Software, Operating System Software

February 8, 2024

Information Technology

Industry Rating	**Overweight**

Investment Thesis

We recommend an overweight rating for the operating system software industry. This is driven by advancements in generative AI and 5G that will personalize and improve user experience, surge in cross-device ecosystems, increased dependence on operating systems due to remote work. High entry barriers and resilience during economic downturns such as the pandemic bolster the industry's prospects and position the three key players and tech giants to maintain their dominance in the industry.

Drivers of Thesis

- Enhanced personalized user experience through integration of generative AI and synergies with 5G. The generative AI industry has a CAGR of 42% and is expected to reach $350 billion dollars by 2030.

- Rising demand for cross-device ecosystems and integrated experiences across a myriad of devices.

- High barriers to entry, enabling tech giants to maintain market share and margins due to diversified revenue streams and large customer base.

- Resilience in economic downturns, including the pandemic, which spurred growth due to the dependence on OS for remote work and collaboration.
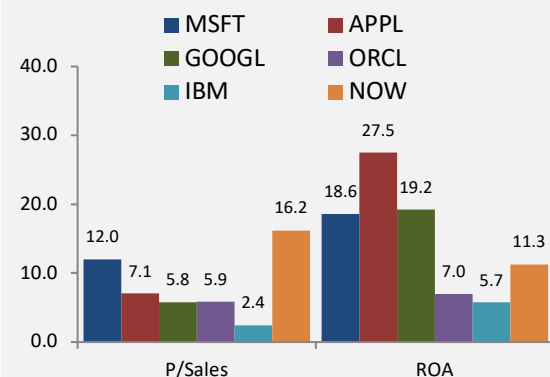
Risks to Thesis

- Software piracy in regions with lax enforcement of intellectual property laws, undermining geographic market growth potential.

- Increased competition in China, the second largest market with 8.3% share, due to new entrants and trade tensions between U.S. and China.

- Inflation reducing consumer spending leading to users postponing software updates and new purchases, impacting revenue growth.
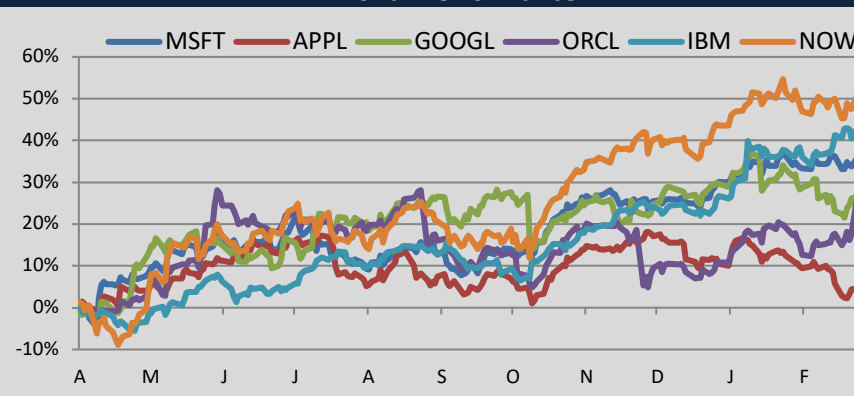
Key Metrics

Market Cap	(in $billions)
Microsoft	3,066
Apple	2,920
Alphabet	1,815
Oracle	323
IBM	167
ServiceNow	162

P/E Ratio	
Microsoft	37.3
Apple	29.5
Alphabet	24.4
Oracle	31.3
IBM	19.2
ServiceNow	191.4

Operating Margin	
Microsoft	41.8%
Apple	29.8%
Alphabet	27.4%
Oracle	26.2%
IBM	13.8%
ServiceNow	8.5%

P/Sales: MSFT 12.0, APPL 7.1, GOOGL 5.8, ORCL 5.9, IBM 2.4, NOW 16.2
ROA: MSFT 18.6, APPL 27.5, GOOGL 19.2, ORCL 7.0, IBM 5.7, NOW 11.3

12 Month Performance

Industry Description

The operating system (OS) software industry develops and distributes the essential software layer that manages computer hardware and provides the foundation for application software to run. Key players in this sector include Microsoft with Windows, Apple with macOS and iOS, Google with Android, and various Linux distributions. These companies cater to a global customer base across personal computing, mobile devices, and servers. Due to high entry barriers, the top four companies have most of the market share.

Important disclosures appear on the last page of this report.

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INDUSTRY DESCRIPTION

The operating system (OS) software industry comprises of companies that develop and distribute the essential software layer that manages computer hardware and provides the foundation for application software to run. They provide a stable, consistent environment for other software to execute commands and perform tasks. Operating systems can be broadly categorized into desktop OS, mobile OS, and server OS, each serving different types of devices and use cases.

Over the recent years, the market for operating systems has grown marginally. The main reasons for the growth being the sustained demand for remote work capabilities and collaborative technological solutions, widespread uptake of personal computing, the surging popularity of mobile technology, growth in the gaming and entertainment sectors, and the broader integration of the Internet of Things (IoT) into various industries. With an increase from $45.8 billion in 2023 to an expected $46.67 billion in 2024, the market will grow at a CAGR of 1.9%. By 2028, it is expected to climb to a valuation of $50.69 billion, maintaining a CAGR of 2.1%.

