

J.P. Morgan Generative AI CIO Survey

Piloting a New Glidepath for Software

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Introduction



Mark Murphy

Large Cap Enterprise Software

- *Covering the Enterprise Software industry since 1997*
- *Over 20 years experience*
- *Cornell University*



Pinjalim Bora

SMid-Cap Infra & Horizontal Software

- *Covering the Enterprise Software industry since 2010*
- *~13 years of Equity Research experience, with 5+ years of software development experience prior to that*
- *Ohio State University (Fisher) MBA, CFA; National Institute of Technology India, Mechanical Engineering*



Brian Essex

Security Software

- *Over 20 years experience*
- *Bryant University, BS Business Administration*
- *Boston College, MS Finance*



Alexei Gogolev

SMid-Cap Vertical Software

- *Part of J.P. Morgan TMT Research since 2009*
- *20 years experience in the industry*
- *Edinburgh University Graduate*



Doug Anmuth

Internet

- *Covering the Internet industry since 2001*
- *Consistently ranked by Institutional Investor*
- *New York University (Stern) MBA, University of Michigan BA*

Executive Summary

Major Hyperscalers Definitely Benefit from Generative AI...

- Across 85 surveyed CIOs of large global firms, ~84% of their Generative AI activity / spend will occur on public clouds vs. only 16% for on-prem / private cloud. **Across Amazon, Google, and Microsoft, spending impact due to Generative AI is lopsidedly positive, with a net 47% to 68% of their installed bases, respectively, seeing increased spend due to the advent of Gen-AI** and the planned activity to support these projects.

...with Microsoft / OpenAI Taking a Commanding Early Lead

- Though Microsoft is already recognized as an early leader in Gen-AI, **the quantifiable magnitude of Microsoft's lead is far greater than investors might have expected**. For example, **CIOs expect 66% of their cloud-based Gen-AI activity / spend to go to Microsoft over the next three years, vs. 14-16% for Google and Amazon, respectively**. While the landscape will evolve, products from OpenAI and Microsoft dominate CIO mentions for the most impressive technologies, conveying a very commanding mindshare lead at the early stages of Gen-AI market formation.

Modern SaaS, Security Leaders Also Stand to Benefit as CIOs Plan to Ramp Gen AI Investments

- In addition to Microsoft, Google, and Amazon, CIOs expect the rise of Generative AI to drive higher spending on **Databricks, CrowdStrike, ServiceNow, Palo Alto Networks, Fortinet, Atlassian, Elastic, Salesforce, and Zscaler**.

Some CIOs Mentioning Early Days...

- At this early stage, a portion of CIOs see their Gen-AI plans as “**exploratory**”, stating that they are “*cautiously*” discovering “*the opportunities and threats created by Generative AI*” with many considering the potential for “*reduction in headcount*”, “*labor to be disrupted*”, and “*potentially reducing staffing needs*.”

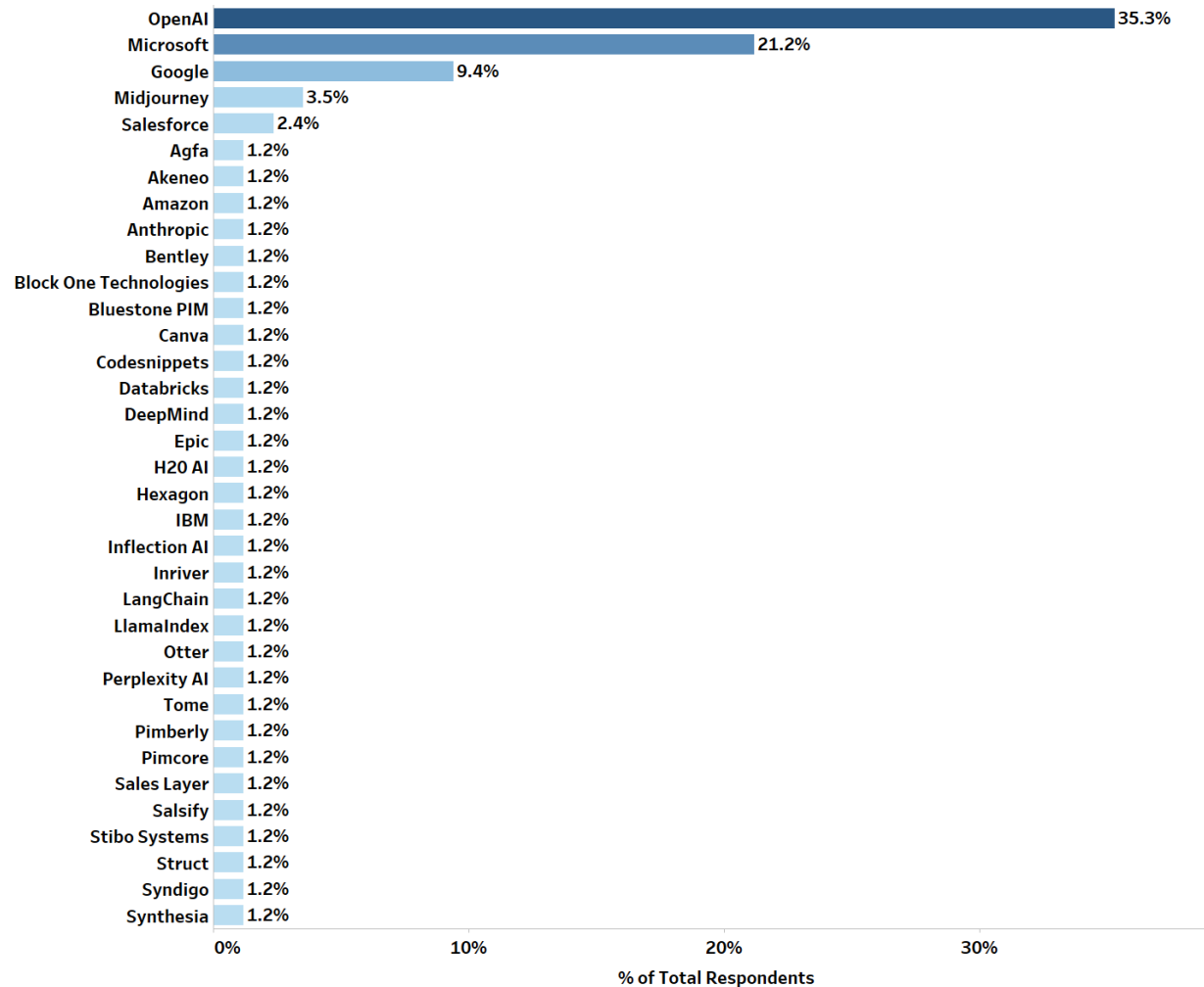
...But Convey Excitement and Envision a Broad Swath of Transformational Vectors

- Many CIOs relay that “**...there is a lot of interest across the board**”, stating that they are “Impressed” by the technologies which are “**...fascinating and game-changing**”, while conveying that ultimately “**AI will come out on top**.” Planned use cases span across image generation (4 mentions of Dall-E, 3 mentions of Midjourney), assessing job applicants, creating content, handling fraud detection, creating “virtual humans”, medical diagnosis, writing doctors’ letters, molecular modeling, generating proposals, understanding consumer behavior, producing emails and blog posts, and dozens of other areas, showing **surprisingly broad applicability of Generative AI**.

Standout Software Vendors for GenAI Investments

Describe how your organization will approach Generative AI investments, and which two to three specific Generative AI products are impressing you the most?

Standout Vendors



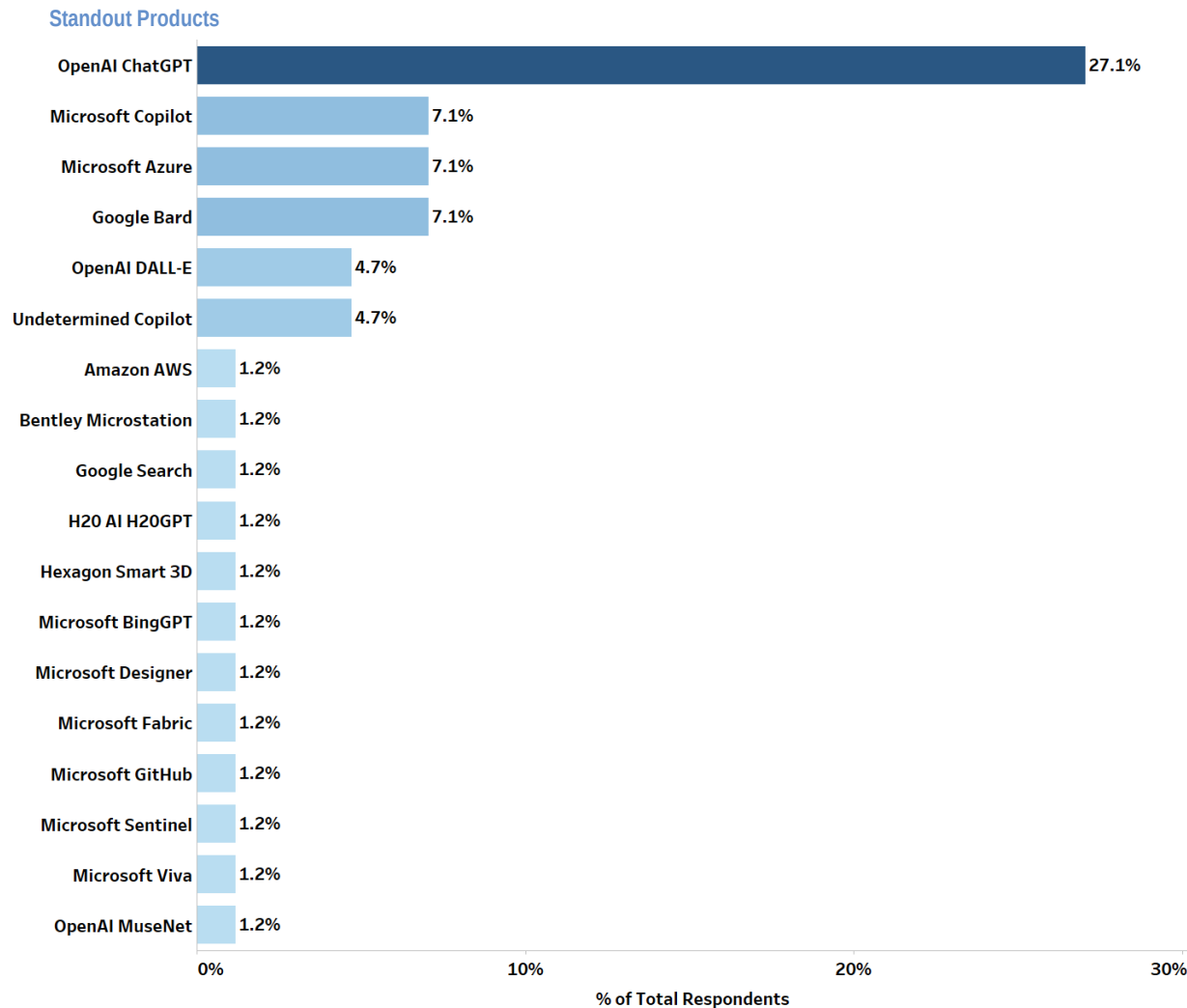
Source: J.P. Morgan Research.

Key Takeaways

- This chart is distilled from qualitative commentary provided by 85 CIOs in answering a question about the generative AI products that are impressing them the most.
- Only 5 companies received multiple mentions: OpenAI, Microsoft, Google, Midjourney, and Salesforce.
- In addition, 30 other companies received a single mention.
- ***While we are still in the early days of market formation for Generative AI technologies, it is extraordinarily clear that the combination of OpenAI and Microsoft have obtained a commanding mindshare lead with the CIOs of large enterprises.***
- In our view, it is equally valuable to consider the companies that did not receive much mention, including but not limited to the non-hyperscaler large language models (LLMs).

Standout Software Products for GenAI Investments

Describe how your organization will approach Generative AI investments, and which two to three specific Generative AI products are impressing you the most?



Source: J.P. Morgan Research.

Key Takeaways

- This chart is also distilled from qualitative commentary provided by 85 CIOs in answering a question about the generative AI products that are impressing them the most.
- Only 5 clearly vendor-attributable products received multiple mentions: OpenAI ChatGPT, Microsoft Copilot, Microsoft Azure, Google Bard, and OpenAI DALL-E.
- In addition, the term “Copilot” was mentioned by ~5% of CIOs without a direct company reference, and while most of these mentions are probably linked to Microsoft, other vendors have also adopted the “Copilot” branding.
- 12 other products received a single mention.
- ***Again, the combined presence of OpenAI and Microsoft products conveys disproportionate, early leadership of Generative AI.***

Generative AI Approach

Describe how your organization will approach Generative AI investments, and which two to three specific Generative AI products are impressing you the most?

