PM View

Artificial Intelligence

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Marketing material

Intelligence Everywhere

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IN A NUTSHELL

- As AI begins to gradually permeate our digital lives, the investment opportunity likely will start to move towards the software and services companies best integrating AI capabilities into their services.
- True "no code" software may offer opportunity but of course disruption potential.
- Gen AI is existential for the big companies, and they are therefore not likely to slow spending near term.
- Investing roadmap/implications

The artificial intelligence (AI) journey kicked into high gear two years ago with the November 30th, 2022 release of Chat GPT, which introduced the world to a version of AI which could interact in natural language and, for the first time, perform cognitive tasks only humans could do. Since then, the level of investment, development, and hyperbole has understandably been high. But for good reason. The global digital infrastructure on which the modern mega company has been built is expected to soon be infused with human-level cognitive capability.

Adoption of AI services to date has been rapid. ChatGPT has ramped quickly to more than 200 million (M) weekly users, while Meta AI has ramped quickly with at least 125M weekly users. But it's still quite early considering 200M is a small fraction of those globally engaging with digital services.

As AI begins to gradually permeate our digital lives, the investment opportunity likely will start to move towards the software and services companies best integrating AI capabilities into their services. Opportunities should begin to emerge in companies that harness the potential of Generative AI (Gen AI) in the physical world, such as robotics and autonomous driving. Finally, AI-first companies (those for which AI is a core part of their differentiation and an admittedly harder to identify characteristic) could become a tangible investment theme.

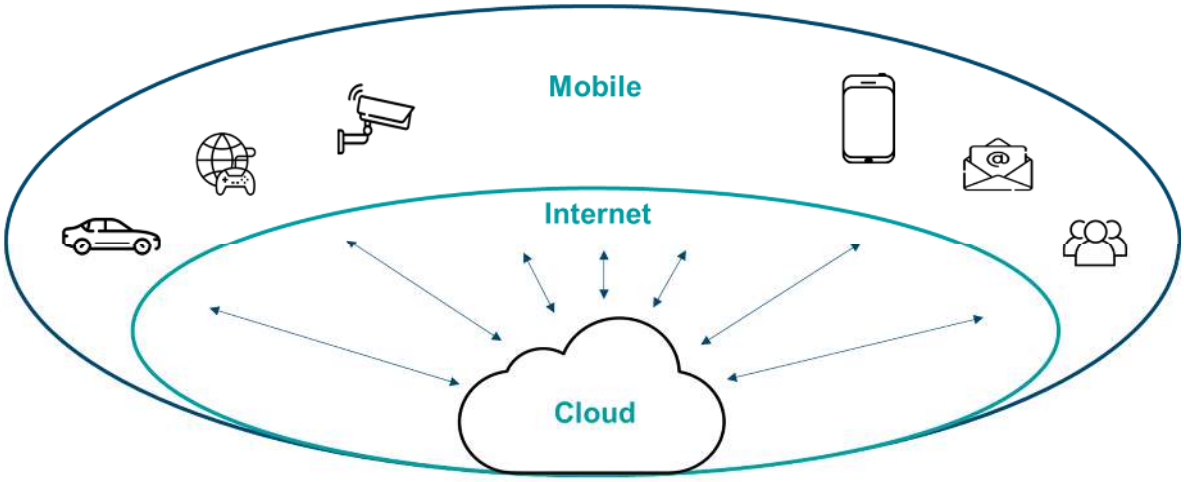
The world has moved online, information is everywhere

Of the 8.03 billion (B) people in the world, there are now more than 5.4B people on the internet, up 5 times versus 2005 (as per Statista), and even more have mobile devices. There are now more 1B websites up from 17M in 2002. And while difficult to quantify, the amount of information and data at our fingertips has dramatically increased. While the history of civilization has been a condition of information scarcity, we have clearly entered an age of information abundance, soon to be enhanced by AI.

Global digital infrastructure has paved the path for the mega company and many other growth companies

The ability to connect directly with customers in real time, do so with services never before available and do so on a highly personalized basis. This has upended industry after industry over the past 20 years. This dynamic goes a long way to explaining the ascendancy of the "mega" company, one that has created or taken over vast markets, has used digital technologies and infrastructure to do so, and has become enormous in the process.

The commonly referred to “Magnificent 7” exemplify the mega company. And for many years, they have defied the “law of large numbers” as this global digital platform has allowed them to tap into vast markets that were not considered technology or communications, such as ecommerce and transportation, financials services, education, travel and more. In many ways the global digital infrastructure has been a giant disruptive innovation. It hasn’t only helped the mega companies, many others have seen substantial growth because of this capability. There are now 49 companies, excluding the Magnificent 7, with annual revenues of at least $10B in technology and communications, and there are 29 companies in technology and communications with a market cap of at least $100B, excluding the Magnificent 7 (per FactSet as of 11/22/2024). Those numbers are even higher when considering companies technically outside of technology and communications, but which derive a material part of their competitive advantage from their global digital infrastructure.