Company	Market Cap (B)	Revenue (B)	ROE	P/E
Microsoft	3,066	227.90	38.82	37.33
Apple	2,920	384.10	171.95	29.50
Alphabet	1,815	307.40	27.36	24.40
Oracle	323	46.84	N/A	31.30
IBM	167	61.86	33.79	19.20
ServiceNow	162	8.97	27.35	191.40

Source: FactSet

The industry is characterized by a small number of dominant players due to high entry barriers, technical complexity of the development of the operating system, and need for extensive support and compatibility. The major players in this industry include Microsoft with Windows, Apple with macOS and iOS, Alphabet with Android and Chrome OS, and various companies that provide distributions of Linux for both desktops and server environments such as Oracle, Red Hat (acquired by IBM), and VMware (acquired by Broadcom). The largest company in the industry by market capitalization is Microsoft as shown in the table. Apple has the highest revenue and a ROE which is substantially higher than its peers. ServiceNow also stands out with the highest P/E ratio of 191.40.

Even if the technical challenges of developing a new operating system are overcome, finding users to shift from Windows, Mac, or Android is nearly impossible due to the network effects. Therefore, the concentration in the operating system software industry is high and the three largest competitors have 98.3% of the market share as of January 2024. Microsoft and Apple compete aggressively in the desktop OS segment with Microsoft holding the advantage of pioneering the space with its Windows platform, while Apple and Google compete in the mobile OS segment, with Android leading worldwide and iOS leading in the US. Apple has the unique competitive edge of having a strong presence in both desktop and mobile operating systems. In terms of market share, Google, primarily consisting of Android, begins with 37.55% of the market in 2019 and shows a general upward trend to peak at 43.92% in 2023 with Chrome OS contributing to the gain. Microsoft, encompassing Windows, starts at 35.60% and exhibits a steady decrease throughout the period, reaching 29.03% by 2024 due to desktop OS losing share to mobile OS in the industry. Apple, with its iOS and macOS operating systems combined, starts at 19.84% and shows an increasing gain in market share to reach 24.55%.

Operating System Market Share Worldwide
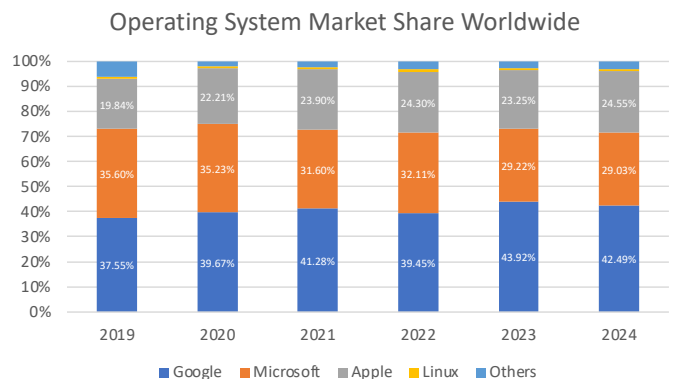
Source: StatCounter

United States dominates the operating system software market with over half of the total last twelve months revenue, indicating a strong domestic industry presence. Other key markets include China, Germany, Japan, and UK. Growth in China seems to have become stable and Germany, Japan, and UK have seen a declining trend over the past three years. Additionally, India stands out with a positive growth trend, suggesting a growing demand for operating system software. We predict that the geographical trend may see continued growth in regions with developing technology sectors like India. Advanced

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markets with high saturation like the United States may stabilize or grow marginally, while countries experiencing economic downturns will showcase fluctuations in their revenue contributions to the operating system software industry. Additionally, the second largest market, China is expected to see a declining trend due to the dominance of a new operating system by Huawei and increasing trade tensions between U.S. and China.

	% of Tot. Rev.	% Chg (Y/Y)	3 Yr Trend
United States	56.5	-0.2	
Mainland China	8.3	-0.6	
Germany	2.6	1.0	
Japan	2.4	-9.6	
United Kingdom	2.1	-10.7	
India	1.9	5.0	
Canada	1.7	-6.9	
France	1.7	-0.5	

Source: FactSet

Desktop Operating System

Desktop OS connect users to computer hardware, facilitating a range of personal and professional tasks on desktops and laptops. They provide an interactive user interface, manage hardware operations, and support numerous application software. Windows dominates in this segment with the largest market share of 64.18%, while Apple's macOS maintains a stable presence of 25.35%. Linux distributions are popular among niche user groups due to their flexibility and open-source nature.