- ***Our company is seeing a lot of potential in Generative AI, and we are very interested in putting our money and resources into it.*** We are looking to work with new small companies and big ones who are leading the way with this technology. We want to invest in solutions that can give us new insights and help us make decisions faster, because these are very important for our business. ***One Generative AI product that we think is very good is the GPT series from OpenAI.*** The newest version, GPT-3, is very special because it ***can create text that looks like a person wrote it.*** We could use this technology in many ways in our company, like making reports automatically, creating personalized messages for our customers, and helping with research and analysis. Another product that we like a lot is ***DALL-E, also from OpenAI. This tool can make unique images from text descriptions. This could be useful in many different areas like advertising, designing products,*** and even real estate, where it could help clients understand and engage more by visualizing things in a custom way. ***We are also keeping an eye on the development of generative models in the music and sound area, like MuseNet from OpenAI.*** This might not be something we can use directly in our company, but it shows the kind of creative and innovative AI solutions we want to support. To wrap it up, when we think about investing in Generative AI, we want to support and use new technologies that ***could change how businesses work and make decisions.*** We are especially interested in AI technologies that fit with our business goals and could give us a good return on investment.
- There are several use cases out there already. ***Auto-generation of content, translations, attribute recommendations, personalization of product recommendations, data management automation, sustainability solutions, provide insights to make informed decisions, enhanced product search and discovery, competitive analysis, routine task automation.*** Vendors that are addressing these use cases include Akeneo, Bluestone PIM, inriver, Pimberly, Pimcore, Sales Layer, Salsify, Stibo Systems, Struct and Syndigo. In my organization, we are evaluating potential use of AI solutions for content generation and insights.
- As a brick-and-mortar business who has been operating for over 60 years, we will tread lightly into Generative AI. We have never been a company on the cutting edge, however we strive to make sure we stay on top of the latest technology so we aren't left behind. This approach will extend to AI, and any investments will be small to start and very specific to our needs. The future offerings from a productivity standpoint from Microsoft, and any web-based offerings from AWS and Azure will be at the top of our list.

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Generative AI Approach

Describe how your organization will approach Generative AI investments, and which two to three specific Generative AI products are impressing you the most?

- We are looking to use a combination of LlamaIndex and LangChain to be able to feed proprietary docs (PDFs mostly) into an LLM to be able to query for information. Much of this is read by humans and parsed for bits of information, so the vision is to load several documents and be able to accurately extract tabular and contextual information via a “chat-ish” interface. **OpenAI and Bard are of course impressive. Midjourney is incredible** though has virtually no real use case at my company (energy sector).
- We believe that GAI will go through the Gartner Hype Cycle. As such, our approach is to form a discovery group to develop the questions we need to wrestle with and how best to provide governance. Our philosophical approach is to utilize GAI as it comes to us through the products that we purchase, rather than invest in a GAI platform and hire expertise. We believe there are **opportunities for it within our electronic health record, our ERP** as well as within our back-office platforms systems.
- We are looking at generative AI tools in the context of **time/labor-saving for lower-tier work** (initial research, confirmations, cite checking, etc.). Frankly, right now it is too early in the space to be impressed with any specific products. The specifics of legal use and the need for answers from a generative AI tool in this space to be 100% correct and provable make caution extremely necessary.
- We will be looking at Generative AI as a productivity enhancing technology, **increasing throughput of our colleagues and minimizing the drudgery from their daily work**. We are looking forward to using a combination of **Microsoft Co-pilot**, developing chatbots for our helpdesks, and help our back-office functions such as legal, purchasing and finance through intelligent assistance.
- Investments will come from the Digital Transformation budget and to justify we look for productivity improvement over next 2 to 5 years and budget reduction on overhead due to this productivity. Products will be related to **software coding: Code generation**, translation, explanation and verification; Chatbot performance improvement; Legacy code modernization.
- We plan to first gain a better understanding of its potential applications and limitations. We also plan to evaluate the technical expertise we will need, and the data infrastructure required along with expert opinion before making investments because it involves risk since the field is still rapidly evolving.. **Certainly ChatGPT, DALL-E and Bard.**

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Generative AI Approach

Describe how your organization will approach Generative AI investments, and which two to three specific Generative AI products are impressing you the most?

- We will launch an AI campaign as part of our innovation management and initiate internal company challenges on this topic with partners (industry, startups). **We were particularly impressed by the capabilities of ChatGPT.** We expect that, for example, **in the context of writing doctors' letters, a lot of relief for medical professionals can take place.**
- The company has defined 4 areas of investment -- from market driven products we might purchase from the market (i.e., Microsoft Co-Pilot) through internal models we may develop for our own products. **Certainly, there is a lot of interest across the board, perhaps led by ChatGPT and Co-Pilot and then pretty much anything that touches content creation.**
- Augmentation of staff capabilities to automate regular procedural tasks to free up time to perform more creative and useful tasks – **[MS] Copilot.** Using it to help create lessons and assessments for students. - TBA. Assist cybersecurity experts in auditing through millions of events to find actionable items - **MS Sentinel and Fabric**
- We started using ChatGPT to generate internal documentation and also external documentation for websites. We also started deploying Viva Sales to support writing minutes for Teams meetings, however this is focused mostly on sales. **We expect to get a big boost in the generative AI area for all employees by Microsoft's Copilot.**
- Identify which business areas and business processes are more adaptable to the use of AI. Identify what specific problems need to be addressed and how G-AI can help solve these problems. **ChatGPT, Canva, DALL-E and Tome seem to be good starts.** Use Cases: Employee Training, Service Desk, Tech Support, Business presentations.
- It is a challenge to awaken curiosity around AI in our executive management team. There are a few isolated cases of practical use scattered in the organization. **ChatGPT is the leader regarding use, simply because of the ease of use and accessibility. We are a Microsoft house, so the anticipation of CoPilot is pretty big.**
- **[Generative AI] is very impressive and promises to be a game changer.** We are looking to see how we can create predictive models out of this. At the moment however, some of the areas where we find the [way to] go to get quick [ROI] is in the space of customer service, and also in Software development.
- We are going to involve a partner having deep experience in Machine Learning projects and with some vertical experiences in logistic market. **We have already identified OpenAI and ChatGPT** for what concern cloud solutions and we will explore the market for identifying the solution best fitting our on prem needs.

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- We are currently conducting small pilots - one with a client generating copy about their products and different/news ways of positioning it with consumers. Internally we have several departments running tests for example **HR are generating job descriptions**. All in cases **we are primarily using ChatGPT and Bard**.
- **Bard and DeepMind** are gen AI products we are using right now to generate user input for our transport and logistics business especially for routing and supply chain optimizations. Our general approach is to invest in a few POC in gen AI in some of our business units to see where we see best value.
- The areas of interest are in scientific discovery, molecular modelling, branding and creatives and internal and external communications. **ChatGPT, Bing GPT, Midjourney, DALL-E, Microsoft Designer, Bard, Perplexity AI are a few tools that we are exploring**, though in an early stage as of now.
- We are a higher education organization. While some faculty see the benefit and need for this technology (seeing it will be ubiquitous in the future in every facet of life), **most do not want anything used by students in courses, as they see it as the student not doing the requisite work**.
- We don't invest directly into GAI, but tools we leverage are investing in GAI capabilities. Our Real Estate CRM products are experimenting with emails and blog posts that are produced using GAI. There are also chatbot companies knocking at our door to have GAI chatbots on our website.
- As a manufacturing company operating predominantly in the B2B market, we will approach generative AI very cautiously. We will use generative AI and LLM for improving our understanding of consumer behavior, and also for production planning based on multiple data inputs and parameters.
- As of now, we have only plans and projects to **integrate OpenAI to our self service chatbot**. We foresee an opportunity in some specific code solutions for our internal processes that can help provide faster responses to the company, but we haven't put together a plan for it.
- We will use AI to support our employees in repetitive tasks, screening of documents and helping - not replacing them. AI will support them in different areas and improve efficiency. **We work with Microsoft and OpenAI in Azure** and start building the first use-cases.

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Generative AI Approach

Describe how your organization will approach Generative AI investments, and which two to three specific Generative AI products are impressing you the most?

- We're exploring both open source LLM such as the H2O GPT, as well as the **Azure OpenAI service**. Explorations are focused on training the models to be more domain specific for example Retail product development, acting as tool or copilot to business users
- We're still waiting for a business use case for which GAI can be used. For now, it's been used for general translations as it does well translating large documents into other languages. That, and the usual "how can I do this in Excel, Word, ...".
- We are already working with **Azure OpenAI and Cognitive Search Services** to deliver a Proposal Generating tool where we compile all proposals in one place and provide 'ChatGPT' like interface to query and construct / re-construct new Proposals.
- We are only starting to investigate ways to leverage Generative AI in our particular industry. **One use case would be to use AI to identify the best candidates out of pool of interviewees. Leveraging ChatGPT** and some plugins available today.
- We are evaluating investments in gen AI carefully as they are plentiful. We will plan to build a pipeline of tech to enable us to react and test use cases rapidly. **The integration with EHRs is fascinating and I think will be game changing.**
- 1) Use it to organize and search large amounts of unstructured data across the organization. 2) Use it to support source code development. 3) **Use it for geographic image analysis to identify terrain and trends of terrain changes over time.**
- Looking to incorporate **Google Search for Retail, with a generative AI component**, into our eCommerce search, and eventually into our store associate / POS search. Also looking at generative AI for our call center / help desk solutions.
- **We want an enterprise ready solution provided by the trusted big tech companies such as Salesforce, Google, etc.** I haven't seen any real business cases, however what salesforce announced in the Connection conference was impressive.

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Generative AI Approach

Describe how your organization will approach Generative AI investments, and which two to three specific Generative AI products are impressing you the most?

- No clear plan, just exploring. Demand Forecasting and Inventory Management: addressing challenges in accurately predicting consumer demand and managing inventory levels. Product design based on data analysis and consumer trends.
- We are learning from it till now. However, our **plan is to start a few MVP together with Microsoft**, related to the following processes: Well location definition, Internal finding of politics/norms, and programming optimization.
- We hope to use generative AI products to **help us streamline labor intensive processes that require judgement. For example, performing intake eligibility for social services beneficiaries instead of using a case worker.**
- **We will use AI where applicable to reduce staffing.** Impressed - using AI to do quality audits of cases on a pallet by Block One Technologies. Also, using AI with Robotic arms to pick cases by Block One Technologies.
- **My organization is leaning in on Generative AI** and have already many products and services in development...and several POCs. We have a subscription to ChatGPT and using several open-source models and services.
- **Using ChatGPT/Bard** to deploy chatbot responses for internal helpdesk, use same to address recruiting needs in assessing applicants, use **GitHub co-pilot** to enhance productivity in application development.
- We are approaching Generative AI within our Modern Workplace suite of Microsoft as Virtual assistant to: Manage the Knowledge of people, Enhance Digital user experience, Enhance operational efficiency.
- It is still too early to know how exactly we will invest in Generative AI. Much of our early investment will be from training employees to use AI in our major technological systems (ERP, CRM, HRM).
- Personalized Travel itineraries and chatbots to be able to answer customer queries relating their travel requirements. But also **Fraud Detection and Security Generative AI solution are of interest!**
- At this point we are still looking for use cases and the appropriate business cases to support the investment. Use cases are most likely **back-office automation and marketing material generation.**
- As a design firm we are looking to pair our creative talent with the power of AI to consider more options with greater efficiency. **ChatGPT and Midjourney are two currently of major interest.**

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Generative AI Approach

Describe how your organization will approach Generative AI investments, and which two to three specific Generative AI products are impressing you the most?

- Possible ChatGPT detection in our LMS (Canvas). **Possible integration of AI in new Salesforce feature for our org.** Looking for ChatGPT like virtual assistant to help with student success.
- Informational support for patient questions regarding care and diagnosis. Higher education student experience and behavioral health support. Replacement of chatbots in service catalogs.
- **We are impressed with Microsoft's overall stack of Generative AI.** We are exploring various use cases on [leveraging] the data lake. This includes competition and market predictability.
- **Looking at AI using sensors in the patients homes to detect new patterns for potential change of condition for homecare.** Piloting sensors now with vendor for potential proof of concept.
- The adoption of Generative AI needs to be on specific use cases basis at the moment. The key use cases will be around Knowledge Management, Marketing Automation and Customer Services.
- Using one of the big 4 consulting companies to assist in ways to practically apply AI technology. **So far have only used ChatGPT in an exploratory fashion.** Concerned with privacy.
- We are experimenting and requesting use cases across all our functions. We are **partnering with Microsoft** to create a company version of generative AI we can use with our data.
- We are embracing GenAI while keeping security top of mind. We are leveraging our own data and provide an avatar like interface. **We are using Azure which we feel is ahead.**
- We will look at applications that produce high quality self-serve experiences and **potentially reduce staffing needs:** better online support, **virtual "humans"**, etc.
- Still looking to identify use case. Clinical informatics looking to work with EMR vendor if opportunities exist to help with documentation in emr for providers.
- The most promising area for generative AI is related to the Design Process. The products we are investigating are Bentley MicroStation and Hexagon Smart 3D.
- We are looking at **Copilot and ChatGPT.** Applications will be on the service delivery side initially for our consultants to summarize multiple data sets.

