the formulation of strategic visions and recommendations for developing countries to avoid the potential side effects of any global technological crisis.

2 RESEARCH PROBLEMATIC

Despite the rapid growth in the artificial intelligence sector, there are indications that its current economic potential is being overestimated, raising questions about:

- Is the world truly experiencing an AI bubble?
- What factors could lead to this bubble bursting?
- What are the implications for emerging economies and developing countries?

2.1 Research Objectives

- To analyze the concept of the "AI bubble" from an economic and technological perspective.
- To study indicators of the sector's inflation (investments, expectations, market values).
- To identify potential economic risks in the event of a bubble bursting.
- To anticipate the future of technology after the correction phase.
- To provide recommendations for decision-makers in developing countries to avoid potential negative impacts.

2.2 Research Methodology

The research adopts a descriptive-analytical approach through:

- Analysis of international economic data and reports (OECD, IMF, World Economic Forum, McKinsey).
- Review of recent academic literature on technology bubbles.

- Comparing the case of artificial intelligence with the dot-com bubble and cryptocurrencies.
- A case study of major AI companies (OpenAI, Nvidia, Anthropic, Microsoft).

3 THE CONCEPTUAL AND THEORETICAL FRAMEWORK OF ECONOMIC BUBBLES

3.1 Concept of the Bubble in Financial and Technological Economics

The concept of the economic bubble is a pivotal concept in financial and macroeconomic analysis, as it refers to a structural imbalance between the intrinsic value of assets and their market value. A bubble occurs when asset prices, whether stocks, real estate, digital currencies, or emerging technologies, rise to exaggerated levels that cannot be justified by fundamental factors such as profits, productivity, or real demand. This rise is typically driven by overly optimistic future expectations rather than solid economic or financial fundamentals. (Reinhart & Rogoff, 2009)

Kenneth Rogoff and Carmen Reinhart defined economic bubbles as "states of significant disconnect between actual financial valuations and investors' behavioral expectations" (Reinhart & Rogoff, 2009). Hyman Minsky, in his theory of "unstable stability," also pointed out that bubbles arise not only from external shocks but also from reckless financial behavior and excessive speculation, which leads to the accumulation of financial fragility that later bursts. (Minsky, 1986)

From a behavioral perspective, several factors contribute to the formation of financial bubbles. Among the most prominent are herd behavior, where investors imitate one another without rational analysis; unrealistic expectations—a term coined by U.S. Federal Reserve Chairman Alan Greenspan in 1996 and later elaborated by Shiller; and short-term speculation driven by the pursuit of high profits without corresponding gains in productivity or real economic value (Shiller, *Irrational Exuberance*, 2000).

In the technological field, economic bubbles often exhibit unique features, frequently accompanying the emergence of new technologies perceived as revolutionary and capable of reshaping economic or market structures. During these periods, capital

flows into sectors related to these technologies accelerate, from both individual investors and major financial institutions. The media exaggerates expectations about the future of these technologies, leading to significantly inflated financial valuations of companies operating in them, even if their business models are immature or lack stable cash flows. (Perez, 2002; OECD, 2023)

A prominent example of this occurred during the dot-com bubble, which spanned from 1995 to 2000. Digital technology startups saw astronomical increases in their market values despite weak returns. When expectations collided with reality, the bubble burst, resulting in losses of hundreds of billions of dollars (Kindleberger & Aliber, 2011). Another example is the cryptocurrency bubble of 2017, when the prices of Bitcoin and other cryptocurrencies rose to unsustainable levels before subsequently collapsing. (WEF, 2024)

At the core of any financial or technological bubble lies a large gap between the true value of assets and their inflated market capitalization. This gap represents structural fragility, and upon the first shock—such as a change in expectations, a slowdown in growth, or a rise in interest rates—this gap closes abruptly, causing a price collapse (Minsky, 1986; Shiller, 2000).

Carlotta Perez's analysis suggests that most technological revolutions go through similar phases: irruption, frenzy, crash, and finally synergy—the same stages that shape the dynamics of any major technological bubble. (Perez, 2002)

3.2 Stages of an Economic Bubble

Economic bubbles typically go through a series of successive stages that recur throughout economic history, whether in traditional financial markets or emerging technology sectors. In her theory of technology cycles, Carlota Perez (2002) explained that every technological revolution goes through a specific cycle: hype, expansion, explosion, and maturity (Perez, 2002). The work of Hyman Minsky (1986) and Kindleberger & Aliber (2011) further supported this model through their analysis of market and investor behavior during financial crises. (Minsky, 1986; Kindleberger & Aliber, 2011)

The following is a detailed breakdown of the stages of this cycle.

3.2.1 Irruption Phase

In this first stage, a new technology or innovative economic opportunity emerges that is perceived as having the potential to profoundly transform the economy. This stage is often associated with a technological breakthrough or new discovery, such as the advent of the internet in the 1990s or artificial intelligence technologies in the current decade.