Desktop OS Market Share

4.28	3.44	2.72	0.03
25.35			
64.18			

■ Windows ■ OS X ■ Chrome OS ■ Linux ■ Unknown ■ Other
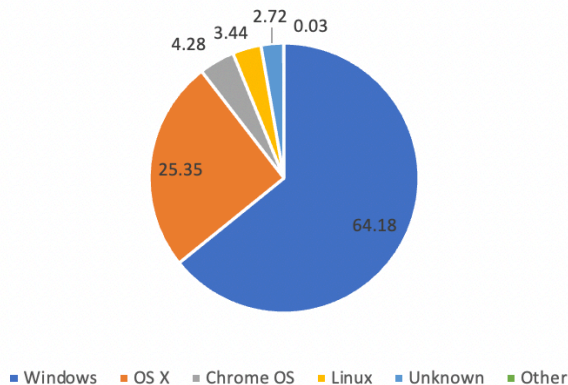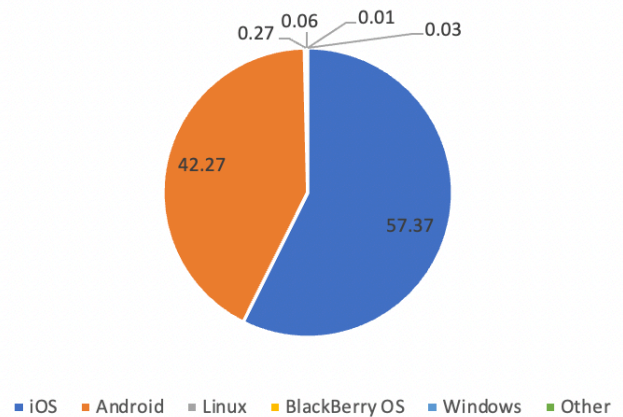
Source: StatCounter

Mobile Operating System

Optimized for smartphones and tablets, mobile operating systems prioritize touch interfaces, power efficiency, and wireless connectivity features. In this segment, Google's Android and Apple's iOS compete aggressively with pricing and various technological updates. Currently, Apple has a higher market share in the U.S. of 57.37%, followed by Android with 42.27%. We predict that the demand in this segment will continue to show growth due to the increase in the usage of smartphones worldwide. Mobile OS is also the fastest growing segment in the industry.

Mobile OS Market Share

0.27 0.06 0.01 0.03
42.27
57.37

■ iOS ■ Android ■ Linux ■ BlackBerry OS ■ Windows ■ Other

Source: StatCounter

Server Operating System

Server operating systems are specialized in managing and running server hardware. They include features for networking, data storage, and system management. As they run critical business applications, they are required to be highly stable and secure. The ability to provide high level of security and data privacy differentiates companies in this segment. Key players include Windows, and Red Hat Linux. Additionally, VMware is also a significant player in the server operating system space, although not through traditional operating systems. VMware is best known for its virtualization products, particularly VMware ESXi, which enables multiple operating systems to run on a single physical server as virtual machines.

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RECENT DEVELOPMENTS

COVID-19 Impact

The pandemic accelerated the adoption of remote working, which increased reliance on robust and secure operating systems. Therefore, key players in the operating system software industry saw an uptick in demand as businesses and individuals upgraded their systems for better remote work capabilities. As companies continue to rely on hybrid work and collaboration among global offices, there is an increased emphasis on security, cloud integration, and cross-platform functionality. Apple and Microsoft continue to innovate with updates that cater to a distributed workforce. Additionally, the pandemic also resulted in growth of Android and Chrome OS in the education and mobile work sectors. The industry's growth during the pandemic, a period where most other industries were struggling, is a key strength and showcases its resilience during economic downturns.

M&A Activity

Broadcom acquired VMware in November 2023, respresenting a substantial consolidation within the technology sector, particularly affecting the operating system software industry. This move signals Broadcom's significant push into software, pivoting from its semiconductor roots. VMware complements Broadcom's portfolio and presents new synergies, especially in cloud infrastructure and enterprise solutions. Broadcom's approach to software licensing, coupled with VMware's virtualization and cloud technologies, could challenge other industry players to innovate and lead to more integrated and comprehensive offerings.

New Entrants

In January 2024, Huawei's announcement of a new version of HarmonyOS which will not support Android apps marked a significant shift in the global operating system landscape. HarmonyOS was positioned as part of Huawei's strategy to reduce its reliance on American technology, particularly the Android operating system, due to the trade restrictions imposed by the US. For the industry, this development may signal increased competition, particularly in markets where Huawei has a strong presence such as China. Since China is the second largest market for Apple and Google, we predict that both players

will lose significant market share due to the innovation of HarmonyOS, which received 1 million downloads on the first day and currently has more than 100 million users.

## INDUSTRY TRENDS

Growth of AI

The integration of AI and generative AI into operating systems is a trend that is expected to reshape user interaction with devices. Operating systems are able to learn from user behavior, anticipate needs, and preemptively allocate resources to enhance performance. This leads to systems that will not only respond to commands but also be able to predict them, automating routine tasks and improving efficiency. For instance, AI can optimize battery life on mobile devices by learning a user's habits and adjusting power consumption accordingly. In the enterprise segment, AI-driven operating systems can manage network traffic to prioritize essential services, reducing downtime and improving productivity. Key players like Microsoft, Apple, and Google are at the forefront of investment in AI and integrating it into their operating systems. One of the biggest deals in this area has been Microsoft's multibillion-dollar investment in OpenAI and the future of generative AI. For Windows, Microsoft is using AI to optimize system operations, personalize user experiences, and improve security measures with features like virtual assistants, and predictive text input integrated into the operating system. Therefore, whichever tech giant is able to win the AI race is expected to benefit the most in the next decade. The rapid expansion of generative AI, from content and code generation to predictive modeling, is the reason it is predicted to reach $350 billion dollars by 2030 as shown.

