FROST & SULLIVAN

Microsoft

2022 COMPANY OF THE YEAR

Global Sustainability and Circularity in Cloud Services Industry

Best Practices Criteria for World-Class Performance

Frost & Sullivan applies a rigorous analytical process to evaluate multiple nominees for each award category before determining the final award recipient. The process involves a detailed evaluation of best practices criteria across two dimensions for each nominated company. Microsoft excels in many of the criteria in the sustainability and circularity in cloud services space.

Microsoft: Provider of Industry-Leading Sustainability and Circularity Solutions in Global Cloud Services

Leading the Way in the Cloud Services Market

With a rich history of innovation dating back to 1975, Microsoft provides cutting-edge cloud services and solutions that enable companies across different industries (e.g., energy, media, healthcare, and manufacturing) to increase sustainability and lower emissions in their business practices and operations.

In line with this, Microsoft launched a $1 billion Climate Innovation Fund to accelerate technology development and deployment of new climate innovation through equity and debt capital.[1] This pledge is Microsoft's attempt to globally encourage the active development and deployment of digital technologies that help customers and suppliers minimize their carbon, water, or waste footprint.[2] Frost & Sullivan believes that such sizable funding allocated to sustainability initiatives will enable Microsoft to advance the commercialization and implementation of its cutting-edge sustainable cloud services and solutions across numerous market segments. This will attract new potential customers and advance sustainability worldwide.

Additionally, Microsoft broadened its strategic collaborations to emphasize sustainability. For instance, in August 2020, Microsoft partnered with Closed Loop Partners, a United States-based investment company,

[1] https://www.microsoft.com/en-us/us-partner-blog/2021/09/02/bold-investments-are-one-small-step-toward-carbon-negative-commitment/
[2] Ibid.

to support its progress toward a more circular economy worldwide.[3] As part of this partnership, Microsoft allocated $30 million to Closed Loop Partners to help it develop innovative recycling, e-waste collection, and supply chain digitization business models. This collaboration provides Microsoft with a range of insights to incorporate into its own innovative circular practices and initiatives, especially regarding e-waste, packaging, and waste diversion from landfills.

Ensuring Energy Efficiency and Minimizing Carbon Footprint with Cloud Services

Moving on-premises data centers to Microsoft Cloud provides substantial sustainability and energy efficiency benefits. Microsoft Cloud services (including Azure Compute, Azure Storage, Exchange Online, and Sharepoint Online) are approximately 98% more carbon efficient and around 93% more energy efficient than traditional on-premises enterprise data centers.[4] The company works on increasing the energy efficiency of its operational practices, information technology, equipment, and data center infrastructure. Specifically, Microsoft applies multitenancy, occupying servers with different user types and a vast user base with various demand patterns.[5] Such load diversity minimizes overall fluctuations and makes loads more predictable. As a result, such a situation also leads to less electricity consumption per useful output. At the same time, Microsoft works closely with suppliers on the energy specifications and servers' design, and other IT equipment, paving the way toward a substantial reduction in electricity consumption. Additionally, the company utilizes various measurement techniques to evaluate the power usage effectiveness and the ratio of overall electricity consumption at the data center facility to the electricity delivered to the IT hardware. To this end, Microsoft applied advanced infrastructure technologies at its hyper-scale datacenters to lower electricity requirements for cooling, power conditioning, and lighting.

> *"Microsoft has played a pioneering role in driving sustainability and decarbonization in cloud services. For instance, in January 2020, the company launched the industry's first Sustainability Calculator, a platform for its cloud customers that provides valuable insights into the carbon emissions of the cloud services."*
>
> ***- Fredrick Royan,***
> ***Vice President – Sustainability & Circular Economy***

Microsoft also stated its intention that, by 2030, 100% of its energy supply will come from zero-carbon resources on grids where the company operates, 100% of the time.[5] As one of the largest renewable energy purchasers in the world, Microsoft's large-scale sustainability actually helps its customers passively reduce their own emissions while helping drive overall market demand at a speed and scale that brings a carbon negative society into view.