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Generative AI Approach

Describe how your organization will approach Generative AI investments, and which two to three specific Generative AI products are impressing you the most?

- We are still discovering the opportunities and threats generated by Generative AI. We do not have an organized approach, rather an opportunistic one.
- We investigated in ChatGPT as well as Synthesia for some use cases. Personally, I believe **Copilot will be after the beta phase and big improvement.**
- Of course, **ChatGPT is used on a daily basis** by IT specialists, as well as developers for Codesnippets, Otter for online Calls and etc..
- Unsupervised learning. Quality assurance in application development. **Medical diagnosis. Diagnostic imaging.** Epic EMR, Agfa, IBM.
- We have an agreement penned with 2 companies to provide these services. There are no specific use cases all are in scope.
- **Anthropic**, an AI model developer and research outfit and Inflection AI, which focuses on human-computer interfaces.
- Cautiously. Will evaluate needs with the business to understand organizational and process improvements / offsets.
- My organization is focused on using AI to aid in data mapping and management including ensuring data is VAULTIS.
- We produce all kinds of hygiene Equipment. We produce, sell, ship and service all our product by our self.
- We are using mainly within **modern workplace Microsoft platform** as virtual assistant of our digital users.
- Creating code faster and feeding AI with corporate intranet material. **Interest is in ChatGPT and GPT4.**
- Internal processes would be enhanced with Generative AI. Automation of some of the tasks will be done.
- Low level automation capabilities for repetitive processes. Metadata extraction / creation. **OpenAI.**
- Predictive maintenance, Customer Service and Accounts Payable will be our first relevant use cases.
- Using a private version of **ChatGPT** and leveraging adjunct products such as **co-pilot.**
- Completely wait and see at this point. We are not looking to lead in Generative AI.

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Generative AI Approach

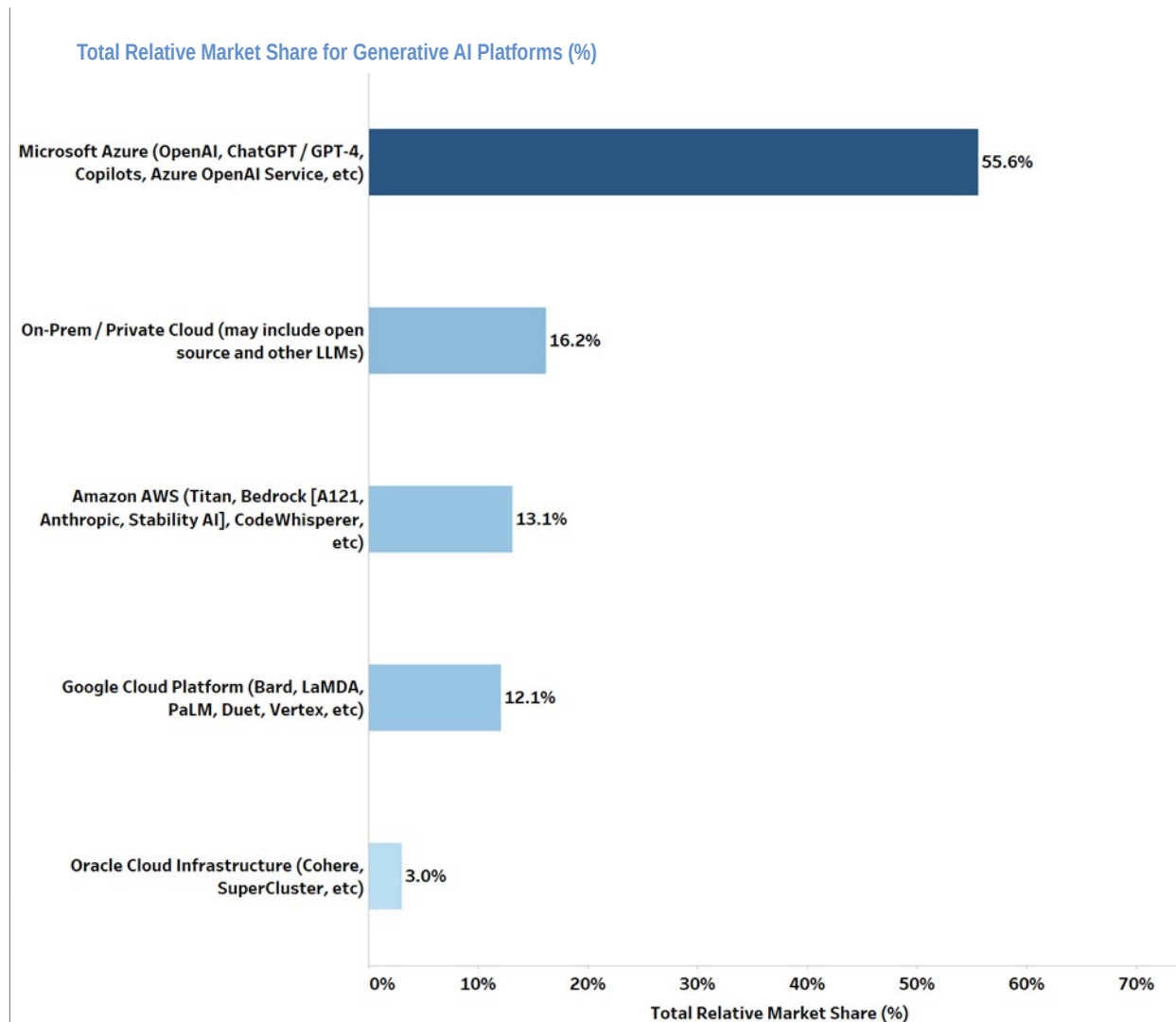
Describe how your organization will approach Generative AI investments, and which two to three specific Generative AI products are impressing you the most?

- Cautious approach, allocate 10% of total budget for such innovation.
- We are trying to implement **ChatGPT** in our user experience platform.
- **ChatGPT** and Chat bot are the two we are either using or exploring.
- Planning projects to pilot use cases in call center environments.
- Conservative approach. Waiting to see how the market responds.
- Exploratory within higher education impact for our students.
- Large Language Learning modules, with MRP generation.
- Our organization will invest in AI at the current time.
- **Databricks and Azure OpenAI Copilot.**
- It is still a topic of noninterest.
- We are still exploring the field.
- No plans currently.
- No plans actually.

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Generative AI Activity / Spending, Next Three Years

Please indicate what percentage of your organization's Generative AI Activity / Spending will be conducted on each of the Generative AI platforms listed below, during the NEXT THREE YEARS?



Source: J.P. Morgan Research.

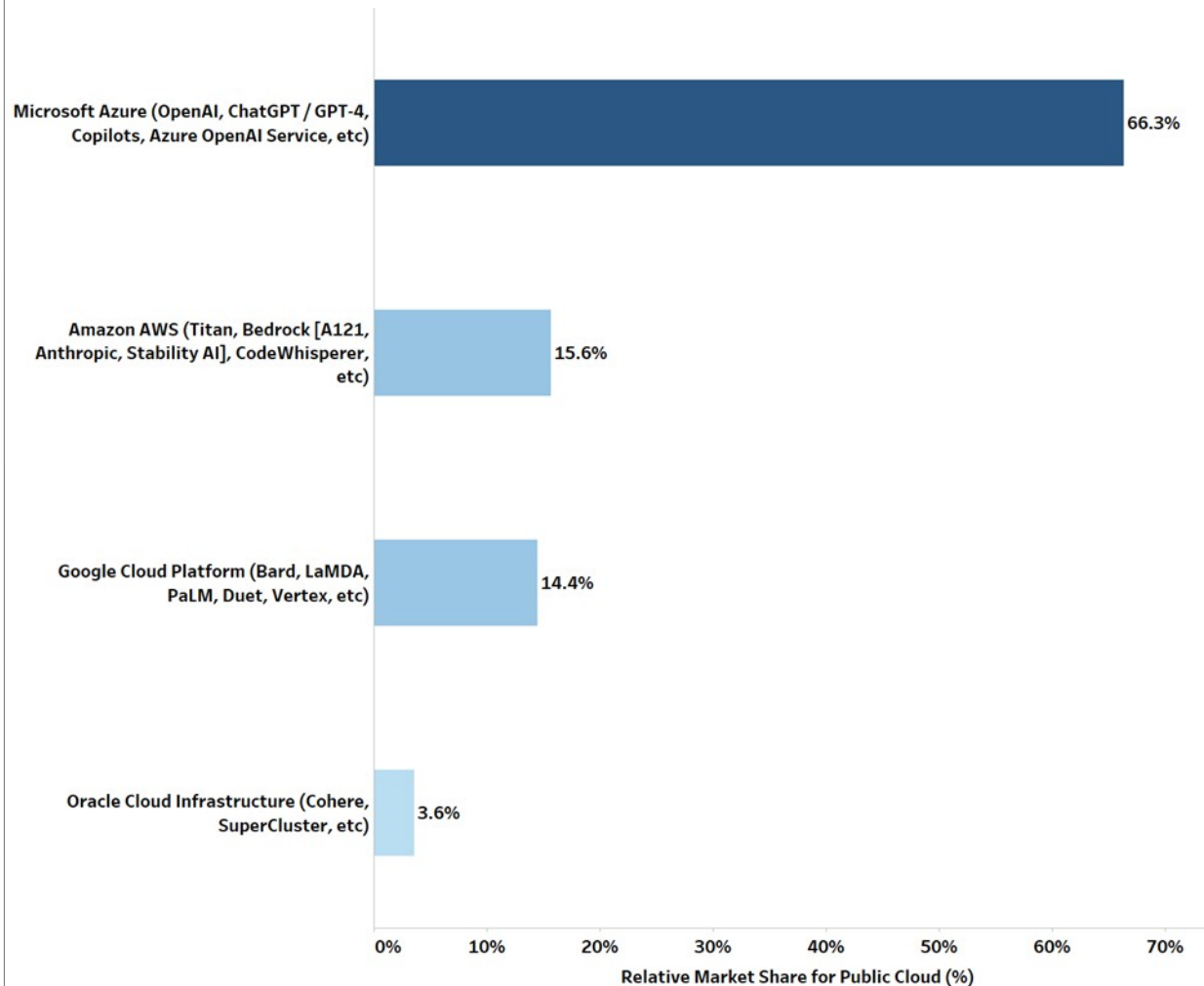
Key Takeaways

- This chart depicts CIOs expectations for how they will allocate their Generative AI activity / spending across platforms and architectures during the next three years.
- We find that the vast majority of the activity will be conducted on the major public cloud hyperscaler platforms, with only ~16% planned for on-prem / private cloud environments.
- ***While it is early in the market formation of Generative AI technologies and the battle will be intensely competitive, we view the magnitude of disproportionate leadership for Microsoft and OpenAI to be quite stunning at this juncture.***
- As a reminder, most market research firms show Amazon AWS carrying nearly 40% market share of IaaS+PaaS, with Microsoft in the low-to-mid 20s and Google in the low double-digits.

Generative AI Activity / Spending, Next Three Years for Cloud

Please indicate what percentage of your organization's Generative AI Activity / Spending will be conducted on each of the Generative AI platforms listed below, during the NEXT THREE YEARS?

Relative Market Share Among Hyperscalers for Generative AI Platforms (%)



Source: J.P. Morgan Research.

Key Takeaways

- This chart takes the data on the prior page and removes the on-premise / private cloud category to show relative public cloud market share.
- We show the data this way because it is aligned with the gravitation of workloads into public cloud, it shows where a vast majority of Generative AI activity will occur, and it eliminates the issue of substantial vendor fragmentation within the on-premise / private cloud category.
- To the extent Microsoft is able to preserve some of its early mindshare lead in the Generative AI market, it is possible that it will experience spillover benefits into other product lines such as Azure, Office 365, Dynamics, GitHub, Security, Power Platform, among others.