Investment appetite at this stage is relatively limited, and participation is restricted to early adopters such as venture capital funds, universities, research labs, and institutions with a high tolerance for risk. Prices are not yet inflated, but an optimistic narrative about the future of technology begins to take shape. Specialized media coverage plays an important role in creating a mobilizing discourse that reinforces the impression that an "economic revolution" is imminent. The basic features of this phase are evident (Perez, 2002):

- Initial measured optimism.
- Limited investments within a narrow scope.
- The "market story" around the new technology begins to take shape.
- Focus on technical feasibility rather than financial feasibility.

3.2.2 Frenzy Phase

In this stage, capital flows into the new sector to accelerate. Institutional investors and large investment funds are attracted to the opportunity, and mass media coverage increases, generating a state of collective enthusiasm. Prices begin to rise at a faster pace than the actual growth in economic value.

Here, what is known as herd behavior appears, where investors rely less on rational analysis and are increasingly influenced by what others are doing. Market expansion and rising prices attract new investors, many of whom lack sufficient experience, thereby increasing momentum and market volatility. The basic features of this phase are evident: (Minsky, 1986)

- Rapid expansion of the investor base.
- Price growth at a pace disproportionate to intrinsic value.

- Dominance of the economic narrative by the mainstream media.
- The beginning of a disconnect between price and intrinsic value.

3.2.3 Mania Phase

This phase represents the peak of the bubble, when prices reach economically unjustified levels. Irrational exuberance, a concept coined by Robert Shiller (2000), prevails. There is a growing belief that prices will not decline and that the "historical opportunity" will last indefinitely.

Short-term speculation is widespread, and inexperienced individuals, driven by the fear of missing out (FOMO), participate in the market. Financial valuations of companies operating in the sector expand to unprecedented levels, often without sustainable business models. At this stage, economic analysis standards weaken and are replaced by faith in the market itself.

The basic features of this phase are evident: (Shiller, Irrational Exuberance, 2000)

- Excessive speculation and exorbitant price increases.
- Entrance of unprofessional investors.
- Nearly complete disregard for risk.
- Complete disconnect between price and intrinsic value.

3.2.4 Crash Phase

After the peak, a sudden shift in market expectations occurs. The trigger may be an economic shock, a negative announcement from a key company, or a liquidity crisis. Large investors begin preemptively selling their assets, leading to a series of panic sales.

At this stage, prices decline sharply, and the market loses confidence in the sector. Several small or financially unstable companies collapse, and funding rapidly declines. This phase is often characterized by a complete loss of confidence, and exiting the market becomes the goal of most investors. The basic features of this phase are evident: (Kindleberger & Aliber, 2011)

- A sudden and sharp decline in prices.
- A state of mass panic and loss of confidence.
- The exit of large capital.
- The beginning of the collapse of financially weak companies.

3.2.5 Consolidation Phase

After the crash, the market enters a structural correction phase, during which assets are revalued according to their true economic value. Fragile companies or those built on unsustainable speculation disappear, while those with true value and the ability to adapt remain.

This phase is extremely important because it allows the market to be purified and rebuilt on more solid foundations. Often, this correction leads to the sector's maturity phase, where technology transforms from a speculative phenomenon into a productive and stable economic sector. This happened, for example, with the internet after the 2000 bubble, and with e-commerce after the 2008 crisis. The basic features of this phase are evident: (Perez, 2002; Reinhart & Rogoff, 2009)

- Prices return to reasonable levels.
- Screening of companies and players.
- Gradual maturation of technology.
- Building a more stable investment environment.

By analyzing these five stages, it becomes clear that bubbles are not merely fleeting aberrations but rather a recurring part of the dynamics of financial and technological markets. They arise from the interaction of technological innovation with speculative investment behavior and evolve through relatively predictable stages. While the bursting stage often leaves significant losses, the correction stage can be an opportunity to build a stronger and more mature sector.

Accordingly, understanding these stages is essential for developing proactive economic strategies, especially for developing countries that could be affected by the repercussions of any global AI bubble.

3.3 Lessons from Previous Technological Bubbles

Modern economic history has witnessed numerous technological bubbles that have left profound impacts on the structure of the global economy, from the railroad bubble of the nineteenth century to the internet bubble of the late 1990s, and the cryptocurrency and artificial intelligence bubble of the last two decades. Despite the losses these bubbles cause, they

often contribute to accelerating technological innovation and the building of future infrastructure, making them a dual-effect phenomenon, combining creative destruction with long-term growth opportunities. (Perez, 2002)

3.3.1 The Dot-Com Bubble (1995–2001)

The dot-com bubble is one of the most prominent examples of the interaction of technological innovation with financial speculation. During the 1990s, valuations of emerging internet companies rose to unprecedented levels, even though most lacked a sustainable business model or real returns. Media and public optimism about the "new economy" dominated investment decisions until the bubble burst in 2000, causing losses exceeding \$5 trillion in market capitalization. (Shiller, *Irrational Exuberance*, 2000)

After the correction, a few companies—such as Amazon and Google—were able to adapt and survive, confirming that bubbles do not end innovation but rather filter it out in favor of the most efficient players (Perez, 2002). Recent analyses indicate that the artificial intelligence phenomenon of the current decade bears similar characteristics in terms of investment rush and inflated expectations. (INET, 2025)

Considering the above, it becomes clear that technological innovation alone is not enough to justify high valuations; it must be supported by a realistic economic model and sustainable returns.

