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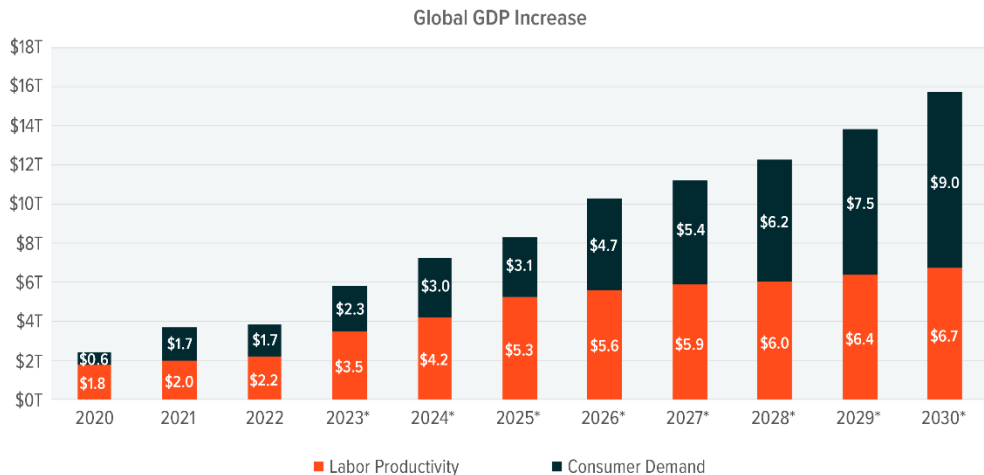
Charting Disruption: Paradigm-Shifting Technologies

This piece is part of a series that dives deeper into the most prevalent themes of this year's iteration of our flagship research piece, **Charting Disruption**. The **Paradigm-Shifting Technologies** section focuses on artificial intelligence, cloud computing, robotics, digital commerce, and entertainment.

The global digital economy is undergoing a significant transformation, guided by growing consumer needs and the advent of major platform shifts, such as Generative AI. The rapid rise and adoption of ChatGPT has particularly propelled AI to a central position, signaling the start of what is anticipated to be a decade dominated by AI-driven technological progress. AI is expected to inject new vigor into cloud computing and demand change in key areas like cybersecurity. On the consumer front, the expansion of the digital economy is pushing leading platforms to constantly adapt, incorporating new features and capabilities to support emerging behaviors such as omnichannel commerce, payments via digital wallets, use of cryptocurrencies, and more. Immersive technologies and new-age entertainment channels like Gaming are expected to gain considerable prominence in this dynamic environment.

AI'S RAPID ADVANCEMENT COULD ADD \$16 TRILLION TO THE GLOBAL ECONOMY BY 2030

Sources: Global X ETFs with information derived from: Bank of America (2023, March 8). Me, Myself an AI: What you need to know, and Medium. (2023, August 31). The Socioeconomic Impact of AI: Bridging the Digital Divide and Empowering Communities.



Key Takeaways

- Generative AI represents a new platform shift in the making, that will have a broad influence on the adoption of technology from across the economic spectrum.
- Adoption of AI will help Cloud Computing growth accelerate in this decade, as AI fuels a global data explosion.



- Adoption of Robotics and Smart machine systems in diverse end markets will create unique opportunities for automation vendors, semiconductor companies, and software players.
- Future of digital commerce dictates seamless integration of the online and the offline, as consumer overwhelmingly carry their digital habits into the store.
- Entertainment has gone digital, with lasting consequences for streaming, gaming, and immersive content services.

Artificial Intelligence: Generative AI's Transformative Power

Recent improvements in large language models (LLMs) mark a significant shift in artificial intelligence, leading to a time when advanced, easy-to-use, and widely integrable AI models are becoming more common and easily accessible over the internet. This change goes beyond just technical advancements, having profound implications for how both consumers and businesses use technology.

AI's performance superiority over humans is already evident for tasks like reading comprehension and language understanding, and the pace of its development for more unique tasks is rapidly accelerating due to multi-modal functionality. This progress is likely to create new markets and end applications, boosting work efficiency, and potentially adding trillions to the global economy.

As adoption intensifies, AI hardware, software, and training costs are expected to decline, promoting even greater model customization, adoption, and productivity. By 2032, generative AI based technology could account for \$1.3 trillion in spending, representing over 10% of total technology expenditure.¹

Cloud Computing: Navigating New Realms

Enterprise technology has shifted from a centralized, on-premise model to a hyperscale powered, decentralized model of operation. Despite addressing over half a trillion in annual spending, Cloud Computing is far from maturity. Recent economic changes have led to a temporary industry slowdown, but we are now witnessing a turning point driven by improving fundamentals, such as profitability.