Generative AI Market Growth Projections ($B)

Source: Statista

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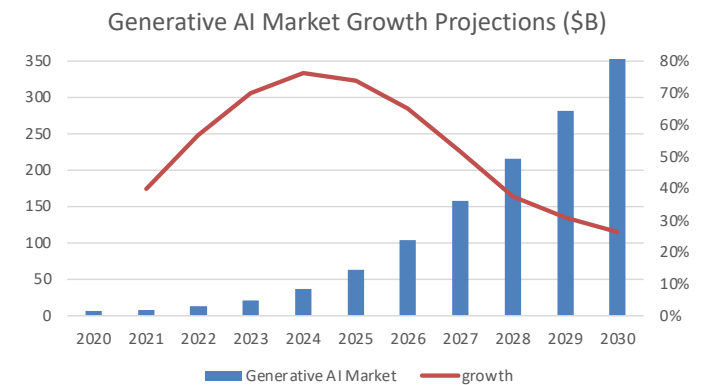
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5G Adoption

The rapid deployment and adoption of 5G networks have had a transformative impact on the operating system software industry. The need for operating systems to manage and optimize the potential of 5G technology is driving innovation, with major players enhancing their systems to provide users with seamless, high-speed connectivity experiences. We predict that the synergy between 5G and operating systems will enable new functionalities in mobility, cloud computing, and edge computing, opening avenues for growth and innovation in the industry. Players in the mobile OS segment such as Google and Apple will benefit the most from the growth in 5G. Projected adoption of 5G technology in mobiles is from 250 million in 2023 to 450 million over the next five years.
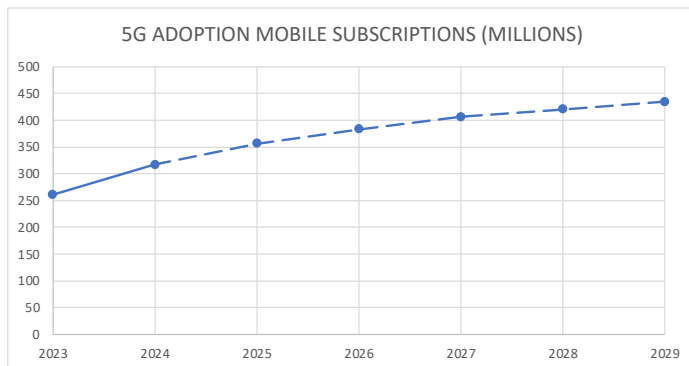
Source: Ericsson

Software Piracy

The widespread use of pirated operating systems not only limits market growth by undercutting legitimate sales but also poses security risks due to the prevalence of malware in such unlicensed software. According to Microsoft's study, more than four in five or 83% of new computers in Asia are sold with pirated software, which is a concern for developers aiming to capitalize on these markets. However, this trend is expected to decrease.

Cross-Device Ecosystem

The industry is moving towards operating systems that allow users to start a task on one device and finish it on another. This trend is driven by the increasing interconnectedness of our digital devices, from smartphones to smart home devices. Apple's Continuity features, Microsoft's Phone Link, and Google's

collaborative ecosystem are part of the trend where the barriers between devices are minimal. These key players are well-positioned to capitalize on existing ecosystems by further integrating their various platforms. Looking ahead, the companies that can most effectively leverage these technologies will likely see increased user engagement and loyalty, giving them an edge in a competitive market.
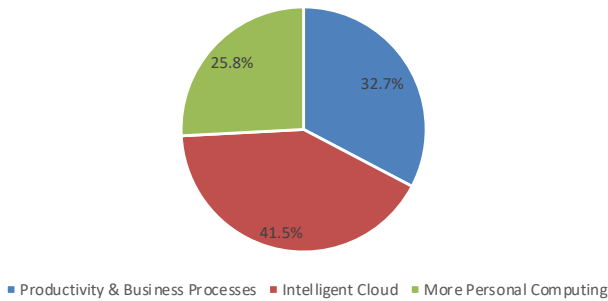
MARKETS AND COMPETITION

Threats of new players in the operating system software industry are low due to the high barriers to entry. The market is dominated by large players like Microsoft, Apple, and Google, who have substantial financial resources, established customer bases, and brand loyalty. New entrants have to ensure compatibility with a wide range of existing software and hardware, which can be challenging without the cooperation of established vendors. Creating an operating system requires significant technical expertise and resources including knowledge of hardware-software interfaces, security, networking, and user interface design. Additionally, the value of an operating system increases with the number of users, creating a feedback loop that reinforces the dominance of existing players. Users are often reluctant to switch operating systems due to the costs associated with learning a new system, migrating data, and potential compatibility issues.