3.3.2 The Crypto Bubble (2017–2022)

This bubble was characterized by an unprecedented surge in digital asset prices, driven by speculation and herding behavior. Recent studies indicate that most cryptocurrencies have experienced repeated cycles of inflation and deflation, and that the collective behavior of investors played a crucial role in bubble formation (Zhang, Wang, & Li, 2022).

In the post-crash phase, researchers have observed persistent patterns of renewed optimism despite losses, reflecting that digital speculation has become a structural component of modern markets (Kou & Xu, 2024). The bubble has also expanded into subsectors such as non-fungible tokens (NFTs) and decentralized finance (DeFi) platforms, increasing market volatility (Yousaf, Yarovaya, & Mirza, 2023)

Based on the previous analysis, it can be concluded that financial innovation requires effective regulatory frameworks and oversight institutions to avoid a recurrence of extreme bubble cycles.

3.3.3 The AI Bubble (Currently in the Making)

Since 2022, generative AI has emerged as the most attractive technology for investment, with valuations of companies operating in it rising to levels that exceeded actual expected returns (Campbell & Shiller, 2024). Recent economic reports indicate that this phenomenon represents an "emerging bubble" driven by unrealistic promises of a comprehensive transformation in productivity (Arrucha, 2025)

A report by the US Federal Reserve Bank (FRBR, 2025) warned that the trajectory of AI investments closely resembles that which preceded the dot-com bubble. A recent study concluded that the "investment hype" around AI may persist as long as tangible returns are not yet proven (INET, 2025).

Given the preceding analysis, distinguishing between technical and economic value becomes critical, as inflated expectations could trigger significant market corrections over the next few years.

3.3.4 Cumulative Lessons from Tech Bubbles

Comparing these cases reveals that all bubbles share common psychological and economic characteristics: herd behavior, excessive optimism, weak regulation, and detachment from economic fundamentals. However, they also represent periods of transition toward innovation maturity, during which resources are redirected toward more efficient actors (Kindleberger & Aliber, 2011; Reinhart & Rogoff, 2009).

Historical experience shows that bubbles are not the end of technology, but rather a natural correction process to rebalance future promises and actual value (Perez, 2002; Arrucha, 2025).

4 FEATURES OF THE ARTIFICIAL INTELLIGENCE BUBBLE

Since 2022, the world has witnessed a massive surge in interest in artificial intelligence (AI), especially after the launch of generative AI models, which revolutionized the way humans interact with machines. This technology has

become a major focus of global economic and political discourse, described as the "new oil" and a "fourth industrial revolution" capable of reshaping productivity, innovation, and the labor market (MGI, *The Productivity Illusion: Assessing AI's Real Economic Impact*, 2025).

However, this momentum was not without worrying indicators, strikingly similar to what the world experienced with the dot-com bubble at the beginning of the new millennium. Excessive inflation in market values, excessive investment expansion without a solid production basis, and the exaggerated media and political discourse about the "claims of surpassing human capabilities of AI" are all manifestations that reflect the characteristics of an economic bubble in its early stages (FRBR, 2025).

In this context, the most prominent features of the AI bubble can be identified in four main, interconnected elements: rapid and uneven investment growth, inflated media and political expectations, limited actual returns, and extreme concentration in a limited number of companies.

4.1 Rapid and Uneven Investment Growth

Recent years have witnessed an unprecedented influx of investment in AI technologies. According to a PwC (2024) report, global AI investments reached more than \$50 billion in 2024, compared to only \$12 billion in 2022. The United States and China contributed more than 80% of this total, highlighting the geographical imbalance in innovation funding. (PwC, 2024)

Arrieta et al.'s (2023) study indicates that this rapid growth is not always linked to real factors of productivity, but rather is fueled by "herd investing" behavior, which drives investors to fund startups for fear of missing out on future opportunities (Arrieta, Rodriguez, & Sanchez, 2023)

Despite the importance of investments in developing technical infrastructure, the rate of return on these investments remains relatively low due to the high cost of cloud computing and the expense of training large language models. For example, it is reported that training a model like GPT-4 costs over 100 million USD. (OECD, *Artificial intelligence, data and competition*, 2024, p. 18)

This disparity between the size of investments and actual returns is one of the most prominent signs of financial bubbles, as it has historically recurred whenever a futuristic narrative dominates realistic economic analysis (Perez, 2002).