[3] https://www.recyclingtoday.com/article/microsoft-announces-recycling-sustainability-goals-invests-closed-loop/
[4] http://download.microsoft.com/download/7/3/9/739BC4AD-A855-436E-961D-9C95EB51DAF9/Microsoft_Cloud_Carbon_Study_2018.pdf
[5] 2021 Environmental Sustainability Report (microsoft.com)
[5] Ibid.

Several case studies demonstrate the high sustainability, quality, and efficiency of Microsoft Cloud in a real-world setting.[6] One compared the energy usage and carbon footprint of a global apparel company's Azure virtual machine application to its on-premises alternative.[7] It found that the Azure virtual machine deployment had a 70% smaller carbon footprint. Another case study compared the energy and carbon footprint of a global engineering consulting company that hosts approximately 10,000 users in Europe on Exchange 2016 on-premises with the equivalent footprint in the Microsoft Azure Cloud.[8] This study found that Microsoft Cloud ensured Azure's Exchange Online environment more effectively than an on-premises deployment that required extra infrastructure and associated energy demands. By deploying the Microsoft Azure Cloud, the consulting engineering company achieved 6,000 kilowatt-hours in energy savings and subsequent emissions reductions of 93%.

> *"Microsoft works relentlessly to address its waste creation. In August 2020, the company launched the Microsoft Circular Centers initiative to cut as much waste as it generates while also reusing and recycling its equipment used in data centers."*
>
> ***- Maksym Beznosiuk, Best Practices Research Analyst***

Thus, Microsoft's industry-leading sustainable cloud services enable businesses across diverse economic segments to facilitate low-carbon business practices, which can help them meet their sustainability objectives. Moreover, Frost & Sullivan finds that Microsoft is well-positioned to capture a higher market share in the foreseeable future.

Design for Sustainability and Circular Data Centers

Supporting the Transition towards Design for Sustainability

Designing products and buildings with a focus on sustainability is a cornerstone of businesses' strategies to reduce or eliminate adverse environmental impacts.[9] With the steep growth of cloud services and data centers, the construction and operation materials used for sourcing, maintaining, and decommissioning data centers must be thoroughly considered, as must the energy intensity of those operations. Knowing these requirements, Microsoft actively contributes to the efforts of companies transitioning towards more sustainable design practices. In 2018, for instance, Microsoft became a sponsor and the first corporate user of the Embodied Carbon Calculator for Construction (EC3)—an open-source platform stakeholders can utilize to find, use, and incentivize lower-carbon building materials.[10]

The EC3 platform also allows users to accumulate carbon emissions information of various building materials. This enables designers, building developers, and contractors to gain a holistic picture of the potential carbon impact of their projects and compare materials to explore ways of lowering the carbon footprint of newly constructed data centers.[11] Microsoft utilized the EC3 platform when modernizing and

[6] Ibid. http://download.microsoft.com/download/7/3/9/739BC4AD-A855-436E-961D-9C95EB51DAF9/Microsoft_Cloud_Carbon_Study_2018.pdf
[7] Ibid.
[8] Ibid.
[9] https://www.sciencedirect.com/topics/materials-science/design-for-sustainability
[10] https://blogs.microsoft.com/on-the-issues/2018/09/12/beyond-our-four-walls-how-microsoft-is-accelerating-sustainability-progress/
[11] https://www.carboncure.com/concrete-corner/embodied-carbon-in-construction-calculator-ec3/

expanding its campus in Redmond, Washington, reducing the amount of carbon associated with the construction of the new buildings by at least 30%.[12]

The Industry's First Sustainability Calculator

In January 2020, the company launched the Microsoft Sustainability Calculator, a platform that provides cloud customers with valuable insights into the carbon emissions of cloud services.[13] The Sustainability Calculator allows stakeholders to access practical tools that ensure adequate sustainability reporting and assess the carbon impact of each Azure subscription and data center region. It also allows users to view carbon savings gained by running workloads in Azure versus on-premises data centers. This information enables organizations to accurately assess and report CO2 emissions while giving them insight that helps optimize their carbon output.