Microsoft Corp. (MSFT)

Microsoft recently became the largest company in the world by market cap beating Apple and is the pioneer of the operating system software industry. Ten years after the start of Microsoft in 1975, it released Microsoft Windows, the most widely used operating system globally. In 2024, Windows is running on an estimated 1.6 billion active devices. The company's current focus extends beyond its legacy software offerings. Microsoft is heavily invested in cloud computing, as shown by the substantial portion of its revenue stemming from the Intelligent Cloud segment. This includes its Azure platform, which is a significant growth driver and competes directly with other cloud giants like Amazon Web Services. The main downfall of Microsoft is not having a presence in the mobile OS segment. Looking ahead, we expect Microsoft to maintain its market leadership with its robust R&D investments and strategic acquisitions in AI.

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**Microsoft Revenue Breakdown FY2023
($211.95 B)**

- Productivity & Business Processes 32.7%
- Intelligent Cloud 41.5%
- More Personal Computing 25.8%

Source: FactSet

Apple Inc. (AAPL)

The second largest company in the world by market cap, Apple is a key player in the OS software industry with significant market shares in desktop OS with macOS and mobile OS with iOS. In 2023, macOS had a stable market share worldwide, with a strong presence in the US market. iOS leads in the U.S. smartphone OS market, with a substantial number of users globally. iPhone sales continue to dominate the revenue share accounting for over 52% of the revenue. Apple's ecosystem, known for its integration and user-friendly experience, continues to attract a loyal customer base. The smooth integration between different products and expanded service offerings make it difficult for customers to jump to different operating systems. Most recently, Apple has been at the forefront of entering the AR/VR space and integrating operating system across even more devices.

**Apple Revenue Breakdown FY2023
($383.3 B)**

- iPhone 52.3%
- Services 22.2%
- Wearables, Home & Accessories 10.4%
- Other (Total) 15.0%
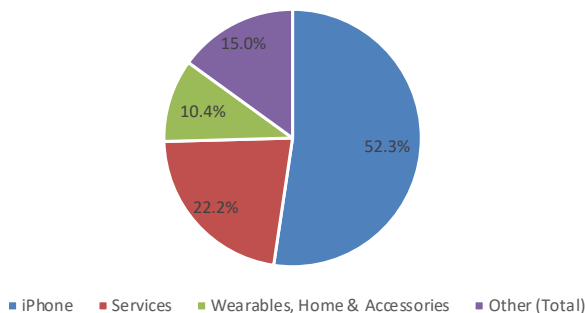
Source: FactSet

Alphabet Inc. (GOOGL)

Google's Android, since its acquisition in 2005, has become a formidable force in the mobile operating system market, rivaling Apple's iOS. Android's open-source nature has been a key differentiator, offering substantial flexibility and customization options, which have been leveraged by a multitude of smartphone manufacturers globally. This openness has fostered a rich and diverse ecosystem, notably through the myriad of applications available on the Google Play Store. Additionally, Android's affordability has made it particularly popular in Asia, contributing to its extensive penetration in emerging markets. However, the rise of native operating system software from Asian tech firms poses a potential challenge to Android's dominance in these regions. While Android's versatility and price-point accessibility will likely continue to drive its adoption, Google may need to navigate the competitive pressures from local operating systems. Strategic partnerships, innovation in user experience, and integration with Google's broader ecosystem of services could be key for Android to maintain or even grow its market share amid these emerging challenges.

**Google Revenue Breakdown FY2023
($307.1 B)**

- Google Services 88.7%
- Google Cloud 10.8%
- Other Bets 50.0%
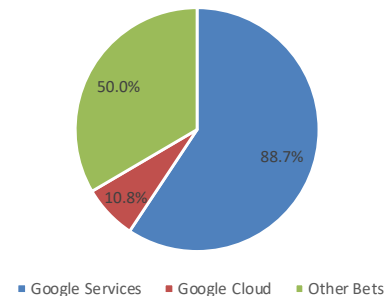
Source: FactSet

Oracle Corp. (ORCL)

Headquartered in Austin, Texas, Oracle is a notable player in the technology industry for its comprehensive database management systems and enterprise software products. In the operating systems industry, Oracle contributes with Oracle Linux, a robust platform engineered to deliver exceptional performance, scalability, and reliability in enterprise and cloud environments. Oracle Linux stands out for its alignment with Oracle's extensive suite of cloud services and software products, optimized to provide an

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integrated and efficient user experience. Oracle is positioned to experience growth due to the company's strategic focus on cloud solutions, coupled with its stronghold in enterprise software, enabling it to capitalize on the increasing demand for infrastructure that supports digital transformation and cloud integration.

Oracle Revenue Breakdown FY2023
($49.9 B)

- Cloud & License
- Services
- Hardware
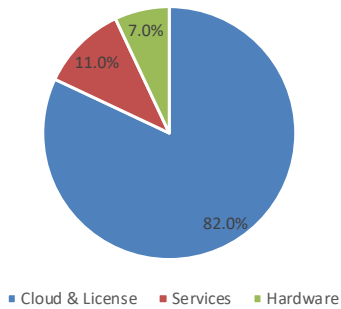
Source: FactSet

International Business Machines Corp. (IBM)