4.2 Media and Political Expectations Inflated

It is noteworthy that the media has played a central role in inflating AI expectations, just as it did during the dot-com bubble of the 1990s. Since 2023, we have witnessed a "rhetorical hype" about AI's potential to radically transform education, health, administration, and the digital economy, to the point of portraying it as a substitute for humans themselves (Le Monde, 2024).

On the other hand, governments have entered the fray by announcing national plans and strategies for "sovereign AI," as the European Union did with its 2024 strategy (European Union, 2024), and the United States with its "Executive Decree on Responsible AI" (The White House, 2025)

However, most of these programs have yet to progress beyond the announcement or experimentation stage.

This media and political discourse leads to what Shiller (2000) calls "narrative contagion," the spread of optimistic expectations through media and financial channels, which reinforces exaggerated investment behavior. Companies are seeking to catch up with AI not out of feasibility, but rather out of fear of losing market confidence (Shiller, *Irrational Exuberance*, 2000).

4.3 Limited Actual Returns in Many Sectors

Despite significant investment expansion, recent data reveal a clear gap between promises and results. According to a McKinsey Global Institute report (2025), less than 15% of organizations that invested in AI achieved tangible productivity gains, while the majority faced difficulties in integrating intelligent systems into their operations. (MGI, *The Productivity Illusion: Assessing AI's Real Economic Impact*, 2025)

The sectors that have benefited most so far are digital advertising, software, and financial services, while agriculture, manufacturing, and

education remain far from achieving actual returns (OECD, 2024). This is due to several reasons:

- High cost of infrastructure (data centers, cloud computing).
- Lack of specialized human resources.
- The complexity of integrating AI with traditional systems.
- Weak legal and regulatory frameworks exist in many developing countries.

In this context, the Global Institute's (2025) study indicates that the net economic return from AI investments during the period 2022–2025 does not exceed 0.4% of global GDP, a modest percentage compared to expectations that predicted a jump of more than 3% annually (Arrucha, 2025)

4.4 Extreme Concentration in a Few Companies

According to the OECD, the AI computing supply chain is often characterized by a limited number of suppliers due to high capital intensity and economies of scale, creating significant barriers to entry. Furthermore, in the GPU accelerator market (used for AI training), "the GPU market is highly concentrated, with NVIDIA emerging as the market leader, with recent estimates suggesting the company holds over 80% of the market share for GPU chips used in AI." (OECD, *Competition in artificial intelligence infrastructure*, 2025, p. 29)

This excessive concentration creates structural fragility in the AI ecosystem; any decline in the performance of a single company can shake the entire market, just as happened during the dot-com bubble when the values of major technology companies collapsed in an interconnected chain (Kindleberger & Aliber, 2011).

This concentration also undermines opportunities for competition and innovation and gives large companies the power to control the path of technological development through their monopoly on data, big models, and computing infrastructure. According to the European Union (2025) report, 70% of AI applications in the European market rely on infrastructure owned by American companies, raising questions about digital sovereignty and technological independence. (European Union, 2024)

5 THE POTENTIAL IMPLICATIONS OF A BURST OF THE AI BUBBLE

The contemporary world is witnessing an unprecedented rush to adopt AI technologies, driven by a general perception that it represents the "Fifth Industrial Revolution" and a major driver of future growth. However, many observers and economists warn that this current momentum bears the hallmarks of a financial and technological bubble—that is, an inflationary state in market valuations that exceeds the true value of the economic and innovative applications of AI (MGI, *The Productivity Illusion: Assessing AI's Real Economic Impact*, 2025; OECD, 2023).

If the so-called "bubble burst" occurs, a collapse in the value of companies operating in this field and a decline in confidence in the technology—the repercussions will be multidimensional, spanning financial markets, employment, scientific innovation, emerging economies, and societal confidence in the technology itself.

The following is a detailed analysis of the most prominent of these implications.

5.1 The Impact of the AI Bubble on Financial Markets and Employment

Financial markets are the most sensitive environment for the emergence of technology bubbles, given their heavy reliance on future expectations and investment speculation fueled by media narratives about the "Fourth Industrial Revolution" and "generative AI." In recent years, data has shown that the valuations of many AI companies have experienced unprecedented inflation, at a rate that outpaces their actual profit growth or market share. Companies such as OpenAI and Anthropic have also received funding exceeding billions of dollars despite the absence of a clear and defined profit model, reflecting the dynamic of "narrative speculation," where financial valuations are based more on future promises than actual results (Shiller, 2019). However, historical experience—such as the dot-com bubble at the turn of the millennium—confirms that these periods of excessive optimism are often followed by sharp price corrections, with markets losing between 40% and 60% of their value in a short period (Kindleberger & Aliber, 2011). This explosion typically leads to a decline in confidence in technology sectors, a mass withdrawal of

venture capital, and the cessation of many startups that relied on consistent funding streams.