Software Spending (Part 1)

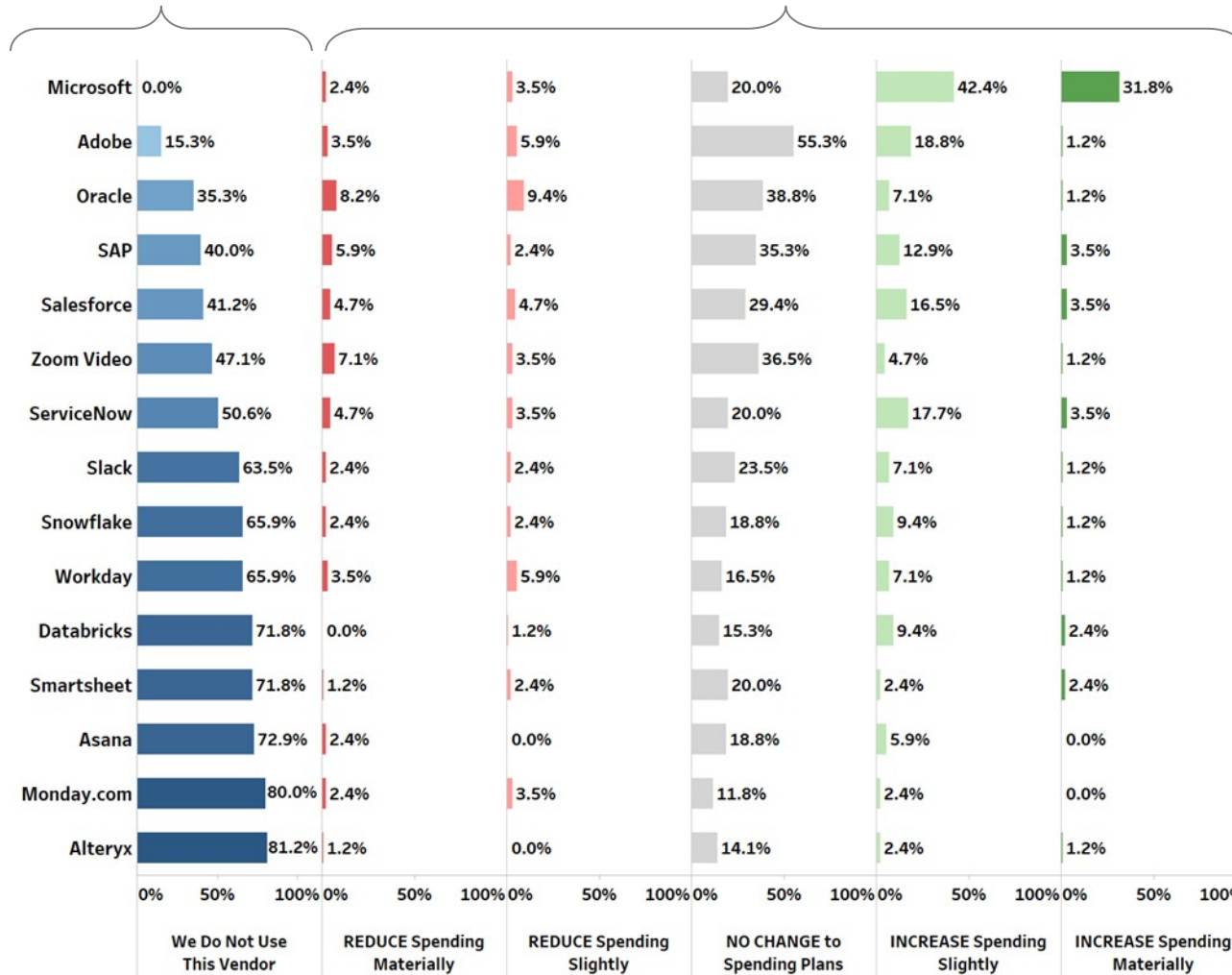
Please indicate whether the rise of Generative AI technologies will cause you to spend MORE or LESS than you otherwise would have, with the following companies:

Spending Plans (% of Respondents) (N=85)

Column displays percentage of respondents who do not use vendor

Columns indicate installed base spending impact due to GenAI

Key Takeaways



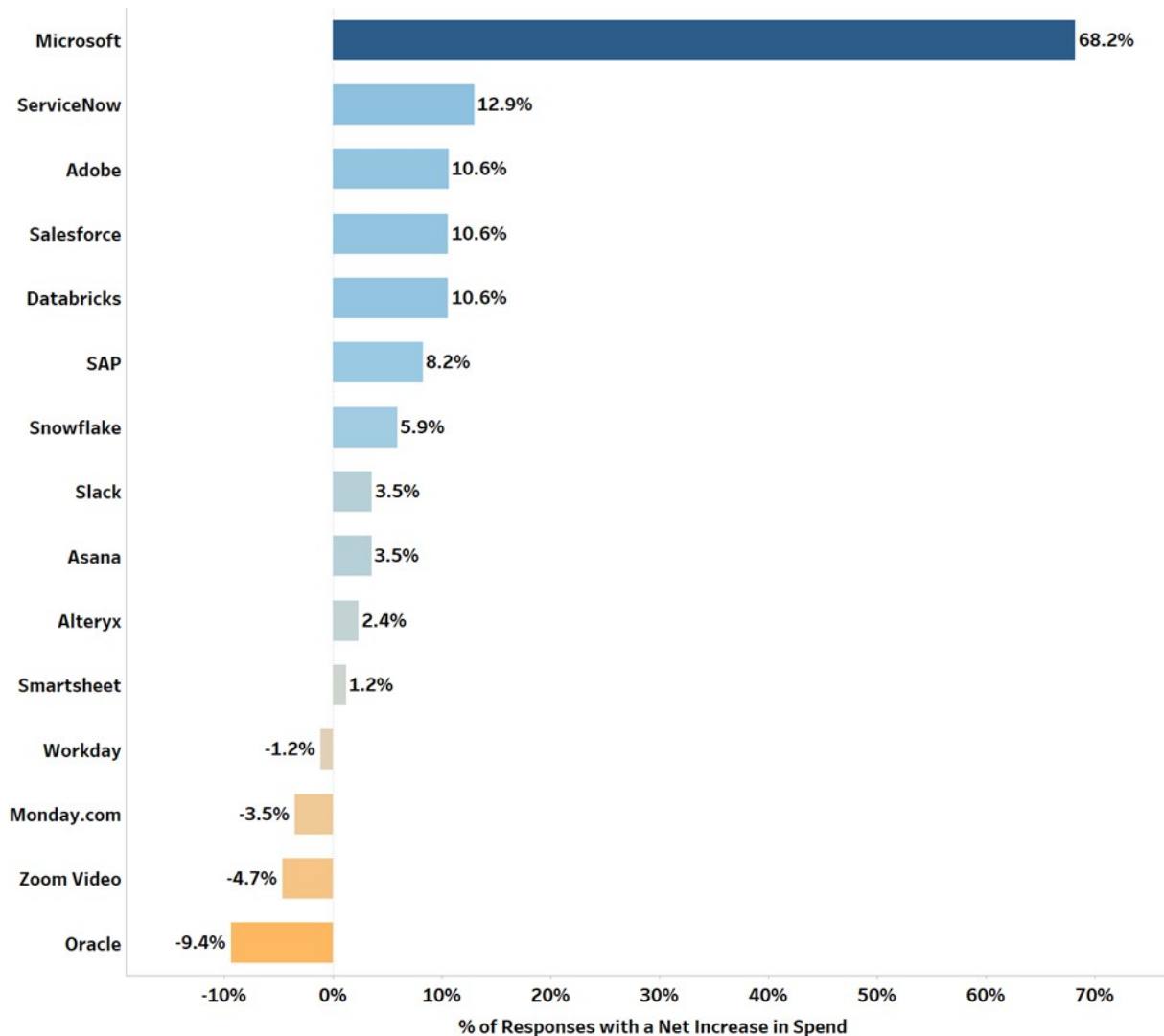
Source: J.P. Morgan Research.

- This chart ranks larger, more heavily adopted companies toward the top and earlier stage companies at the bottom.
- The bars shaded green depict the percentage of total CIOs (n = 85) who indicate Generative AI technologies will cause them to spend **more** on each representative software company.
- The bars shaded red depict the percentage of total CIOs (n = 85) who indicate Generative AI technologies will cause them to spend **less** on each representative software company.

Software Spending (Part 1)

Please indicate whether the rise of Generative AI technologies will cause you to spend MORE or LESS than you otherwise would have, with the following companies:

Net Percent of Respondents Indicating Expected Increases in Spending by Company



Source: J.P. Morgan Research.

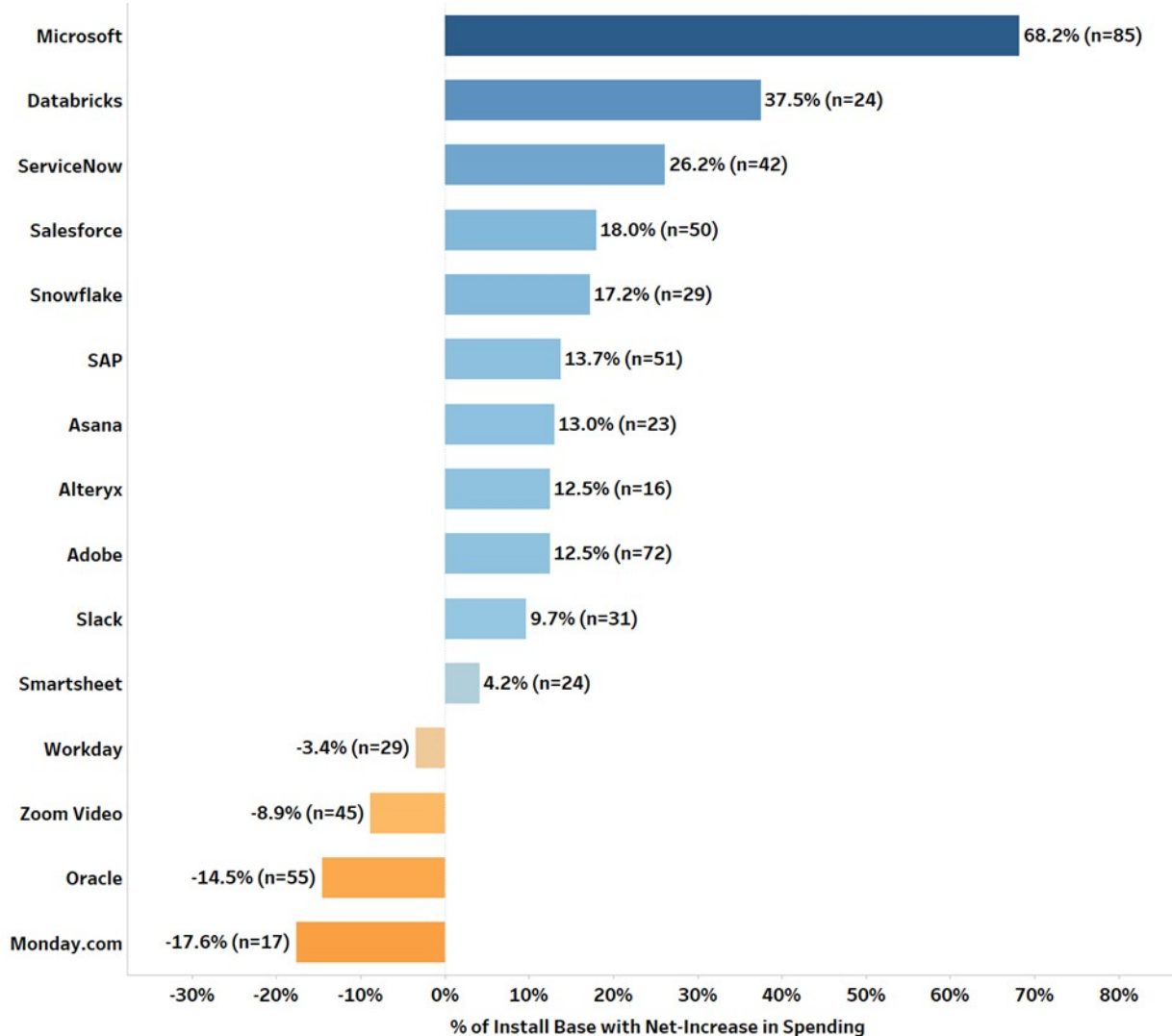
Key Takeaways

- This chart depicts the **net** percentage of total CIOs who plan to increase spending with each listed company due to the rise of Generative AI technologies; **based on n = 85**.
- For example, for Microsoft ~74% of CIOs (or 63) expect to increase spending, whereas ~6% (or 5) expect to decrease spending due to Generative AI, for a net total of +68%.
- **Microsoft, ServiceNow, Adobe, Salesforce, and Databricks enjoy a double-digit percentage of total CIOs increasing spending, whereas Oracle and Zoom Video appear less favorably.**

Software Spending (Part 1) – Installed Base

Please indicate whether the rise of Generative AI technologies will cause you to spend MORE or LESS than you otherwise would have, with the following companies:

Installed Base % with Net-Increase in Spending



Source: J.P. Morgan Research.

Key Takeaways

- This chart depicts the percentage of each company's **installed base** expected to increase spending with that company, due to the rise of Generative AI.
- Thus, the size of each company's installed base varies, so n ≠ 85 (with the exception of Microsoft).
- For example, a total of 42 out of 85 CIOs currently use ServiceNow. Among them, 18 are increasing spending and 7 are decreasing spending due to Generative AI, for a net total of 11 out of 42 increasing spending, or 26%.
- Keep in mind the data is less meaningful for two of these companies (Alteryx and Monday.com) due to small sample sizes where n < 20.