Growth through this decade will be driven by explosive data asset generation and demand for AI services. Cloud hosted solutions are crucial for handling data, providing easy access to information, and deploying generative AI. Growing use of AI-as-a-service is also an opportunity for cloud computing companies to incrementally monetize their offerings by upselling additional cloud infrastructure and services. By 2030, AI itself might generate over half of all online data.

Corporate digital transformations and newly announced AI investments will help spending on cloud computing top \$600 billion for 2023, up 22% YoY.² As access for data, software, and communication systems moves online, the IT stack will be presented with unique security challenges, which will help cybersecurity spending grow 2.5 times by 2030, reaching \$450 billion.³

Robotics: The Rise of Smart Machines

Growing demand for precision manufacturing, a tight skilled labor market, and policy shifts like reshoring of manufacturing are boosting adoption of industrial robotics. Countries like South Korea, Singapore, Japan, Germany, are leading in industrial robot density, and significant investments from the U.S. are expected to help bridge the gap in the coming days.

Concurrently, Service Robots, especially those used in delivery and healthcare, are also expanding their presence due to advancements in technologies like generative AI. The trend is further fueled by the increasing affordability of robots and broad sophistication of automated systems.

Government incentives are also creating unique opportunities for applied automation. For example, US government programs to boost domestic chip manufacturing, electric vehicle production, infrastructure development, are expected to drive a general uptick in use of automation in the manufacturing industry.⁴

Automation requires constant feedback loop between data capture systems and centralized processing systems, and IoT devices are seeing similar growth. Consumer electronics explosion and demand for monitoring, tracking, and measurement of vitals for healthier lifestyles is also propelling the IoT theme.

Clicks & Commerce: What's Next for the Internet Economy

The global internet economy, valued at trillions of dollars in annual consumer spending, is continuously expanding as platforms swiftly adapt to meet the ever-evolving demands of consumers.

Firstly, consumers are spending more money online, expanding the range of categories available online and demanding a wider array of services and functionalities. They are also increasingly favoring omnichannel commerce, prompting platforms to invest in fulfillment, analytics, merchant tools, and research and development while adapting to meet new behaviors.

Secondly, platforms are focusing on incremental monetization, diversifying commercial revenues beyond advertising-based monetization. Simultaneously, the financial sector is undergoing a parallel evolution. Shifting consumer behaviors such as preferences for digital wallets, tap-to-pay, adoption of cryptocurrencies, expectations for enhanced lending practices, and quick settlements are all presenting unique opportunities for platforms and legacy institutions to capitalize on.

The convergence of digital and physical channels in commerce, coupled with the financial industry's tech-forward evolution, signals a future dominated by omnichannel strategies and deep-rooted digital integration. This transformation will reshape consumer interactions with retail and financial services, paving the way for a more interconnected, seamless, and personalized experience.

Pixels, Unleashed: Interactive Entertainment in the Age of Bits

Digital engagement continues to soar, surpassing pandemic-era highs. Social media platforms, streaming services, and gaming platforms are capturing this surge in attention and monetizing it at an accelerated pace.

Continuous innovations in formats and features by these platforms are also fueling their fundamental growth, expanding the total addressable markets for key areas like digital ads. The global digital advertising market is projected to surpass \$1 trillion by 2027, with video advertising currently a key driver.⁵

In parallel, online video platforms are adapting to the rising popularity of short-form content, a trend further fueled by generative AI technologies that are expanding creative possibilities and heralding a shift towards AI-enhanced content. AI will also play a pivotal role in driving down content costs.

Concurrently, gaming continues to attract a growing number of users who are dedicating time and resources to online engagement. As smartphone adoption matures, we anticipate that technological advancements such as the proliferation of immersive hardware will further contribute to a resurgence in the gaming industry's growth.

Conclusion

The digital economy is evolving rapidly, driven by consumer demands and platform shifts like Generative AI. ChatGPT's popularity has propelled AI to the forefront, heralding an AI-driven decade. AI will reshape cloud computing and cybersecurity, while consumer trends like omnichannel commerce, digital wallets,

and cryptocurrencies are driving platform innovation. Immersive technologies and new entertainment forms like gaming are poised for significant growth.

Footnotes

1. Bloomberg. (2023, June 1). Generative AI to Become a \$1.3 Trillion Market by 2032, Research Finds.
2. Gartner. (2023, April 19). Gartner Forecasts Worldwide Public Cloud End-User Spending to Reach Nearly \$600 Billion in 2023.
3. Global X Estimate with data from Gartner 2023, Gartner Forecasts Global Security and Risk Management Spending to Grow 14% in 2024
4. RobotIQ (2023, January 11). Robotics in 2023: What the Latest World Robotics Report Tells Us.
5. BCC Research. (2023, August 17). Digital Advertising: The Mammoth Industry That's Tipped to Top a Trillion Dollars by 2027.

Information provided by Global X Management Company LLC.

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