In the case of artificial intelligence, the repercussions of the explosion may be deeper and more widespread due to the cross-cutting nature of the technology, which touches vital sectors such as industry, finance, education, and healthcare. A sudden decline in investment could lead to mass layoffs of workers and engineers, especially in startups that rely on external funding without generating stable cash flow. The World Economic Forum (WEF, 2024) warns that nearly 25% of new AI jobs could disappear within three years if investment slows, particularly in the development of large language models (LLMs), big data services, and algorithm training (WEF, *The Future of Jobs Report 2024*, 2024)

In the longer term, the collapse of the AI bubble could spill over into major financial institutions themselves, including the investment banks and hedge funds that financed the expansion of technology companies. This intertwining of the financial and technology sectors increases the fragility of the global financial system and increases the likelihood of financial contagion if valuations suddenly decline (Reinhart & Rogoff, 2009).

Economist Hyman Minsky argues that "financial stability breeds instability," meaning that extended periods of recovery encourage investors to take on increased risk and borrow, ultimately resulting in the accumulation of structural fragility in the financial system, which can eventually cause a collapse. This logic applies perfectly to the case of artificial intelligence today: massive investment flows and exaggerated hopes create an inflationary cycle in digital and technological assets, which quickly turns into a crisis if not supported by real productivity. (Minsky, 1986)

Thus, it can be argued that the bursting of the AI bubble could lead to a wave of financial and structural volatility, including a decline in technology company valuations, a decline in innovation funding, widespread layoffs in the tech sector, and a decline in investor confidence in high-tech markets. However, this correction—if managed rationally—can be viewed as an opportunity to reset the market and direct investments toward more sustainable projects with real economic value.

5.2 The Impact of the AI Bubble Burst on Innovation and Scientific Research

Artificial intelligence (AI) is one of the most dynamic fields in the history of modern science, as evidenced by the pace of scientific publications, volume of patents, and rate of research funding. However, this rapid development is closely linked to investment funding cycles and market dynamics, making research activity in the field vulnerable to the fluctuations resulting from economic bubbles. When financial valuations peak, capital flows into AI projects without scrutiny, leading to an explosion in short-term applied research focused on "the race to the biggest and most expensive models," rather than long-term basic research (OECD, 2023).

However, when the bubble bursts, there is a sharp contraction in research funding, especially for start-ups and private innovation centers that rely on venture capital. This decline in funding has a direct impact on scientific activity. Data from the Organization for Economic Co-operation and Development (OECD, 2023) shows that periods following financial crises typically witness a decline in R&D spending of between 20% and 35% in high-risk sectors. Historically, studies by Perez (2002) show that periods following the bursting of technology bubbles—such as the dot-com bubble—experience a decline of approximately 30% in the number of new patents during the first three years after the crisis. (Perez, 2002)

However, this slowdown is not interpreted as a permanent decline in the pace of innovation. Rather, as Carlota Perez (2002) argues, it represents a phase of "structural purification" that separates true innovation from scientific speculation. In the post-dot-com bubble period, despite the disappearance of hundreds of startups that focused on quantitative growth, a few companies emerged, such as Google and Amazon, that were able to build sustainable business models based on genuine innovation and the practical application of technology. By analogy, it can be argued that the bursting of the AI bubble, despite the temporary stagnation, may represent an opportunity to redirect research activity toward added economic and social value

rather than focusing on "demonstrating technical capabilities." The focus of research is expected to shift from large, expensive AI models to small, specialized innovations and toward the promotion of edge AI, which focuses on efficiency and resource conservation (MGI, *The State of AI 2024: From Hype to Value Creation*, 2024)

This shift could also encourage a rebalancing of academic and industrial research, with universities and national scientific research centers reasserting their leadership role in developing open-source technologies that serve the real economy, rather than relying entirely on the initiatives of giant corporations, whose activities may decline after the crisis. A McKinsey report (2024) indicates that the post-correction phase may be characterized by a "rationalization of AI use," meaning its integration into the real economy in a more cost-benefit-balanced manner, with an increased focus on sustainability and transparency in research models. Therefore, the bursting of the AI bubble does not necessarily mean the collapse of innovation. Rather, it can be viewed as a transitional turning point that reshapes the scientific research environment along more stable and realistic foundations, establishing a new phase of responsible and sustainable innovation that links technology to long-term development. (MGI, *The State of AI 2024: From Hype to Value Creation*, 2024)

5.3 On Emerging Economies and Developing Countries (Risks and Opportunities)

Since 2023, the world has witnessed an unprecedented wave of investment in artificial intelligence (AI), with global investments exceeding \$500 billion in 2024, most of which are in major American and Chinese companies (Huaxia, 2025)

However, this rapid rise has been accompanied by excessively inflated startup valuations and unrealistic expectations regarding economic returns, prompting many experts to warn of the imminent emergence of a "new technology bubble."

If the bubble bursts, developing countries will be the most affected due to their near-total reliance on imported technology, weak digital

infrastructure, and limited investment in domestic research.

5.1.1 Macroeconomic Impacts

– Shrinking Foreign Direct Investment (FDI) Flows

The bursting of the bubble is expected to lead to a rapid withdrawal of capital directed towards technology projects in emerging markets, such as digital services and cloud computing companies in Africa and Asia.