Establishing Effective Circular Model of Data Centers

Microsoft is committed to becoming zero waste by 2030. In March 2020, it launched the Microsoft Circular Centers program to reduce waste by reusing and repurposing its data center equipment.[14] The goal of Circular Centers is to reuse 90% of Microsoft's cloud computing hardware assets by 2025.

The company is establishing Microsoft Circular Centers at key data center campuses across the globe. The pilot Circular Center opened in Amsterdam in 2020.[15] Microsoft has since opened Circular Centers at its data center campuses in Ireland,Virginia, and Singapore and has plans for additional centers in Australia, Sweden, and the US (Washington State, Illinois, Iowa, Texas, and Wyoming).

The company utilizes machine learning tools to optimally process hardware and servers to meet its reuse goals. At the heart of the company's initiative is a "plan for every part" goal when decommissioning cloud assets. This goal serves as a foundation for operating the reverse supply chain management model of the Microsoft Circular Centers.[16] Prior to an asset introduction to Microsoft's supply chain, the company ensures that each component already has an optimized disposition plan when that asset is ready to be decommissioned. Thus, such an approach allows Microsoft to facilitate value recovery and higher sustainability. To this end, Microsoft launched the Intelligent Disposition and Routing System (IDARS) to support this circular model approach, and it keeps track of all asset tags and assigns end-of-life processing routes once assets are commissioned into the company's supply chain. IDARS helps ensure effective processing and sorting of end-of-life assets at Circular Centers and provides Circular Center operators with an optimized disposition plan for assets as they are received.

As part of "design for sustainability" – Microsoft is also engaging with its suppliers on understanding the carbon intensity of the products supplied for its data centers and collaborate in lowering the carbon footprint. In this context – Microsoft has already worked with one of its suppliers and jointly developed a roadmap to drive one-third reduction of carbon footprint over the next five years.

[12] https://www.fastcompany.com/90608415/microsoft-and-skanska-are-using-this-free-tool-to-dramatically-cut-their-carbon
[13] https://www.microsoft.com/en-us/sustainability/emissions-impact-dashboard?activetab=pivot_2%3aprimaryr12
[14] https://blogs.microsoft.com/blog/2020/08/04/microsoft-direct-operations-products-and-packaging-to-be-zero-waste-by-2030/
[15] Ibid.
[16] https://customers.microsoft.com/EN-AU/story/1431789627332547010-microsoft-circular-centers

In addition to boosting the availability of network and server parts for subsequent reuse internally or with company suppliers, Circular Centers are designed to minimize the carbon footprint of transporting and shipping hardware to these processing facilities.

Supporting the Transition to More Effective Carbon Reporting and Reduction

Companies currently in economic segments such as energy, manufacturing, and electronics seek to implement practical tools to assess and report their CO2 emissions. Specifically, they strive for cost-effective and flexible means to connect emissions sources and ensure accurate carbon reporting.

In response to this need, the Microsoft Cloud for Sustainability was introduced in 2021. This software-as-a-service solution enables organizations to record, report, and minimize their environmental impact through automated data connections and actionable insights. The solution offers several competitive advantages, such as:

- **Flexibility—**Microsoft Cloud for Sustainability helps companies automate information collection via connectors that can remove manual uploads using real-time connections to facility emission sources. To this end, users can select and establish data connections from a catalog of prebuilt connectors and operational data providers (e.g., energy providers and trading partners). At the same time, this solution utilizes a standard data model to break down acquired data across different emissions sources, further stepping up data integration and reporting.
- **Transparency—**Microsoft's solution also allows clients to assess, visualize, and report their resource use, sustainability progress, and environmental impact to relevant regulatory bodies, stakeholders, and the general public. This is possible because Microsoft's solution utilizes acquired information to generate customized visualizations and dashboards to help users measure performance against their sustainability objectives.
- **Efficiency—**Microsoft's solution enables users to establish and track their objectives based on insights and recommendations. It also enables users to detect any gaps in complying with stringent environmental requirements. Consequently, users can be better informed when altering business processes to achieve better sustainability. Additionally, Microsoft's solution allows users to compare sustainability performance with peers that use its solution.

Along with the ability to achieve quick and effective assessment and reporting of CO2 emissions, the Microsoft Cloud for Sustainability solution provides insights that can be used to develop effective measures to reach higher cost-efficiency beyond achieving higher regulatory compliance with environmental standards.