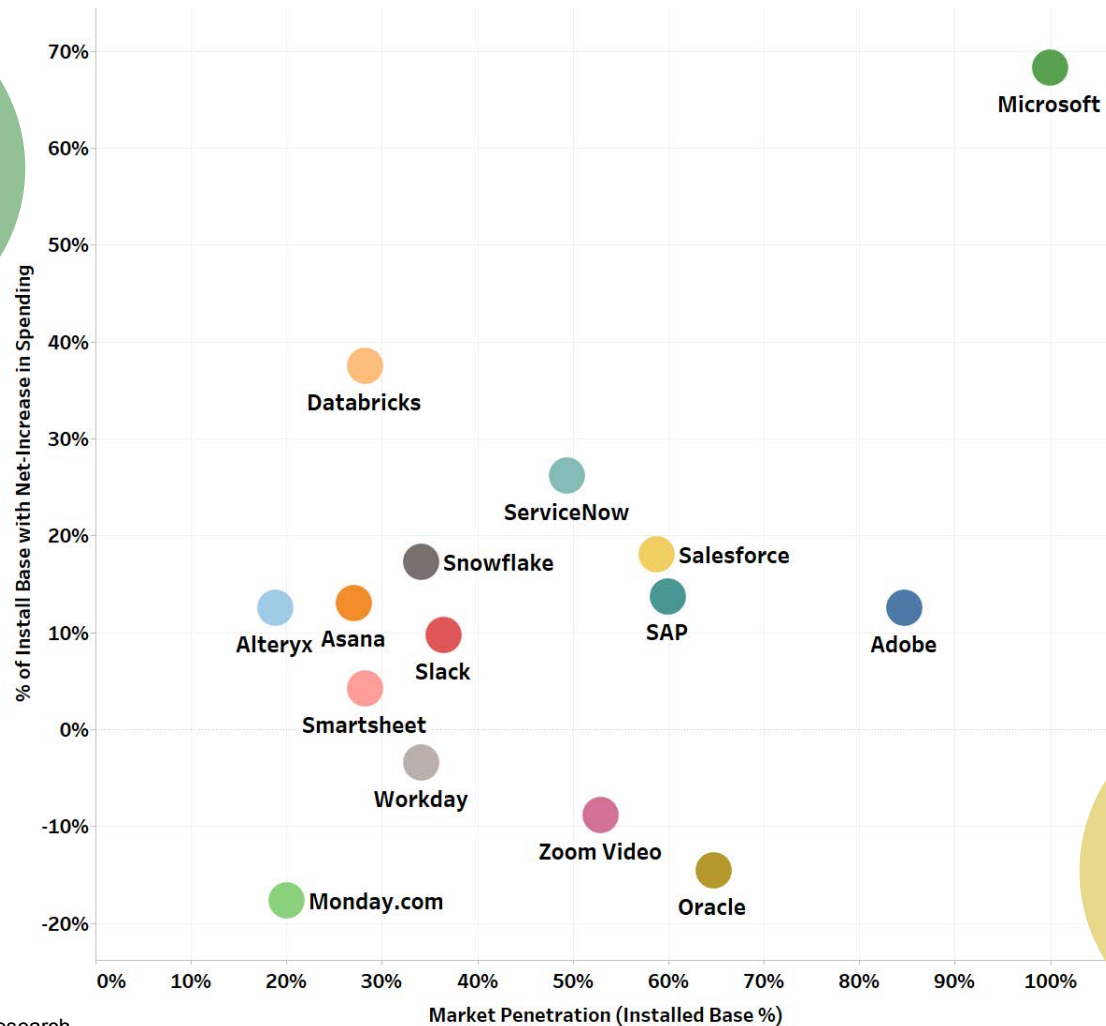
Software Spending (Part 1)

Please indicate whether the rise of Generative AI technologies will cause you to spend MORE or LESS than you otherwise would have, with the following companies:

- This chart depicts an overlay of market penetration and installed base net increase in spending plans due to GenAI by vendor.

Software Vendor Spending Plans Matrix

Companies toward the upper left of this chart may be viewed as less penetrated / earlier stage but also likely to see a tailwind from Generative AI



Companies toward the lower right corner of this chart may be viewed as more penetrated among our CIO respondents and also seeing less of a tailwind from Generative AI

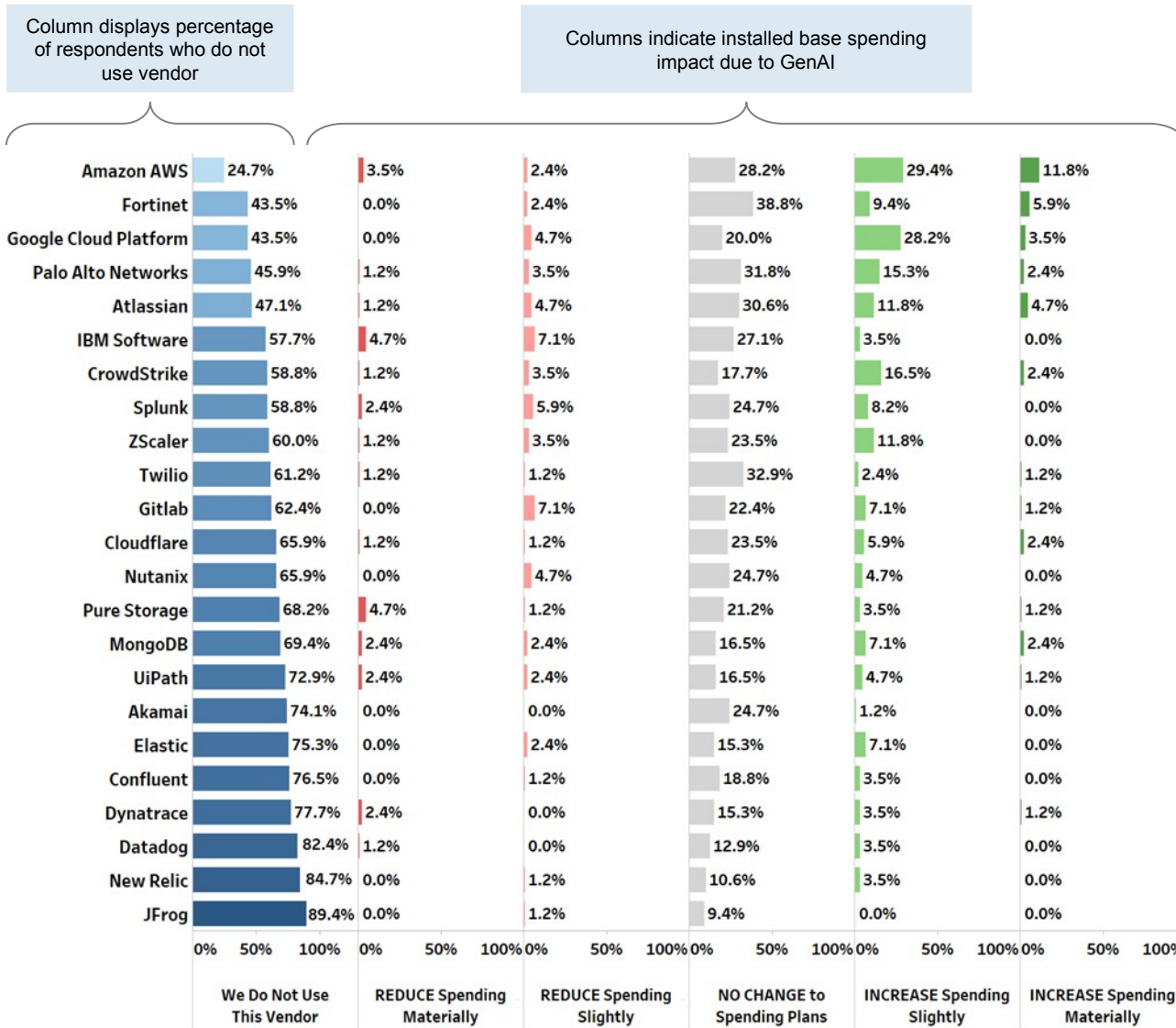
Source: J.P. Morgan Research.

Note: Indications with smaller sample sizes, particularly below the 25% market penetration threshold, may be less meaningful.

Software Spending (Part 2)

Please indicate whether the rise of Generative AI technologies will cause you to spend MORE or LESS than you otherwise would have, with the following companies:

Spending Plans (% of Respondents) (N=85)



Key Takeaways

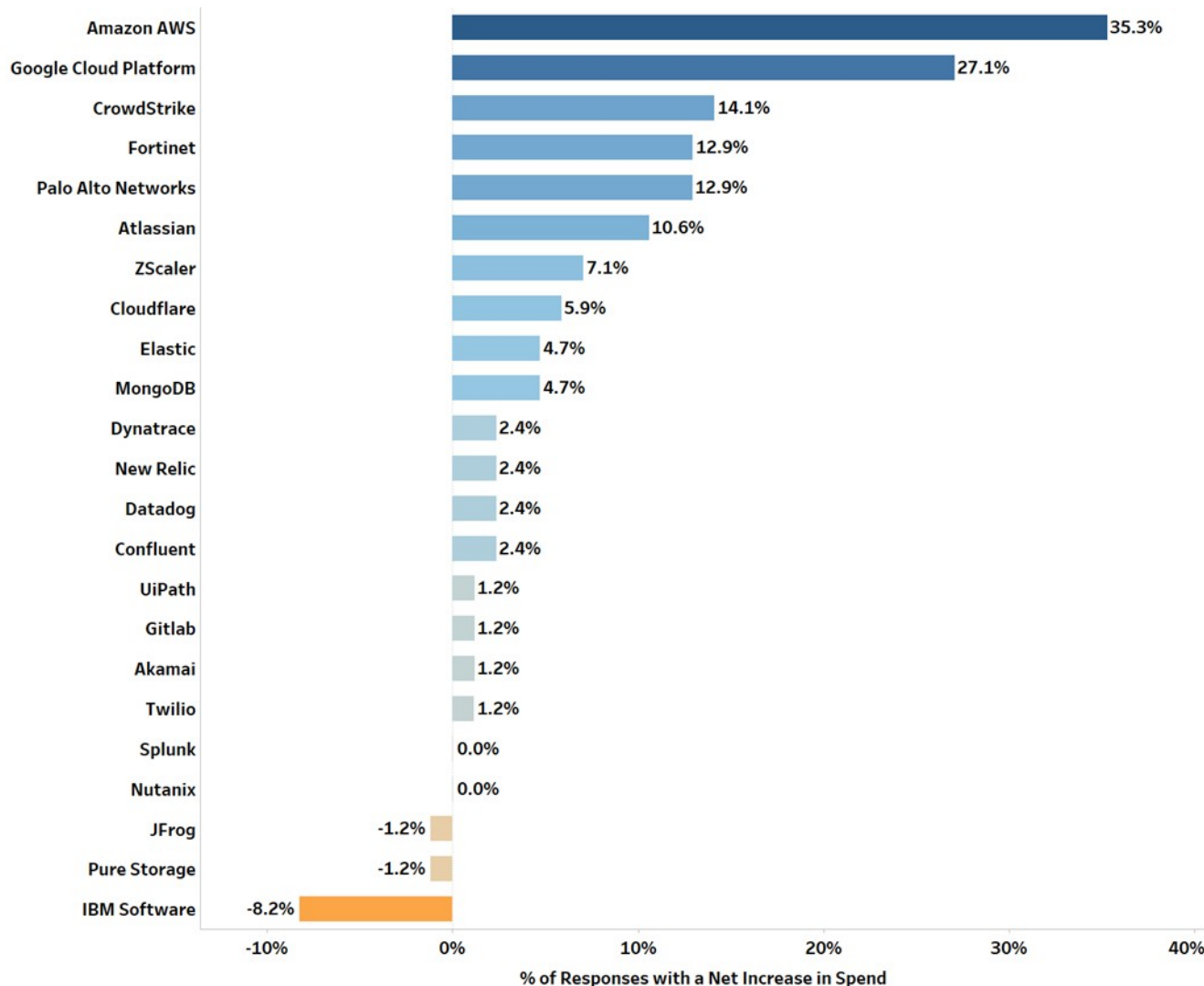
- This chart ranks larger, more heavily adopted companies toward the top and earlier stage companies at the bottom.
- The bars shaded green depict the percentage of total CIOs (n = 85) who indicate Generative AI technologies will cause them to spend **more** on each representative software company.
- The bars shaded red depict the percentage of total CIOs (n = 85) who indicate Generative AI technologies will cause them to spend **less** on each representative software company.

Source: J.P. Morgan Research.