In previous experiences—following the dot-com bubble of 2000—investment flows to developing countries declined by 35% over two years (UNCTAD, 2002).

Since most AI investments in the South are financed externally, any correction in global markets will directly translate into the freezing or downsizing of local projects, slowing the digital transformation and increasing unemployment in emerging technology sectors.

– Declining Value of Technology Startups

The lack of robust data infrastructure, limited AI research capacity, and reliance on foreign partnerships constrain the growth and commercial viability of AI startups in Africa. ((CIPIT), 2023, p. 17)

– Impacts on Currencies and Inflation

The decline in the value of digital companies and the decline in financial flows will affect local exchange markets, especially in countries that rely on foreign dollar investments to finance their digital infrastructure.

The rising cost of importing smart technologies and devices will also increase inflationary pressures in the short term (IMF, 2025)

5.1.2 Technological and Knowledge Impacts

– Disruption of Technology Supply Chains

With the stagnation of global markets, exports of cloud artificial intelligence (Cloud AI) services by major companies will decline, deepening the gap in access to technology between rich and poor countries. For example, most African and Arab universities rely on OpenAI, Google Cloud, and Amazon Web Services for research and training. Any

disruption to these services will lead to a partial paralysis of academic research and local applications (UNESCO, 2024).

– Slowdown of Government Digital Transformation Projects

Digitization plans in many developing countries rely on external funding or partnerships with global companies. The bursting of the bubble will force these companies to re-prioritize their technologies, potentially freezing government digital programs such as smart education and e-government (WB, 2024).

– Slowing the adoption of artificial intelligence in productive sectors

The industrial and agricultural sectors in developing countries are still in the early stages of smart transformation. If a global technological recession occurs, these sectors will find it difficult to obtain software, licenses, or technical support, weakening productivity and widening the efficiency gap with developed countries (OECD, 2024).

5.1.3 Social and Institutional Impacts

– Loss of Trust in Technology and Innovation

In developing countries, technology is often associated with the image of a "perceived solution" to unemployment and inefficiency. However, when digital projects fail due to the global recession, a negative social backlash against digital transformation itself may arise, weakening the incentive for innovation and entrepreneurship (Deloitte, 2024)

– Tech Brain Drain

When local job opportunities and funding in startups shrink, programmers and researchers will increasingly migrate to Europe, America, and Asia, a phenomenon known as the "tech brain drain." This will deepen knowledge dependency and delay the development of national AI systems (UNDP, 2025)

– Declining Digital Justice

Economic crises lead to reduced public spending on digitization and digital education, leaving large segments of society outside the digital transformation. This deepens the gap between digitally connected elites and vulnerable groups, creating a new form of

digital inequality (OECD, Bridging the Digital Divide: AI and Productivity in Emerging Markets, 2024)

– **Opportunities for Positive Transformation After the Bubble**

Despite the bleak picture, tech crises often open a window for rebalancing. In the event of a global correction, developing countries can benefit from:

- Declining software and cloud services prices after investors withdraw.
- Redirecting resources toward low-cost local research.
- Encouraging small national companies to fill the gap left by the withdrawal of foreign companies.
- Developing more flexible national regulatory frameworks that take local specificities into account, rather than importing ready-made policies.

5.4 The Impact of the Artificial Intelligence Bubble Burst on Societal Trust in Technology

Societal trust in technology is one of the most important intangible components of sustained digital innovation, representing the link between technological development and its social acceptance. However, historical experience shows that the bursting of technology bubbles not only leaves an economic impact but also creates a cognitive shock in societal consciousness, eroding trust in technology and its promoters (Shiller, *Irrational Exuberance*, 2000). In post-crisis periods, the public mood shifts from enthusiasm to skepticism and caution, and public discourse becomes more critical of innovations that were only recently considered symbols of progress.

In the case of artificial intelligence, the potential bursting of the bubble could lead to a decline in societal faith in the ability of algorithms to bring about the desired change, especially after the media and technology institutions have inflated expectations regarding the ability of intelligent models to replace humans in the fields of work, education, and artistic creativity. However, when these promises fail to materialize as quickly as hoped or when the current limitations of AI are exposed, collective disillusionment arises,

resulting in slow adoption of new technologies and a decline in demand for smart products (WEF, *The Future of Jobs Report 2024*, 2024).

This erosion of trust is further compounded when it coincides with ethical and technical failures such as loss of privacy, algorithmic bias, data leaks, or fears of losing control over autonomous systems. Reports from the Organization for Economic Cooperation and Development (OECD, 2023) emphasize that declining trust in digital technologies after crises can slow the adoption of new innovations for a period of five to ten years, known in tech economics as the "technological legitimacy rebuilding phase."

However, this phase does not necessarily represent a permanent setback. History shows that technological crises often catalyze the emergence of new governance and regulatory reforms that redefine the relationship between society and technology. After every financial or technological collapse, institutional responses emerge that seek to establish an ethics of innovation, such as establishing standards for transparency, accountability, and data protection, which (Perez, 2002) refers to as the "constructive side of bubbles."