Headquartered in Armonk, New York, IBM is a legacy player in the technology sector, known for its significant contributions across hardware, software, and IT services. The acquisition of Red Hat marked a strategic enhancement to IBM's portfolio strengthening its capabilities in hybrid cloud and enterprise IT solutions. Red Hat, renowned for its open-source solutions, including the popular Red Hat Enterprise Linux (RHEL) operating system, now operates as a distinct unit within IBM. The future growth prospects for IBM, particularly in the operating system software sector, are promising due to its ability to leverage the growing trend towards hybrid cloud environments and open-source ecosystems. As organizations increasingly adopt flexible and scalable cloud solutions, IBM's expertise in managing complex IT infrastructures, combined with Red Hat's open-source innovation, is likely to drive continued expansion and market penetration for IBM's operating system offerings.
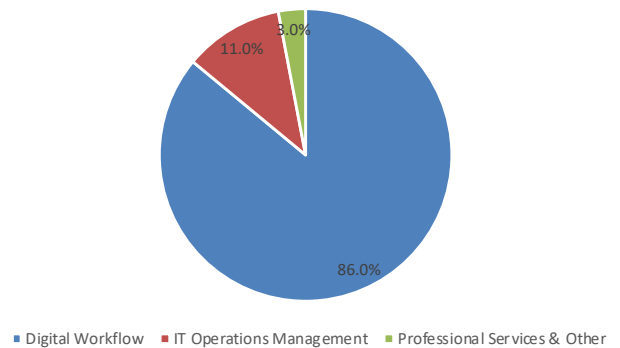
IBM Revenue Breakdown FY2023
($60.5 B)

- Software
- Consulting
- Infrastructure
- Other
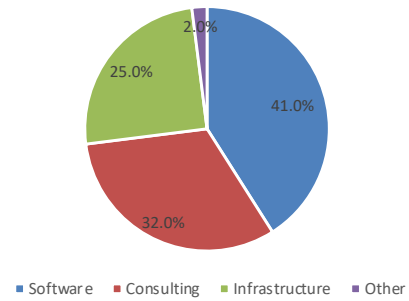
Source: FactSet

ServiceNow, Inc. (NOW)

Founded most recently in 2004, ServiceNow does not provide traditional system software like operating systems. Instead, ServiceNow's services operate at the application layer, offering solutions for streamlining IT operations and optimizing enterprise workflows. Their platform's success is reflected in their revenue breakdown, showing a significant reliance on digital workflow products. As enterprises continue to embrace digital transformation, ServiceNow's offerings are likely to become even more integral to efficient operations management. The company's future growth will hinge on its ability to innovate within the cloud services space, potentially expanding its suite to offer even more comprehensive workflow solutions.

ServiceNow Revenue Breakdown FY2023
($8.9 B)

- Digital Workflow
- IT Operations Management
- Professional Services & Other

Source: FactSet

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Profitability and Ratio Analysis

Company	Oper. Margin	Net Margin	R&D % Sales	D/E
Microsoft	41.8%	34.2%	12.8%	38.5%
Apple	29.8%	25.3%	25.3%	199.4%
Alphabet	27.4%	24.0%	14.5%	10.5%
Oracle	26.2%	17.0%	17.3%	8885.9%
IBM	13.8%	12.2%	10.3%	365.9%
ServiceNow	8.5%	19.3%	23.7%	29.9%

Source: FactSet

Margins: Microsoft's leading operating and net margin can be attributed to its diversified portfolio of software and services, including cloud computing and enterprise services, which tend to have high margins. Apple's strong margins are typically due to its premium pricing strategy and efficient supply chain management. Alphabet and Oracle also have healthy margins, likely due to their mix of scalable cloud services and software products. IBM and ServiceNow, while lower, still demonstrate margins indicative of healthy businesses, though they may have higher costs relative to revenues, reflecting their transitions to cloud-based models.

R&D expenses as a percentage of sales: Apple's significant investment in R&D as a percentage of sales underpins its commitment to innovation and development of new products, which is essential in the highly competitive consumer electronics market. ServiceNow's high R&D spend is typical for a growing company focused on expanding its product offerings and improving its cloud-based services. Oracle's higher R&D investment could be geared toward enhancing its cloud infrastructure to compete with other cloud giants. Alphabet and Microsoft, while investing a lower percentage of sales, still commit substantial absolute amounts to R&D due to their large revenue bases, allowing them to maintain competitiveness and innovate. IBM's lower relative R&D spend may reflect a strategic focus on specific high-value areas within its portfolio.

Debt to Equity (D/E) Ratio: Oracle's extremely high D/E ratio suggests it has taken on a significant amount of debt, potentially to finance share buybacks. IBM's also elevated D/E ratio might be the result of its long-term transformation and restructuring efforts, including acquisitions. Apple, despite its enormous cash reserves, may use debt strategically to finance share repurchases or dividend payments, taking advantage of low-interest rates. Microsoft and ServiceNow have more moderate D/E ratios, indicating a more balanced approach to financing. Alphabet's very low D/E ratio points to a conservative capital structure, likely relying more on its substantial cash flows from operations rather than debt for financing its activities.