Conclusion

Many companies in the energy, retail, manufacturing, electronics, and other sectors of the economy aim to incorporate sustainable cloud services and solutions as they transition towards more sustainable operations with a lower CO2 footprint. To understand their CO2 impact and ensure compliance with increasingly stringent environmental standards, they need accurate, automated carbon reporting. Microsoft leads the way by providing the Cloud for Sustainability solution, which enables clients to quickly and effectively assess and report CO2 emissions. The company also demonstrates a strong commitment towards a complete transition to carbon neutrality. Through its Circular Centers, Microsoft aims to reuse 90% of its cloud computing hardware assets by 2025.

With its industry-leading sustainability and circularity solutions in global cloud services, Microsoft earns Frost & Sullivan's 2022 Global Company of the Year award for sustainability and circularity in the cloud services industry.

What You Need to Know about the Company of the Year Recognition

Frost & Sullivan's Company of the Year Award is its top honor and recognizes the market participant that exemplifies visionary innovation, market-leading performance, and unmatched customer care.

Best Practices Award Analysis

For the Company of the Year Award, Frost & Sullivan analysts independently evaluated the criteria listed below.

Visionary Innovation & Performance

Addressing Unmet Needs: Customers' unmet or under-served needs are unearthed and addressed by a robust solution development process

Visionary Scenarios Through Mega Trends: Long-range, macro-level scenarios are incorporated into the innovation strategy through the use of Mega Trends, thereby enabling first-to-market solutions and new growth opportunities

Leadership Focus: Company focuses on building a leadership position in core markets and on creating stiff barriers to entry for new competitors

Best Practices Implementation: Best-in-class implementation is characterized by processes, tools, or activities that generate a consistent and repeatable level of success

Financial Performance: Strong overall business performance is achieved in terms of revenue, revenue growth, operating margin, and other key financial metrics

Customer Impact

Price/Performance Value: Products or services provide the best value for the price compared to similar market offerings

Customer Purchase Experience: Quality of the purchase experience assures customers that they are buying the optimal solution for addressing their unique needs and constraints

Customer Ownership Experience: Customers proudly own the company's product or service and have a positive experience throughout the life of the product or service

Customer Service Experience: Customer service is accessible, fast, stress-free, and high quality

Brand Equity: Customers perceive the brand positively and exhibit high brand loyalty

About Frost & Sullivan

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The Growth Pipeline Engine™

Frost & Sullivan's proprietary model to systematically create ongoing growth opportunities and strategies for our clients is fuelled by the Innovation Generator™.
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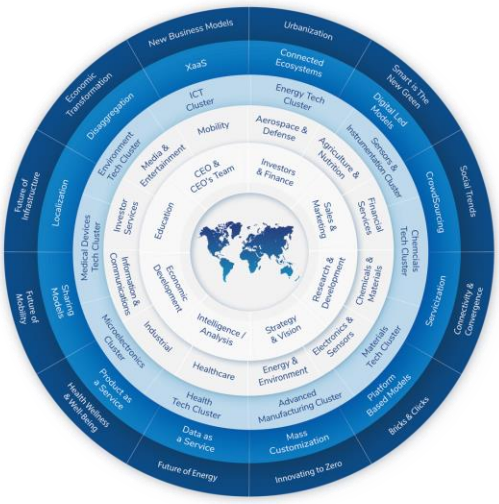
Key Impacts:

- **Growth Pipeline:** *Continuous Flow of Growth Opportunities*
- **Growth Strategies:** *Proven Best Practices*
- **Innovation Culture:** *Optimized Customer Experience*
- **ROI & Margin:** *Implementation Excellence*
- **Transformational Growth:** *Industry Leadership*

The Innovation Generator™

Our 6 analytical perspectives are crucial in capturing the broadest range of innovative growth opportunities, most of which occur at the points of these perspectives.



Analytical Perspectives:

- Mega Trend (MT)
- Business Model (BM)
- Technology (TE)
- Industries (IN)
- Customer (CU)
- Geographies (GE)