In this context, the bursting of the AI bubble—despite its short-term negative effects—may contribute to a global debate about building ethical and humane AI, based on the principles of trust and digital justice, rather than an obsession with profitability and expansion. The bubble can thus be viewed not only as a financial or technological disaster, but also as an opportunity to re-establish social trust on more mature and sustainable foundations that balance technological progress with ethical considerations, and between innovation ambitions and human rights in the digital age.

6 FUTURE SCENARIOS AND ADAPTATION STRATEGIES

Global economies today face a critical crossroads in their relationship with artificial intelligence (AI). After a period of excessive investment and expectations, the signs of a "tech bubble" are clear, but at the same time, new opportunities are emerging to transform this wave into a stage of technological maturity and sustainability.

Several recent economic reports indicate that the years 2025–2026 will be decisive in determining the future of the sector: either the world will head toward a price correction and temporary investment stagnation, or toward equilibrium and sustainable growth based on the actual integration of AI into the real economy (WEF, *AI Futures: Managing the Next Technological Transition*, 2025)

Therefore, understanding future scenarios is not limited to predicting a burst or continuation, but rather extends to analyzing how to adapt in each possible scenario. Four strategic paths are proposed here, representing the pillars of the transition toward sustainable technological maturity:

- Moving from bubble to technological maturity.
- Rational investment in AI infrastructure.
- Supporting local research and development.
- Enhancing digital culture within organizations.

6.1 The Transition from Bubble to Technological Maturity

From the perspective of the history of innovation, every technological wave goes through a cycle of hype → expansion → explosion → maturity (Perez, 2002). Today's AI is likely experiencing the peak of hype and price inflation, just as the internet did in 1999.

However, history demonstrates that the bursting of a bubble does not mean the end of innovation, but rather the beginning of its true productive phase. After the bursting of the internet bubble, companies like Amazon and Google emerged as leaders because they focused on actual added value rather than market speculation (Mazzucato, 2013)

By the same logic, technology experts predict that the next phase of AI will witness a shift from large-scale models to specialized AI models capable of serving specific sectors such as agriculture, health, education, and energy (OECD, 2024).

The Stanford AI Index (2025) also indicates that investment is beginning to shift from developing a single "large language model (LLM)" to more

efficient and less expensive hybrid solutions. This shift is an early sign of "maturity," with the focus

shifting to sustainability and economic viability rather than hype (Maslej et al., 2025)

From an economic perspective, this shift can be represented by the "market correction" model, which rebalances the (overvalued) symbolic value of a technology with its true economic value (Campbell & Shiller, 2024)

From an analytical perspective, if a correction occurs in 2025–2026, companies with solid scientific foundations (such as Nvidia, Microsoft, and Anthropic) will remain in the lead, while hundreds of startups without a sustainable profit model will disappear. So, the transition from bubble to maturity is not a crisis; rather, it is a necessary corrective mechanism that paves the way for a new, more rational and stable production phase.

6.2 Rational Investment in AI Infrastructure

According to Axis Intelligence, about 33.7% of AI funding in 2024 went into infrastructure and foundation models. (Axis Intelligence, 2025)

However, after every bubble, leading economies realize that the real return lies in infrastructure: servers, data centers, green energy, and fast connectivity.

According to recent analyses, training frontier AI models requires substantial power inputs, with individual models demanding on the order of hundreds of megawatts. The largest AI model currently requires a power draw of approximately 154 MW. Cumulative training consumption for large-scale AI systems has been estimated at about 1,700 GWh, highlighting the need for robust and environmentally efficient infrastructure (International Energy Agency, *Energy and AI*, 2025, p. 49; Down, 2025).

For developing countries, investing in digital infrastructure is a strategic priority. This includes:

- Building national data centers.
- Developing high-speed internet networks.
- Providing sustainable energy sources to reduce operating costs.
- Supporting partnerships with local universities and startups to develop national computing solutions.

When this phenomenon is subjected to logical analysis, it becomes clear that if a price correction occurs in global markets, countries that have focused on infrastructure will subsequently benefit from lower technology costs, giving them a competitive advantage after the bubble bursts. Therefore, rational investment is to build the foundations (computing infrastructure, energy, and connectivity), as these are the assets that remain after the speculative wave subsides.

6.3 Supporting Local Research and Development

UNESCO (2024) confirms that the North-South AI gap is not only a technological gap, but also a knowledge-research gap. (UNESCO, 2024)

Developed countries produce more than 90% of academic research registered in AI journals, while developing countries contribute no more than 2%, often with limited applied research.

Therefore, promoting local research and development (R&D) is a central step in any national AI strategy.

This includes:

- Establishing national AI centers linked to universities and decision-making centers.
- Encouraging public-private partnerships.
- Funding applied research directed at national priorities (such as smart agriculture, water management, and renewable energy).
- Integrating AI as a key component of higher education curricula.