Population of Internet Users

Over the last decade, the total number of internet users has increased significantly. The pandemic has also increased the dependence on the internet to get work done. Windows, while maintaining a majority share, shows a gradual decline as a proportion of total users due to its lack of presence in the mobile OS segment. Android's growth is prominent, mirroring the global adoption of smartphones and tablets, which have become primary access points for internet usage. iOS also has seen incremental growth, suggesting steady sales of Apple's mobile devices. While Windows is likely to remain significant in the desktop and laptop markets, its share of total users will continue to face pressure from mobile operating systems as mobile devices become increasingly central to internet access. The adoption of Chrome OS and Linux may grow in specialized markets or regions with specific user requirements.


Internet Users Worldwide 2012-2022
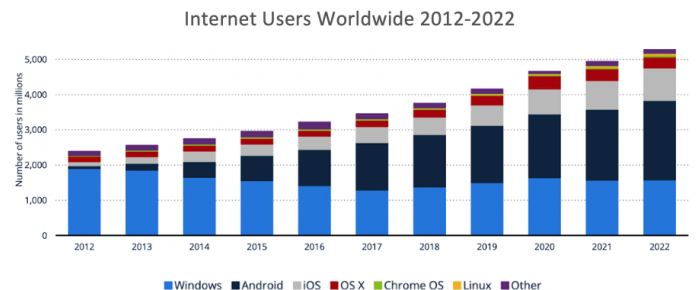
Source: Statista

Desktop Shipments Worldwide

Global shipments of desktops have decreased from 2014 to 2022, reflecting the global shift towards mobile devices. However, the desktop market remains vital for many business and professional sectors, and Windows' clear lead suggests that it is the preferred choice. Apple shows a consistent, smaller portion of the market, indicative of Apple's stable and niche user base. Linux, Chrome OS, and Android represent a minor segment, suggesting these operating systems haven't been able to emerge in the desktop space. We don't expect significant changes in the

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decreasing and stabilizing trend in desktop shipments, as well as the market share, as this segment is matured.

PC Shipments Worldwide 2012-2022
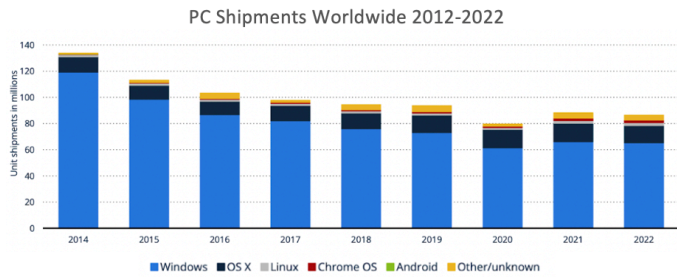
Source: Statista

Mobile Shipments Worldwide

On 16 January 2024, Apple reached a significant milestone in the mobile operating system market, surpassing Samsung in smartphone shipments and becoming the leader with a market share of 20.1%. This milestone marks a considerable shift in the mobile OS segment, the fastest growing in the operating system software industry. However, the aggregate market share of Android device manufacturers, including Samsung at 19.4% and Xiaomi at 12.5%, collectively maintain Android's lead in the mobile operating system globally. These figures highlight Android's extensive reach, despite individual shifts among manufacturers. We predict that Apple's market share will continue to benefit from its brand loyalty and the integration of its hardware with its iOS platform. On the other hand, Android facing fierce local competition in its main geographic markets will be a challenge.

| Company	Shipment 2023	Market Share 2023	Shipments 2022	Market Share 2022	Growth
Apple	234.6	20.1%	226.3	18.8%	3.7%
Samsung	226.6	19.4%	262.2	21.7%	-13.6%
Xiaomi	145.9	12.5%	153.2	12.7%	4.7%
OPPO	103.1	8.8%	114.4	9.5%	-9.9%
Transsion	94.9	8.1%	72.6	6.0%	30.8%
Others	361.8	31.0%	377.2	31.3%	-4.1%
Total	1,166.9	100.0%	1,205.90	100.0%	3.2%

Source: International Data Corporation

ECONOMIC OUTLOOK

The operating system software industry is influenced by macroeconomic factors such as real GDP, interest rates, inflation, and overall economic health. In an environment where interest rates are high, as they have been recently, companies and consumers may scale back their spending, which can lead to reduced demand for operating systems

as part of the broader slowdown in tech spending. However, since operating systems are essential for both personal and professional technology use, they may be less susceptible to economic downturns compared to other discretionary tech purchases. Moreover, with the trend towards cloud computing and subscription-based services, companies like Microsoft, Apple, Google, and various Linux distributions have recurring revenue streams that buffer against economic headwinds. Therefore, despite broader economic challenges, the need for reliable and efficient operating systems is sustained due to their foundational role in personal computing, enterprise environments, and emerging technologies.

Interest Rates

In February 2024, the Federal Reserve maintained the federal funds rate at 5.25%-5.5% continues to impact the technology sector, including the operating system industry. High interest rates typically result in increased borrowing costs, which can lead to reduced spending on IT infrastructure and software upgrades, potentially slowing down the growth of the operating system market. The US Treasury yield curve's relatively flat to downward slope as shown in the graph below for longer maturities dated February 1 suggests that investors may be expecting slower economic growth. For the operating system software industry, this could mean a cautious approach to investment and expansion in the near term, with companies potentially delaying significant upgrades or new projects until the economic outlook becomes clearer. While we predict two rate cuts this year, the FED could keep interest rates high, which would raise the WACC, making capital expenditures and mergers and acquisitions more expensive and potentially slowing down these activities.