Software Spending (Part 2)

Please indicate whether the rise of Generative AI technologies will cause you to spend MORE or LESS than you otherwise would have, with the following companies:

Net Percent of Respondents Indicating Expected Increases in Spending by Company



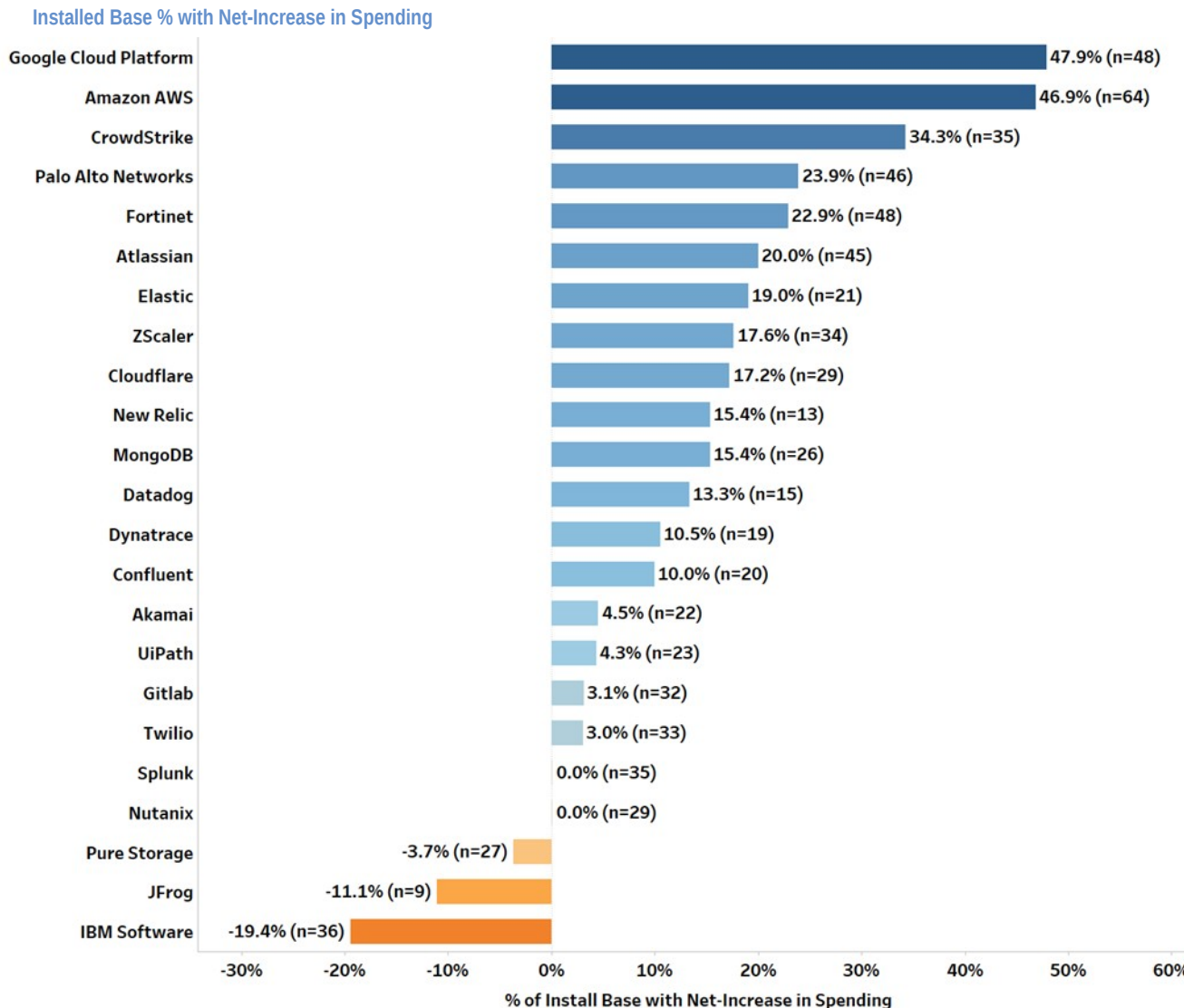
Source: J.P. Morgan Research.

Key Takeaways

- This chart depicts the **net** percentage of total CIOs who plan to increase spending with each listed company due to the rise of Generative AI technologies; **based on n = 85**.
- For example, for Amazon AWS ~41% of CIOs (or 35) expect to increase spending, whereas ~6% (or 5) expect to decrease spending due to Generative AI, for a net total of +35%.
- **Amazon AWS, Google Cloud Platform, CrowdStrike, Fortinet, Palo Alto Networks and Atlassian enjoy a double-digit percentage of total CIOs increasing spending, whereas IBM Software appears less favorably.**

Software Spending (Part 2) – Install Base

Please indicate whether the rise of Generative AI technologies will cause you to spend MORE or LESS than you otherwise would have, with the following companies:



Source: J.P. Morgan Research.

Key Takeaways

- This chart depicts the percentage of each company's **installed base** expected to increase spending with that company, due to the rise of Generative AI.
- Thus, the size of each company's installed based varies, so n ≠ 85.
- For example, a total of 35 out of 85 CIOs currently use CrowdStrike. Among them, 16 are increasing spending and 4 are decreasing spending due to Generative AI, for a net total of 12 out of 35 increasing spending, or 34%.
- Keep in mind the data is less meaningful for four of these companies (New Relic, Datadog, Dynatrace, and JFrog) due to small sample sizes where n < 20.

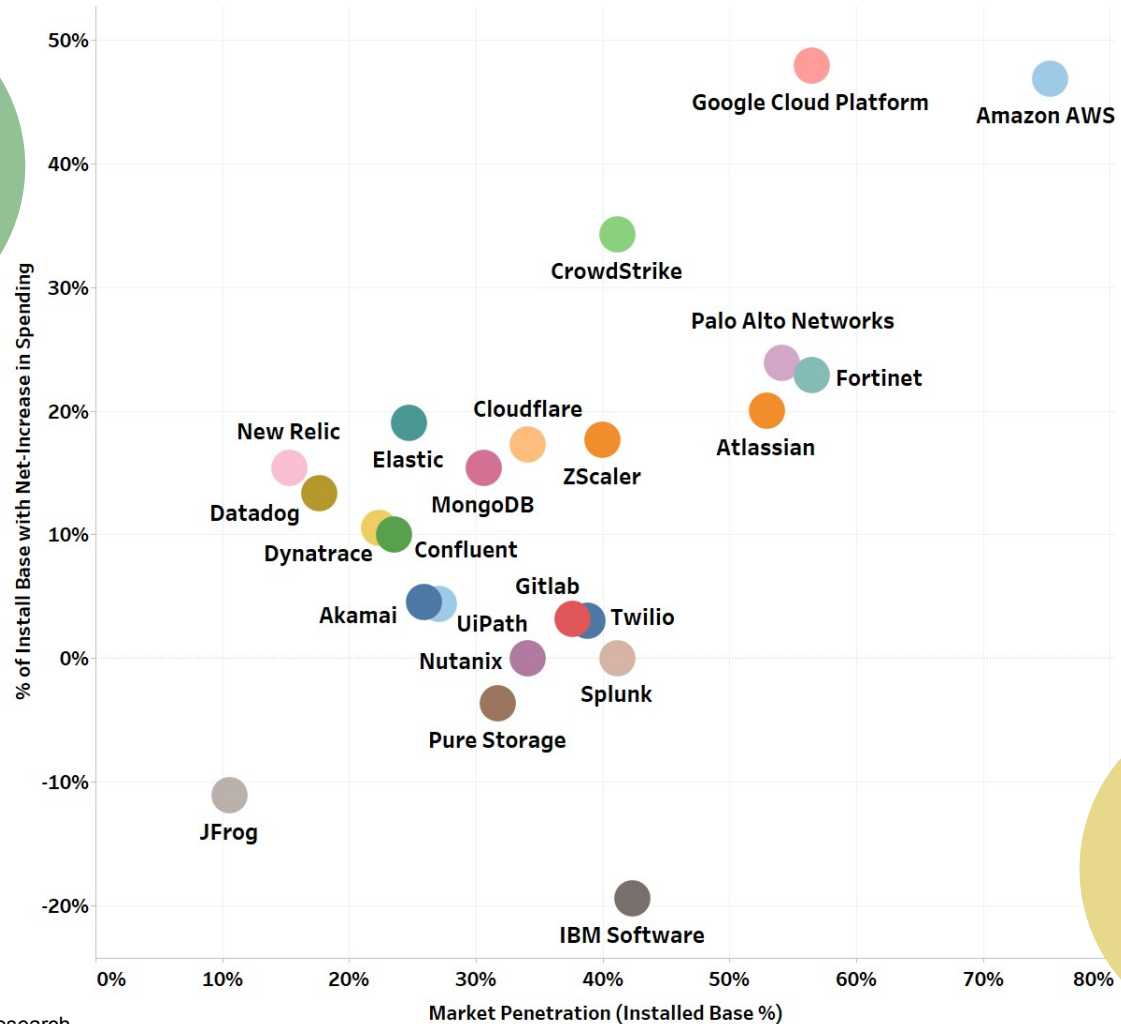
Software Spending (Part 2)

Please indicate whether the rise of Generative AI technologies will cause you to spend MORE or LESS than you otherwise would have, with the following companies:

- This chart depicts an overlay of market penetration and installed base net increase in spending plans due to GenAI by vendor.

Software Vendor Spending Plans Matrix

Companies toward the upper left of this chart may be viewed as less penetrated / earlier stage but also likely to see a tailwind from Generative AI



Companies toward the lower right corner of this chart may be viewed as more penetrated among our CIO respondents and also seeing less of a tailwind from Generative AI

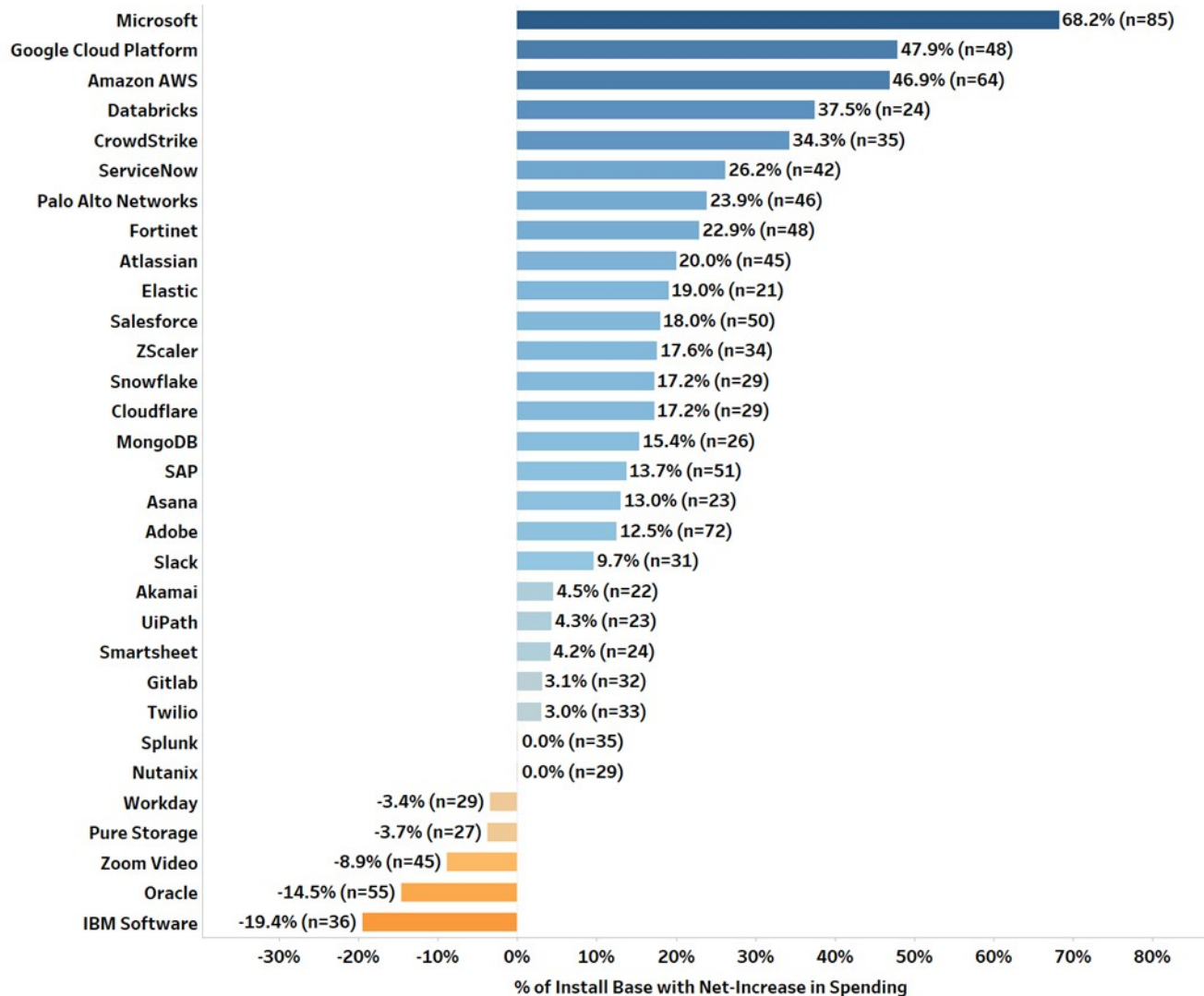
Source: J.P. Morgan Research.

Note: Indications with smaller sample sizes, particularly below the 25% market penetration threshold, may be less meaningful.

