Navigating the Data Surge: Revealing Investment and Sustainability Trends in the Era of Digital Transformation

Introduction

In recent years, the amount of data generated in the world has exploded. Globally, over 5 billion active users are continuously producing data on the internet. A recent forecast suggests that in 2024 alone, the world is expected to produce 1.5 times the amount of data it did just two years ago. Various trends drive this ever-growing generation, ranging from companies shifting their data on to the cloud, to the recent boom in AI development. The necessity for an expansion of the capacity of data centers is imminent and becoming increasingly more evident. Demand is everywhere, any time you shop online, stream a movie, participate in a video meeting, check social media, or make an electronic payment, individuals and companies are relying on bandwidth and server capacity hosted in a data center. Data centers, which can be defined as facilities providing shared access to data using complex networks and storage infrastructures, are the backbone of this upheaval in demand. Just as railways did during the industrial revolution in the 18th century, these digital real assets provide the basis for the development of our contemporary society, which relies increasingly on data. Private investors have understood this and found attractive investment opportunities in cloud infrastructure projects. As a matter of fact, data center deals increased by 40 percent from 2020 to 2021, the aggregate value of deals scaling up from $34 billion to $48 billion in one year. A new issue was then brought to the table: sustainability. As significant consumers of energy, data centers call for innovative solutions to reduce their environmental impact, driving the industry towards looking into more sustainable practices and green solutions. Therefore, the core purpose of this report will be to dive into the current landscape of the data center industry and understand the current investment dynamics at play. The report will investigate a large spectrum of topics, ranging from the recent explosion in data generation to opportunities data centers present to investors, offering a complete analysis of this rapidly growing sector.

Data growth

In the digital age, data has become the new gold rush. The development of powerful language models like ChatGPT (OpenAI), Gemini (Google), and Llama 2 (Meta) relies heavily on vast amounts of data for training and improvement. However, a recent study by Epoch warns of a potential "data drought" by 2026, where high-quality, real-world information becomes scarce. Faced with this challenge, companies are getting innovative. For instance, OpenAI tackled the issue by transcribing over a million hours of YouTube videos, feeding the resulting text into their GPT-4 model for training.

With a staggering 67,200 dedicated AI companies worldwide in 2024, and an additional 115 million companies integrating artificial intelligence in some form, the AI industry is booming. Growth has been fueled by the powerful synergies and efficiencies AI offers to

businesses. Studies by RSM show how AI is revolutionizing tasks like analyzing spreadsheets, researching competitors, and accelerating research timelines. Even the healthcare sector is benefiting, as AI proves invaluable in drug discovery. This rapid expansion creates a dual demand: for more data storage centers to handle the information influx, and for robust ethical and security protocols to ensure responsible data processing.

To ensure successful AI deployments, organizations must prioritize eight data storage requirements:

- Scalable storage to efficiently handle ever-growing data volumes.
- High-performance storage to deliver fast data access for real-time applications.
- Durable and reliable storage to ensure data integrity and minimizes downtime.
- Data variety and structuring to allow AI systems to process diverse data types and gain richer insights.
- Accessible and compatible storage to facilitate data retrieval, sharing, and integration with AI tools.
- Secure and private storage to build trust and safeguards sensitive information.
- Data lifecycle management to ensure data quality, efficiency, security, and accessibility throughout its lifecycle.
- Cost-effective storage to optimize resource allocation and ensure long-term viability of AI projects.

By meeting these requirements, organizations can leverage data storage as a foundation for building effective and scalable AI systems. Therefore, data storage is unquestionably a crucial part of the AI revolution, and as we continue to see AI become more relevant, data centers will only become more important.

Data Storage as an Investment Opportunity

Data centers are a promising investment due to several key factors. The ever-growing tide of data, the shift to cloud computing, and the rise of AI all contribute to a sustained demand for data storage, creating a stable market for investors. Data centers offer multiple revenue streams through colocation (renting out space to servers, storage devices, computing hardware), managed hosting (leasing services to a single customer), cloud services, and content delivery, providing long-term financial stability and potential for growth. Well-located facilities can also see capital appreciation due to the limited availability of suitable land and the increasing value of data infrastructure. Data centers, particularly established ones with reliable tenants, also tend to offer a favorable risk-to-reward ratio. The essential nature of data storage ensures consistent revenue streams, making data centers an attractive option for diversified investment portfolios.