In comparative studies, India, South Korea, and Canada are successful models in building integrated research systems that have enabled the production of local solutions with high export value (WB, 2024).

From a strategic perspective, it can be said that investing in local research transforms AI from an "imported technology" to a "national development tool," reducing the vulnerability of emerging economies to global market fluctuations. Therefore, without a local R&D system, developing countries remain mere consumers of technology, not active users.

6.4 Enhancing a Digital Culture in Organizations

A true digital transformation cannot be achieved without changing organizational culture.

Deloitte (2024) indicates that approximately 65% of AI projects in organizations fail due to the lack of a digital culture and employees' refusal to change. (Deloitte, 2024)

In other words, integrating AI is not just a technical decision; it is an organizational and cultural change process that requires conscious leadership and a strategic vision.

In this context, organizations should focus on:

- Training human resources to use everyday AI tools (such as predictive analytics and automation).
- Restructuring decision-making systems to be data- and analytically based rather than intuition-based.
- Encouraging a culture of innovation and experimentation without fear of failure, as AI is a rapidly evolving field.
- Adopting clear ethical and regulatory policies for the use of data and intelligent systems (AI governance).

From an organizational perspective, organizations that invest in an internal digital culture possess a high degree of adaptive flexibility, enabling them to survive even in the event of a market correction or recession. So, the success of artificial intelligence depends not only on algorithms, but also on the human beings who understand and employ them well.

By linking theoretical data with practical reality, indicators show that the world is approaching an inflection point in the path of artificial intelligence.

While some fear a "new bubble," others see this phase as paving the way for AI to enter a stage of economic and institutional maturity.

The real challenge lies not in predicting the bubble's bursting, but in the ability to adapt after it.

The economies that will succeed are those that:

- Build their digital infrastructure on sustainable foundations,
- Invest in local knowledge and research,
- Reshape their corporate culture around innovation and digital responsibility.

7 CONCLUSIONS

This study concludes that what is now known as the "AI bubble" represents a multidimensional phenomenon, combining financial dynamics, technological bets, and high societal expectations regarding the future of AI. As historical experiences with previous technology bubbles, such as the Internet bubbles of the late 1990s, have shown, overestimating the short-term potential of emerging technologies often leads to inflated financial valuations, followed by a painful explosion that resets the trajectory toward a more balanced economic reality.

The results of the analysis indicate that the AI sector is currently experiencing a "boom and bust" phase, with investments flowing at an unprecedented pace into startups and research labs, without all of them translating into tangible productivity returns. This situation holds significant opportunities for innovation, but also entails economic and structural risks, especially if a "hard correction" occurs in the market, which could lead to widespread financial losses, a contraction in research funding, and a decline in investor and societal confidence in the technology.

On the social level, a potential bubble burst could negatively affect the labor market, especially in economies that have not yet prepared for the repercussions of a profound digital transformation. Failure to manage this phase could also slow innovation in critical areas such as scientific research or even hinder digital transformation in emerging economies, which rely heavily on technology as a driver of development.

The potential bursting of the AI bubble, despite the economic and investment losses it may cause, represents a necessary corrective phase in the course of technological development. As previous technological revolutions have demonstrated, bubbles are not the end of development, but rather part of its dynamics. They expose exaggerated valuations, reveal the limits of commercial applications, and push toward a new level of cognitive and technological maturity. Therefore, the impact of the crisis depends on the willingness of countries and institutions to adopt proactive policies based on:

- Diversifying sources of investment in scientific research to avoid excessive reliance on private funding or speculative investments, and ensuring the sustainability of scientific progress even during periods of technological stagnation.
- Protecting the labor market from digital disruptions through vocational rehabilitation programs and employment support policies in sectors affected by automation.
- Investing in human capital as the foundation for ensuring a responsible and sustainable transition to AI, through education, continuous training, and building a critical digital culture among individuals.
- Adopting proactive policies to monitor financial valuations in the technology sector, to limit excessive speculation, and ensure transparency in financial disclosure.
- Supporting long-term academic research instead of focusing excessively on short-term commercial projects, to ensure the sustainability of innovation after any market correction.
- Developing national legislative frameworks for AI that take into account local specificities and limit overreliance on foreign companies for digital infrastructure.
- Activating international cooperation between developing countries and global research institutions to share knowledge and exchange experiences on the responsible use of AI.
- Enhancing societal trust through ethical policies in the development and application of AI, embracing transparency, privacy protection, and algorithmic fairness.
- Establishing a national or regional observatory to monitor the development of the AI market and periodically assess the indicators of the technology bubble.

Artificial intelligence—despite all the hype and aspirations it generates—is only one stage in a long process of technological transformations that the global economy has witnessed. Therefore, approaching it rationally and with foresight, avoiding both hype and alarmism, is the best way to avoid a "new bubble" scenario and ensure that the AI revolution serves humanity and development, rather than merely a passing wave in the history of digital capitalism.

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