Combined Installed Base Spending Intentions

Please indicate whether the rise of Generative AI technologies will cause you to spend MORE or LESS than you otherwise would have, with the following companies:

Installed Base % with Net-Increase in Spending – Excludes Companies where n<20



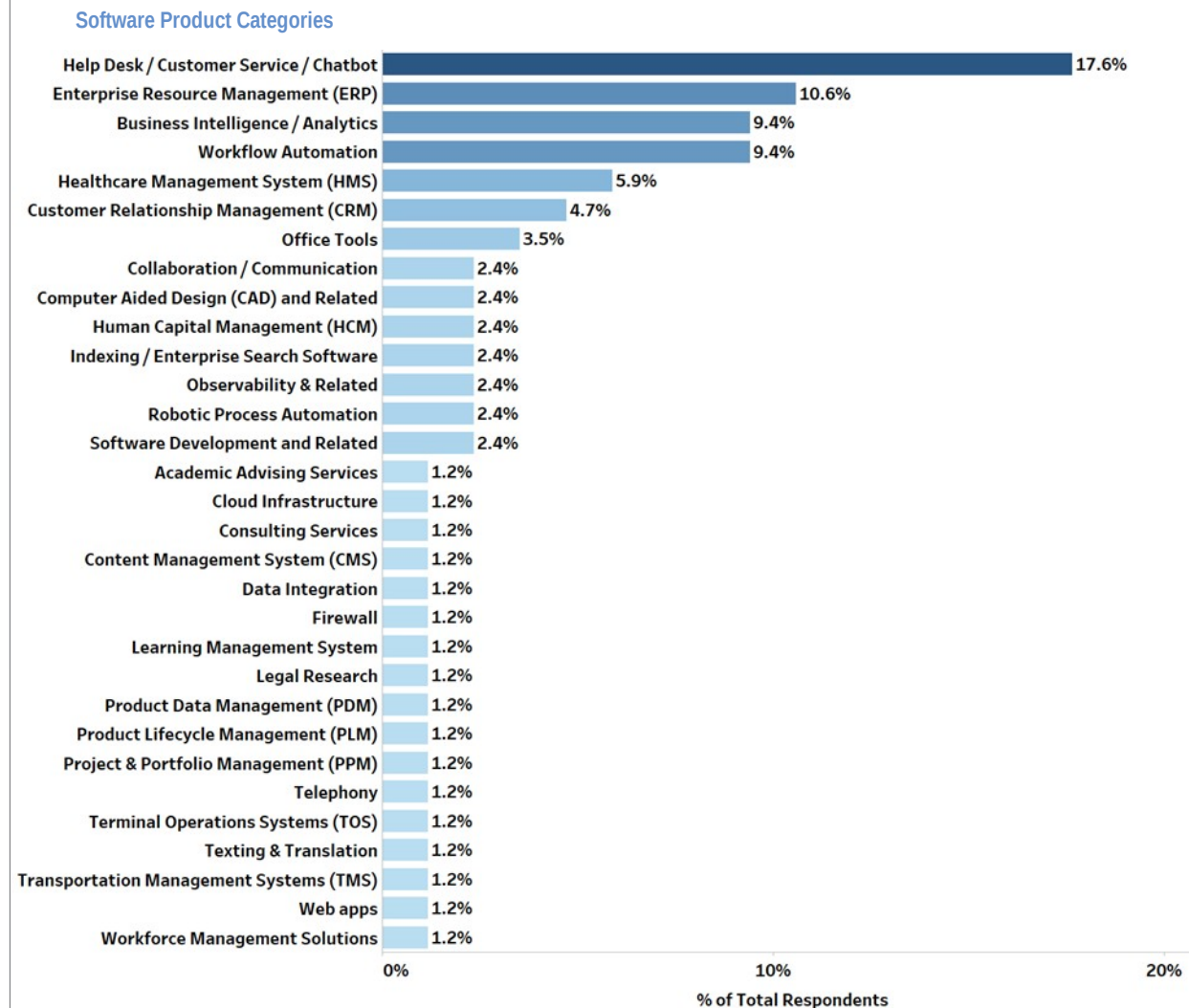
Source: J.P. Morgan Research.

Key Takeaways

- This chart combines the two groupings of software companies displayed on the prior slides, while excluding companies with a small sample size where n < 20.
- This representation of the data clearly conveys that the big three hyperscaler platforms all stand to materially benefit from the advent of Generative AI technologies.
- We also see positive surprises in the performances for key security software providers CrowdStrike, Palo Alto Networks, Fortinet, and Zscaler, and believe the indications for ServiceNow, Elastic, and Salesforce show more positively than investors may have expected.

Software Product Categories – AI Disruption Potential

Please name 1 or 2 software products within your organization's IT stack which will get *Disrupted* by Generative AI - in other words, software products for which you will consume dramatically less or require far fewer seat licenses?



Source: J.P. Morgan Research.

Key Takeaways

- This chart distills qualitative comments to reveal software categories deemed to face disruption potential due to Generative AI.
- ***The major categories CIOs cite as being ripe for disruption / innovation include Help Desk / Customer Service / Chatbot, ERP, Business Intelligence / Analytics, Workflow Automation, Healthcare Management Systems (HMS), CRM, and Office Tools.***
- ***This chart conveys how broadly and pervasively CIOs believe Generative AI technologies can disrupt or modernize a wide swath of key software systems at both the application and infrastructure layers.***
- We recommend reading the detailed comments on the following pages to gain a deeper understanding of the underlying thought processes.

Software Product Categories – AI Disruption Potential

Please name 1 or 2 software products within your organization's IT stack which will get *Disrupted* by Generative AI - in other words, software products for which you will consume dramatically less or require far fewer seat licenses?

- We think Generative AI can make big changes to some of the software products we are using now in our company. One area that could be affected first is our customer relationship management (CRM) system, especially Salesforce. Salesforce is a very important tool we use for handling customer interactions and information. But, with new AI technologies like GPT-3, we could see a decrease in the need for entering and managing data by hand. ***GPT-3 could make the process of recording customer interactions, understanding customer feelings from emails and calls, and even guessing customer behavior automatic. This could mean we don't need to use traditional CRM tools as much. Another area that could be affected is our data analysis and reporting software. Right now, we use tools like Tableau for showing data and making reports. But Generative AI could make much of the data analysis and report making process automatic. For example, an AI could look at complex data sets and create reports that are easy to understand, like a human would. This could mean we don't need specialized data analysis software and the licenses that come with them as much. These changes could lead to us needing fewer seats or licenses for these software products.*** But it's important to remember that this is a slow process. Fully integrating Generative AI will take time and will likely grow alongside these existing tools, instead of fully replacing them right away.
- Our current allocation software MID should be affected by Generative AI in the coming years. Right now, it uses tried and true allocation methods based upon historical data, however we anticipate AI to enhance the allocation selection process greatly. This technology will more than likely require us to use a different vendor as I don't this technology is on their road map for future development.
- ***Firewalls. We expect AI will 'infiltrate' other areas of the security stack and change the dependency on firewalls. Legal research. AI will change the number of sources that have to be (somewhat) manually used.*** Applying on-prem AI to our own data will allow for more thorough validation of precedents and expose data and information details that now aren't known.
- We are using a number of storage applications and policies within to move transform and perform various operations with our files, we are now evaluating these approaches as we will need data. All archiving tools not preserving meta-data stubs will be retired. Lastly looking for Market Solutions on AI penetrative testing, to retire services.

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Software Product Categories – AI Disruption Potential

Please name 1 or 2 software products within your organization's IT stack which will get *Disrupted* by Generative AI - in other words, software products for which you will consume dramatically less or require far fewer seat licenses?

- Academic Advising Systems: AI-powered academic advising systems can provide personalized recommendations for course selection, career paths, and academic support. If the system can analyze student data, including performance, interests, and goals, to offer tailored advice and assistance, **less academic advisors may be needed.**
- Hard to say now since we are still in early stages. But **I believe Workday and Cornerstone LMS will be impacted in the short/mid term. There are several potential uses cases of AI in the talent development space that can be replaced by AI.**
- We anticipate using gen AI for our code development especially translation, explanation and verification we also see a likely use case for Chatbot performance improvement. “senty” extraction, whole-conversation sentiment classification and generation of journey flows from general descriptions
- The service management tool Symphony Summit will reduce dramatically as it is a classical tool without much of an AI ability. **The new age software with Generative AI can bring in lots of value add and automation from a customer response and satisfaction perspective.**
- Freshservice (Freshworks) and Microsoft Dynamics (CRM). I do not anticipate that AI will dramatically decrease seat licenses for either, but I do think AI will dramatically change the efficiencies of our functional users of these two products by automating workflows.
- **Microsoft technology tools and office products will be highly disrupted. The overall productivity potential could be a 20% reduction in "seats", with potentially more of a reduction as the business learns how to exploit the technology more across the organization.**
- **I can't think of any software products that will get displaced as a result of AI - I see certain software becoming more useful and predictive and potentially increasing in capability but no reduction in cost per se because of the way we are traditionally licensed.**
- ServiceManager will be reduced. All the self service will eliminate a lot of the service requests to the IT team. We also have Microfocus PPM that could be reduced as we currently have a lot of workflows implemented that can be managed and resolved by AI.

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Software Product Categories – AI Disruption Potential

Please name 1 or 2 software products within your organization's IT stack which will get *Disrupted* by Generative AI - in other words, software products for which you will consume dramatically less or require far fewer seat licenses?

- ***I expect labor to be disrupted***, but I anticipate no change to the number of license suites or software agreement to decrease as a result of Generative AI. In fact, I expect the opposite. Salesforce, Slack, Adobe for sure will continue to rise.
- ***Minimal disruption anticipated in the next couple of years outside of human-to-system interaction like ServiceNow and some Workday***. No displacement, viewing this as an augmentation exercise not a staff replacement exercise. For now!
- ***Many of the data analysis tools could be disrupted depending on how good Co-Pilot is in Excel. Really too soon to see how this will impact spend on vendors except that we will most likely spend more with Amazon, Microsoft, and Google.***
- ***Usage on Qlik analytics tool for visualization will disappear. The AI stack will help big time in generating synthetic data. Also, the efforts needed for building dashboard will be totally eliminated with curated outcome of Generative AI.***
- Ideally, we will use our PLM (product lifecycle management) / PDM (product data management) products from PTC in a drastically different way with augmentation of generative AI solutions.
- Some systems like Smartsheets will be lessened but we are expecting a reduction in headcount as a result of customer service enhancements, chat functionality and chatbots.
- Nintex K2 - copilot generation of forms in MS Teams and such will move people to PowerAutomate and Forms. ***Tableau - MS Fabric will replace this due to it powerful features.***
- ***We will not be using Zoom any more as we expect Copilot to be able to handle various Teams tasks, including the creation of meeting minutes, transcripts, translations.***
- Patient scheduling will be streamlined and ability to offer new shifts for caregivers. Also, can see billing be automated as well to interface with payer portals.
- ***Some software development tools could be reduced due to AI's ability to write software code.*** This might impact Microsoft software development tools.

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Software Product Categories – AI Disruption Potential

Please name 1 or 2 software products within your organization's IT stack which will get *Disrupted* by Generative AI - in other words, software products for which you will consume dramatically less or require far fewer seat licenses?

- **Zendesk - as with the use of ChatGPT enabled AI bot, we could reduce # of human service agents and automate many standard call center queries.**
- I don't believe we will use any of our products less. Quite the opposite. I will be looking to see how we can enhance the use of our products with GAI.
- Workflow Tools (Service Now, but know they have something in works). Knowledge Bases (Service Now, but know they have something in works).
- I would say we are too early to understand all the use cases, but I assume Elasticsearch, and other indexing software will be disrupted the most.
- **We don't see any of the current products making way for Generative AI. We see Generative AI as an augmentation to the current system set.**
- Specifically, there is one area that is disrupted significantly and that is in the GitHub area for our source code. Will we need as many licenses?
- **I don't see any product currently being replaced by AI. AI will come on top, but I don't see it replacing anything in the next 1-2 years.**
- We are at the very early stages of your generative AI journey and **have not [determined] any technologies that will be disrupted yet.**
- Perhaps Cisco VoIP we would look to reduce as it could be disrupted by this AI where we could reduce our land lines.
- Encompass Technologies less WMS staffing when we install better pick solutions. Using automation to pick cases.
- **SIEM by Splunk and homegrown customer care applications used to help troubleshoot real-time customer issues.**
- The European CRM piece, as for last caller ID service management and **helpdesk areas, including HR Services.**
- We will phase out bespoke custom tools (not commercial). We will realize something which today doesn't exist.

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Software Product Categories – AI Disruption Potential

Please name 1 or 2 software products within your organization's IT stack which will get *Disrupted* by Generative AI - in other words, software products for which you will consume dramatically less or require far fewer seat licenses?