Investors looking beyond traditional data center ownership can find a wealth of promising opportunities across the data center value chain, a market poised to reach 35 gigawatts by 2030 in the U.S. Sustainable energy solutions have slowly become part of the conversation, since data centers are massive energy consumers. One of the options is to improve data center

efficiency. With 40% of a data center's energy dedicated to cooling, investors can back companies developing innovative cooling technologies and AI-powered management systems. Prefabricated and modular data centers offer an attractive option for faster construction and lower costs. In fact, hyperscalers (large cloud service providers) have invested $9 billion to build more capacity in 2022, growing at a rate of 4% per year. Additionally, global spending on data centers is forecasted to reach $49 billion at a growth rate of 5.4% by 2030. Investors can target manufacturers or integrators of these components. The burgeoning edge computing market (bringing computation and data storage closer to sources of data) also demands specialized solutions. Investment opportunities exist in real estate companies and startups focused on edge computing; a market projected to reach $274 billion by 2025. By looking beyond just data centers themselves, investors can tap into the vast potential of the data center value chain.

Role of sustainability in future data centers – ESG ambitions

This past decade, the data center sector has come under pressure to use more efficient systems, and to integrate renewable energy and carbon-cutting practices. Therefore, the imperative to make data center environmentally sustainable is significant. Regulations imposed by authorities on facilities are strict, as we will later investigate, because authorities are vigilant and stringent about the potential risks and impact. New rules therefore create new opportunities for investors to help data centers secure carbon-free supplies.

Traditionally, the data center industry has been known for its high energy consumption, which results in high carbon emissions. In fact, a hyperscale data center can use as much power as 80.000 households do. The consumption is such because data centers' equipment, often consisting of thousands of servers, must be cooled to work efficiently. Therefore, the capacity of a data center is dictated by how well it cools the servers—the more closely they can be stacked, the more productive the square footage. Efficient cooling is therefore a crucial driver of a data center's profitability and the cost from overheating can be high. The energy consumption of these infrastructures is not sustainable in the long run, and the adoption of sustainable data centers is a necessary step toward a more sustainable future. Hence, the increasing demand for the development of green facilities designed to minimize their environmental impact is starting to be met. These new data centers use energy-efficient technologies and renewable energy sources to reduce their carbon footprint.

Moreover, another way for data centers to go green is by implementing power purchase agreements (PPAs). PPAs are signed between suppliers of renewable energy and data centers and allow the latter to have continuous energy provision at a fixed price. However, the problem with renewable energy is that it often cannot be provided on a linear and continuous basis, as data centers would require to run uninterruptedly. One emerging solution is "24/7" PPAs, which commit themselves to matching each hour of electricity consumption with a combination of carbon-free supplies and, more importantly, stored renewable energy. An alternative that is often selected, is to provide fossil-fuel supplies on top of PPAs.

Prefabricated or modular data centers have also risen in recent years, as a response to the increasing demand for capacity, but also to address the sustainability concern.

Authorities play a vital role in creating an enabling environment for green data centers through policies, incentives, and regulations. The EU has understood the urge, and to meet the goal of becoming carbon neutral by 2030, it rapidly pushed for the adoption of stringent legislations. Existing instruments among other regulations include the EU code of conduct on data center energy efficiency and EU green public procurement criteria. The commission has also linked energy efficient data centers to policy through the Proposal for a directive on energy efficiency, and to funding initiatives with programmes such as Horizon Europe, InvestEU or the Recovery and Resilience Facility. These initiatives will support the establishment of innovative, green and secure clouds.

Challenges & Future Trends

Data centers are navigating a complex landscape of challenges that threaten their growth and efficiency. As we have seen, sustainability regulations are forcing them to adopt expensive new technologies to meet stricter environmental standards. Staffing shortages make it difficult to find qualified workers, and outages, though less frequent, remain costly. Keeping up with rising power demands requires investment in innovative cooling solutions like liquid cooling, while older facilities struggle to adapt to these growing needs. Data centers are further squeezed by supply chain disruptions and economic factors like inflation. Limited power availability in some regions restricts new construction and expansion, and the looming possibility of a recession adds another layer of uncertainty. However, data centers that can embrace adaptability and innovation will be best positioned to weather these storms and remain successful.