US Treasury Yield Curve
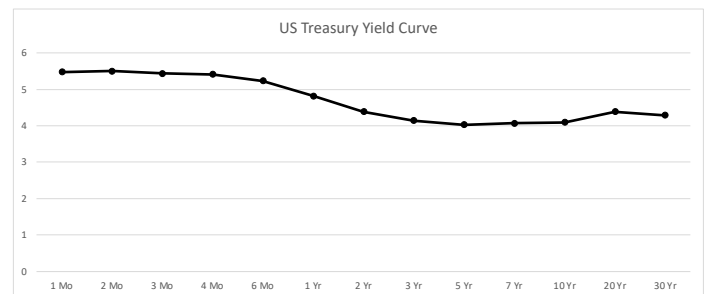
Source: U.S. Department of Treasury

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Inflation

Despite the recent uptick in inflation over the last year, the Federal Reserve officials project that the measure of underlying inflation could end at 2.4% by the end of 2024, suggesting that inflationary pressures are expected to ease over the coming years as shown in the projected data from IMF. The operating system software industry faces inflationary pressures primarily from rising cybersecurity costs and significant investments in digital transformation and AI innovation. For the industry, inflation can increase the costs of production as companies face higher expenses for staff, as well as the components and services needed to develop and maintain operating systems. On the other hand, if companies can adjust their pricing strategies in line with inflation without significantly impacting demand, they might maintain or increase their profitability. We expect that core inflation will decrease to 3.0% in 2024, primarily due to an expected decline in services inflation.
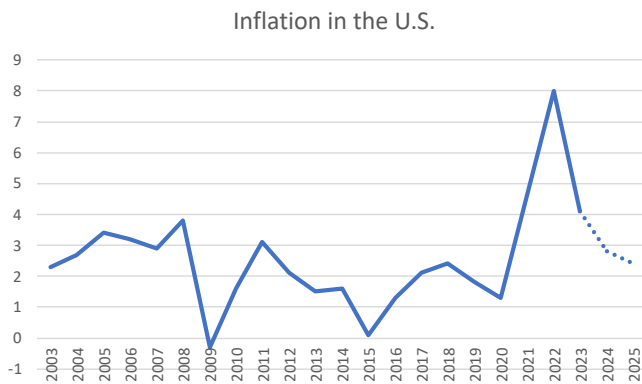

Source: International Monetary Fund

Real GDP

The Q4 GDP for 2023 in the U.S. showed an expansion at an annualized rate of 3.3%, which was higher than the forecasted rate of 2% This performance, which follows a 4.9% growth rate in Q3, signals continued economic resilience despite challenges such as rising interest rates aimed at curbing inflation. The advance estimate reflects contributions from consumer spending and exports, with the overall growth rate for the year from Q4 2022 to Q4 2023 being reported at 3.1%. This growth surpasses many economists' estimates and suggests that the economy is maintaining momentum, possibly easing concerns of a recession. For the operating system software industry, such economic conditions could potentially translate to

increased investment in infrastructure and software upgrades. While we do not forecast a recession in 2024, we project that the pace of consumer spending will diminish, contributing to a deceleration of overall GDP growth to be around 1% during the second and third quarters of the year.
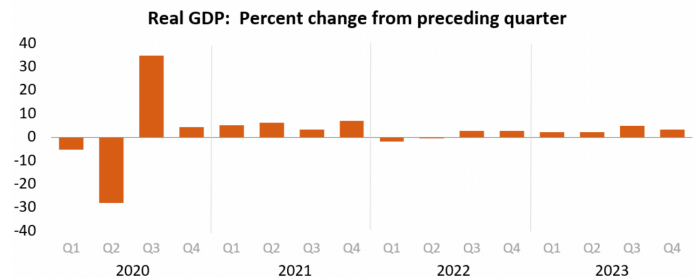
Source: U.S. Bureau of Economic Analysis

KEYS TO MONITOR

The operating system software industry's growth is propelled by several key factors. Integration of generative AI and the proliferation of 5G networks will elevate the user experience, making operating systems more integral to the user. The trend towards seamless cross-device ecosystems continues to drive demand, as operating systems become the critical link for users to access a range of devices. The mobile OS segment is expected to see robust expansion as smartphones increasingly become primary gateways to digital content. The high barriers to entry will benefit established tech giants, allowing them to leverage their extensive customer bases and diverse revenue streams to maintain a strong market presence. Furthermore, the industry's demonstrated resilience to economic downturn its robustness. The shift to remote work and the increasing reliance on digital collaboration tools have only intensified the need for reliable and efficient operating systems. Therefore, we recommend an overweight rating for the industry, with all three key players – Apple, Microsoft, and Alphabet – showcasing growth potential. However, there are risks that could negatively impact this growth. Software piracy remains a significant concern, particularly in regions with weak intellectual property protections including India. The competitive landscape in China, a crucial market, is becoming increasingly challenging, with new local entrants and ongoing US-China trade tensions. Lastly, inflationary pressures could curtail consumer and enterprise spending, potentially delaying software upgrades and purchases.

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