- No elimination of software products identified yet, ***perhaps the Apache Solr Search engine will be replaced.***
- As the technology matures, ***I expect reduction in the use of analysts and the associated analytics software.***
- Design iteration software and construction documents, sketch-up and Autodesk Revit/Civil3D as examples.
- TMS (Transportation Management Systems) product and TOS (Terminal Operations System) product.
- Dedalus ORBIS. Writing of doctors' letters. Dedalus Deep Unity. Decision Support in diagnosing.
- ***Help desk / service desk automated service. Recruiting screening / assessments for applicants.***
- On-premise service desk application can be replaced by application with AI functionalities.
- ***SAP and back-office applications will be disrupted by relevant AP AI driven solutions.***
- D365, Microsoft. ***Automation in AR (accounts receivable) / AP (accounts payable).***
- FAQs sections in various service areas. Gartner and other consulting services.
- License in use today for chat solution channels like Whatsapp for our agents.
- Bespoke development automation. Chatbots, Business process automation.
- SDL & Trados. Quanos Software. Translation and texting software.
- OTRS - we will change to a complete ITSM Solution with AI.
- ***I can't think of any products that will consume fewer seats.***
- ***SAP/ BW- reducing how data / reports will be consumed.***
- Salesforce commerce cloud. GA4/GA360. Linc chatbot.
- ***Asana, Slack, translation from an automation approach.***
- ***Call center software and revenue cycle applications.***
- ***TalkDesk Contact Center / Jira Help Desk software.***

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Software Product Categories – AI Disruption Potential

Please name 1 or 2 software products within your organization's IT stack which will get *Disrupted* by Generative AI - in other words, software products for which you will consume dramatically less or require far fewer seat licenses?

- We have not identified yet such software products.
- Chat bots. Knowledge base. User support tools.
- User support, chat bots, process automation.
- Bentley Microstation. Microsoft Dynamics.
- **Chatbox, RPA (Automation Anywhere).**
- Tail applications. Microsoft Excel.
- **BI Tools - Qlik and MS Power BI.**
- Splunk. Informatica. Agfa PACS.
- Apptus / Conga. Oracle EBS.
- No change in licensed seats.
- Have not gotten that far yet.
- Microsoft365, SAP, Oracle.
- AWS and Azure products.
- Power Platform Office365.
- **SAP ERP (and then S4).**
- **ServiceNow; Infor; Epic.**
- Home grown web apps.
- Unknown at this point.
- Too early to know.

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Software Product Categories – AI Disruption Potential

Please name 1 or 2 software products within your organization's IT stack which will get *Disrupted* by Generative AI - in other words, software products for which you will consume dramatically less or require far fewer seat licenses?

- Not identified yet.
- Oracle licenses.
- ServiceNOW.
- Oracle IBM.
- None.
- None.
- None.
- None.
- SAP.
- EMR.
- TBD.

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Appendix – Prior Thematic Work On Generative AI

Topics Included

- Reaffirming Our Bullish Outlier View on Generative AI
- Generative AI: Evolving at the Speed of Light Matrix
- Generative AI Risk and Opportunity Framework for Software
- J.P. Morgan Software - Generative AI Thematic Research Notes
- J.P. Morgan Software - Generative AI Thematic Investor Events

Reaffirming our Bullish-Outlier View of Generative AI

1. **Seminal moment in tech, more so than the Internet or iPhone (we stated this last year)**
2. **We were not impressed by IoT, Metaverse, Blockchain, 3D printing: GenAI is very different**
3. **GenAI is doing things today, everyone agreed were physically impossible 9-12 months ago**
4. **Evolving at Light Speed; ChatGPT capabilities are different today than 3 weeks ago**
5. **ChatGPT vastly outperforms the typical person in the Bar, LSATs, SATs, GRE...**
6. **LLMs can work in >1,200 dimensions; human beings struggle with 3 dimensions**
7. **GenAI is applying Logic & Reasoning, connecting abstract thoughts in ways that its engineers did not predict and cannot fully explain**
8. **Microsoft / OpenAI have potential for Escape Velocity, although it will become increasingly competitive**
9. **VC investments pivoting rapidly from Cloud & Crypto to GenAI; material % of Y Combinator companies are AI**
10. **At software user conferences, loudest visceral responses by far coming from GenAI code-generation demos**
11. **GPT-4-32K can understand / store a 50-page document**
12. **Potential for Massive Workforce Productivity Boom, Next 1-3 years; could affect shape of economic cycle**
13. **Potential for Mass-Scale white collar job wipeout, 4-8 years out (Customer Service, Data Entry, Content Creation, Paralegals, Teachers, Doctors, Authors, Photographers, Graphic Artists, Tax Preparers, and many more)**

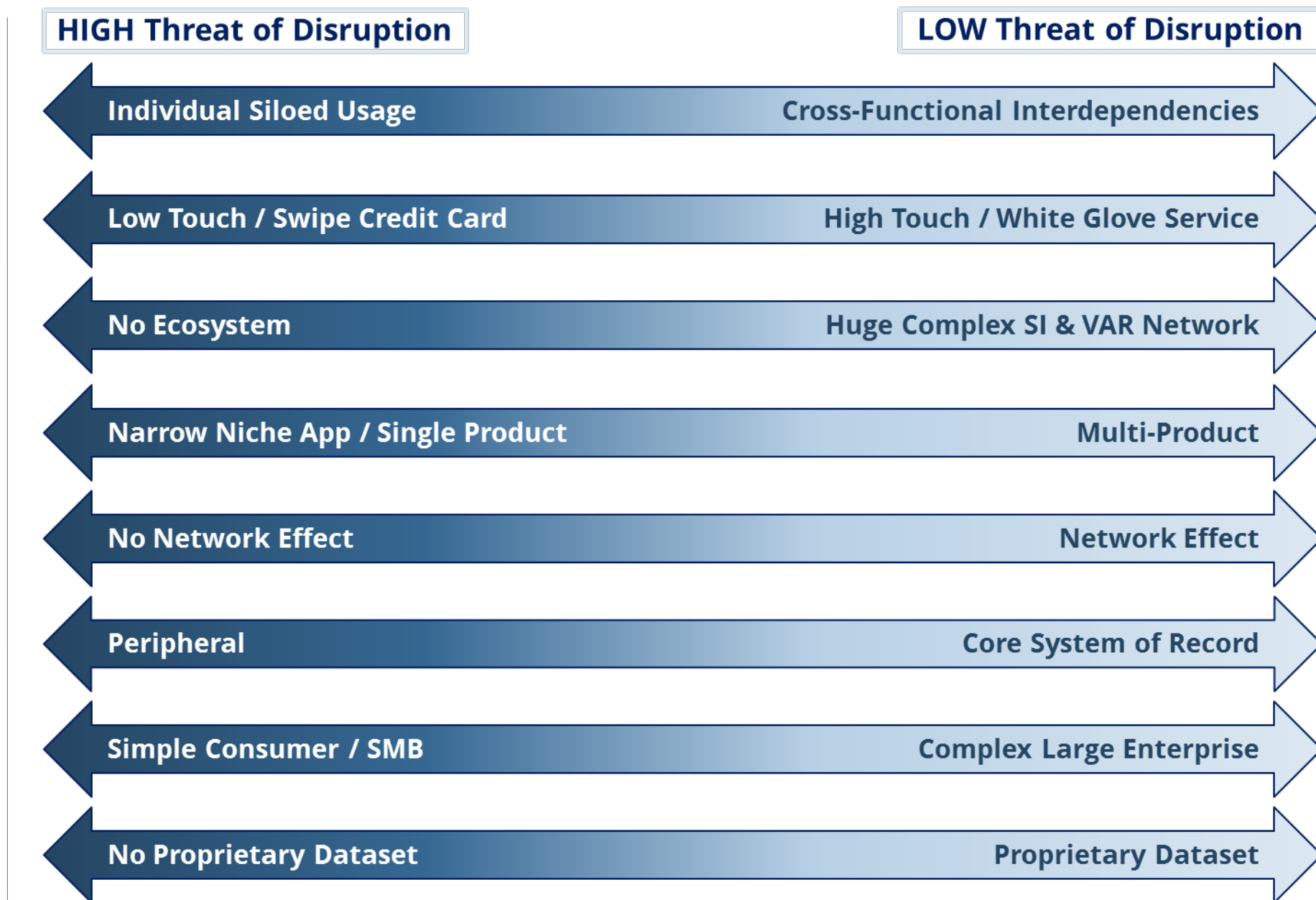
Generative AI: Evolving at the Speed of Light

	PRE - 2020	2020	2022	2023?	2025?	2030?
TEXT	Spam detection Translation Basic Q&A	Basic copy writing First drafts	Longer form Second drafts	Vertical fine tuning gets good (scientific papers, etc)	Final drafts better than the human average	Final drafts better than professional writers
CODE	1-line auto-complete	Multi-line generation	Longer form Better accuracy	More languages More verticals	Text to product (draft)	Text to product (final), better than full-time developers
IMAGES			Art Logos Photography	Mock-ups (product design, architecture, etc.)	Final drafts (product design, architecture, etc.)	Final drafts better than professional artists, designers, photographers)
VIDEO / 3D / GAMING			First attempts at 3D/video models	Basic / first draft videos and 3D files	Second drafts	AI Roblox Video games and movies are personalized dreams

Large model availability: ● First attempts ● Almost there ● Ready for prime time

Source: Sequoia - [Generative AI: A Creative New World](#)

Generative AI Risk and Opportunity Framework for Software



J.P. Morgan Software - Generative AI Thematic Research Notes

Research Publications:

- [MSFT: AI Driving Platform Transformation & Business Model Innovation, See Fast Growing Path to \\$10B in AI Business](#)
- [CRM: Trailblazing New Path for CRM with GenAI; Trust, Pricing, Open Ecosystem Key Areas of Differentiation](#)
- [Spring Series 2023 – Software: Generative AI Breathing New Life Into Software](#)
- [CRM: Partner Survey – Partners Remain Below Plan on Macro Volatility, See Strong GenAI Positioning; FCF/Sh Trending Favorably](#)
- [In Focus: Generative AI](#)
- [NOW: Minding Your Ps and Qs: AI Strategy Fleshed Out, Targets Trimmed but Not Thesis-Changing](#)
- [MSFT: AI Mentioned Not Once, Not Twice, but 50 Times on Earnings Call; Signs of Category Leadership to Outweigh FCF Pressures](#)
- [MSFT: FQ3 Partner Survey – Partners Inline with Plan as Optimization Headwind Set to Continue; AI the Next Big Battleground](#)
- [GenAI “An Order of Magnitude Bigger” Than Prior Tech Waves: MSFT Solidly in the Lead as Generative AI Evolving Rapidly; “Can Touch All Aspect of Life”](#)
- [MSFT: Moving at the Speed of AI with Launch of Copilot for Security at Microsoft Secure](#)
- [ADBE: Scaling New Summits in Design With Sensei GenAI, Firefly; Continue to Invest in Unified Platform](#)
- [March Madness 2023 – Software: Snowbound Reflections](#)
- [CRM: Partner Survey – Macro Constrains Remain Evident, But All Eyes on Margin and FCF/Sh](#)
- [MSFT: Reshaping Every Software Category, Microsoft Begins to Harvest Years of Prescient AI Investments](#)
- [MSFT: FQ2 Partner Survey – Partners Finish Inline with Plan as Sentiment Remains Muted; Security & Automation Gain Traction](#)
- [Software Outlook 2023: Winter Has Begun – The Pause that Refreshes](#)

J.P. Morgan Software - Generative AI Thematic Investor Events

Investor Calls/Events:



[Spring Series 2023 - Software: Generative AI Breathing New Life Into Software](#)



[2023 TMC Conference Takeaways: Software](#)



[In Focus: Generative AI](#)



[Generative AI Disruption Call](#)



[GenAI, ChatGPT, and OpenAI: Exploring the AI Revolution with BCG, a Partner of OpenAI](#)



[MSFT: Partners Inline with Plan as Optimization Headwind Set to Continue; AI the Next Big Battleground](#)



[AI, ChatGPT and Software Sector Implications](#)



[March Madness 2023 - Software: Snowbound Reflections](#)



[CRM: Partner Survey - Macro Constrains Remain Evident, But All Eyes on Margin and FCF/](#)
[Sh](#)



[The AI Leadership Battle \(GOOGL vs. MSFT\)](#)



[MSFT: Partners Finish Inline with Plan as Sentiment Remains Muted; Security & Automation Gain Traction](#)



[Software Outlook 2023: Winter Has Begun - The Pause that Refreshes](#)

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	Overweight (buy)	Neutral (hold)	Underweight (sell)
J.P. Morgan Global Equity Research Coverage*	47%	38%	15%
IB clients**	47%	44%	34%
JPMS Equity Research Coverage*	46%	41%	13%
IB clients**	66%	65%	53%

*Please note that the percentages might not add to 100% because of rounding.

**Percentage of subject companies within each of the "buy," "hold" and "sell" categories for which J.P. Morgan has provided investment banking services within the previous 12 months.

For purposes only of FINRA ratings distribution rules, our Overweight rating falls into a buy rating category; our Neutral rating falls into a hold rating category; and our Underweight rating falls into a sell rating category. Please note that stocks with an NR designation are not included in the table above. This information is current as of the end of the most recent calendar quarter.

Disclosures

Equity Valuation and Risks: For valuation methodology and risks associated with covered companies or price targets for covered companies, please see the most recent company-specific research report at <http://www.jpmorganmarkets.com>, contact the primary analyst or your J.P. Morgan representative, or email research.disclosure.inquiries@jpmorgan.com. For material information about the proprietary models used, please see the Summary of Financials in company-specific research reports and the Company Tearsheets, which are available to download on the company pages of our client website, <http://www.jpmorganmarkets.com>. This report also sets out within it the material underlying assumptions used.

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