Furthermore, AI is transforming data centers from warehouses into intelligent hubs. By automating tasks, optimizing energy use, and predicting equipment failures, AI is addressing sustainability concerns by making data centers more efficient and reliable. This also translates to other benefits like reduced costs and minimized downtime. With even more powerful AI systems, integration with cutting-edge technologies, and a strong focus on sustainable resource management, the future of AI in data centers is bright.

Additionally, the rollout of 5G is putting pressure on data centers to adapt. They'll face a surge in data due to the Internet of Things and more connected devices. To handle this, data centers will need to upgrade storage capacity and processing power by shifting towards edge computing and cloud services. Faster data transfer rates from 5G will demand network upgrades, including routers, switches, and potentially the entire infrastructure. Increased processing power will bring a need for more powerful cooling systems and additional electricity. Data security will become even more critical as 5G introduces new vulnerabilities. To stay competitive, data centers will also need to understand Open RAN standards, which allow them to utilize equipment from different vendors. Finally, seamless data transfer

between small and large data centers will be essential, potentially requiring greater colocation and architectural convergence.

The case of Amazon Web Services

After having looked at the general picture of the data centers landscape, it is relevant and of interest to further focus on a specific case that exemplifies the growing interest of private investors in these real digital infrastructures.

Amazon Web Services (AWS) is a subsidiary of Amazon that provides on-demand cloud computing platforms to different types of clients. AWS started off 2024 on strong footing, the substantial recent investments it made demonstrate a recognition of the need for additional data center capacity financing and investment. In the meantime, AWS also emphasized the fact that such expansion should align with a responsible and sustainable development. The firm has made a commitment to achieve net zero carbon in its operations by 2040 and transition to 100% renewable energy by 2025. AWS also claims that its cloud services inherently promote sustainable practices, referring to a study by 451 Research which indicated that AWS' public cloud is five times more energy-efficient than traditional data centers in Asia-Pacific.

From a national standpoint, the firm focused heavily on expansion within the United States. Between 2011 to 2021, according to Roger Wehner, AWS's Director of Economic Development, the giant invested $51.9 billion "including capital and operational expenses to AWS's data center infrastructure", in Virginia only. The firm pushes its investments even further in the state: in mid-January of the current year, AWS said it plans to invest another $35 billion by 2040 to establish multiple data centers across Virginia. More recently, Amazon acquired Talen Energy's data center site and assets in Pennsylvania (referred to as Cumulus data center campus) for $650 million, according to a Talen investor presentation.

Consequently, AWS is eager to expand its data center footprint, aiming to grow at the national level but also overseas with massive commitments made to various foreign nations. By committing in January to invest 2.26 trillion yen ($15.24 billion) in Japan by 2027 and later in March to invest $5.3bn in Saudi Arabia in the future, the cloud giant sends a clear message of its willingness to establish itself as a key player in the digital transformation of these regions. The strategic expansion of Amazon's cloud infrastructure footprint in several markets is a direct response to customer demand and the exponential increase in data generation trends.

Conclusion

As we have explored in this report, the digital era has pushed into an unprecedented surge in data generation, driven by technological advancements and shifts in the behavior of consumers. This growth in data, fueled by AI development and cloud computing, has positioned data centers as pivotal assets in our digital economy and has thus created interesting investment opportunities. However, as we work towards the future, a critical question emerges: How will the data center industry balance growth with the imperative of sustainability? Finding balance will be crucial as stakeholders are willing to innovate and

invest in solutions that not only meet today's demands but also ensure a sustainable digital future. Will the industry take advantage of the occasion, evolving in ways that meet these complex demands while driving economic and environmental value? Only time will tell. Nevertheless, the groundwork laid now will undeniably shape tomorrow's landscape. The industry's ability to adapt and evolve, integrating economic and environmental value, will likely dictate its trajectory in the coming years.

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