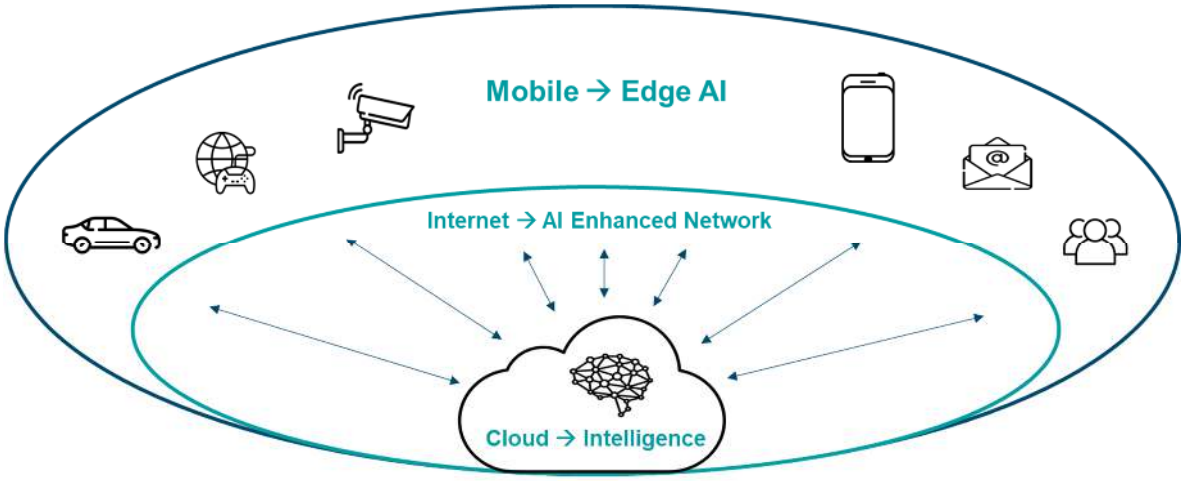


AI will extend the capability of this global digital platform

This global level of online presence has been made possible by innumerable innovations, but can be boiled down to a few big trends: *The Internet connected much of the world in ways we could never before, Mobile made it available everywhere we went, and Cloud technologies brought much of the world’s information online.* AI is the next step of this journey. Intelligence will increasingly be built into this global platform making human-level assistance a feature of most things going forward, embedded in the digital fabric**.**

Now or the near future:

- Highly capable conversational AI that can serve as a virtual storefront, customer service, tech support, or in similar capacities that humans currently do;
- Sales and service support;
- Creative tools that are drastically accelerating content creation, website development, ad copy
- Automation and data entry;
- Software development;
- Document, presentation and spreadsheet creation and or refinement;
- Collaboration;
- Speech as an effortless user interface (UI): accurate, without delay, like speaking with a human, multiple languages, real-time translation into other languages;
- Highly personalized experiences: shopping, entertainment, learning, healthcare;
- Highly detailed monitoring: healthcare, manufacturing, asset tracking;
- Increasingly capable predictive data analytics; and
- “Ambient Intelligence:” smart homes, smart buildings, smart cities, medical settings.



A bit longer term – Accelerating growth in worldwide "Intelligence" capacity

There are so many places intelligence can be embedded that the amount of "intelligence capacity" is becoming a topic of discussion. To date, the world's total capacity of intelligence (that is only things humans can do) has been derived, not surprisingly, solely from us humans and bound by our growth. But going forward our machine intelligence will add to that. Of course not all "intelligence" is the same, but there is a large range of functions that only humans currently do that can be done by an AI.

"Thought hours" is one way to think about this resource, the total amount of hours of thought available, and how much machine intelligence will add to this. Getting to a reasonable forecast of this growth requires a good deal of categorization (type of thought hours, quality of thought needed) and availability (i.e., what percent of our mental capacity is devoted to which issues/problems), and how to translate machine intelligence capacity, or tokens, to an equivalent human thought hour. We won't dive into that here, but it's reasonable to conclude that the current and planned investments in AI infrastructure worldwide will increase the rate of growth of overall intelligence capacity. This is definitively a longer-term trend, but worth considering as it also has potential to be highly productive and transformative. *In the same way a civilization's progress can be propelled and measured by its energy consumption, growth in "intelligence" capacity may one day be considered a key factor in long-range growth and progress.*

True "no code" software may offer opportunity but of course disruption potential

One of, if not the main, areas where Gen AI has been effective so far is in helping write software. Google has publicly stated that more than a quarter of their new code is produced by AI. This capability will continue to improve, and an industry aspiration of true "no code" programming, where the project is described in natural language, suddenly seems within reach, including complex projects. As Open AI's CEO/founder Sam Altman recently said, "It will be a while before Gen AI can write all the software needed for a startup, but it's within reach." Measurable impact on the software industry may not be that far off. Private fintech company Klarna said over the summer they will be using AI-generated solutions to "shut down their uses of several SaaS providers." This isn't realistic for the majority of SaaS users now, but the roadmap is coming into view. How providers and users of software/SaaS choose to adapt will be one of the most closely watched trends over the next 18 months. Will providers be fast enough to make Gen AI a key part of their offering? Will users adopt this or build the capabilities themselves? Of course software/SaaS is vast and Gen AI's risk and opportunity set is highly dependent on the markets and customers served, a one-size-fits-all investing approach is bound to miss a lot of opportunity.

Vying to be your agent

Gen AI kicked off two years ago with intelligent chatbots. We're now on the verge of large-scale availability of "agents," those that can both converse and independently carry out multi-step projects. Salesforce.com recently made its Agent Force available, Microsoft has solutions, and there are more projects in various stages of development. The concept of an agent is another level of utility. And naturally, what many companies increasingly want to be is your personal agent. To be both a big and personalized service provider is a challenge that AI can help solve. That is to say, an AI agent that has a memory of you, really gets to know you, and can help across a diverse range of activities. It's likely to start off with specific use cases, but it's easy to see how it could increasingly migrate to more general help. Key to all of this is memory – the more time you've invested with a particular chatbot, copilot, or agent, the more useful it is and the harder it is to leave, and the easier it is for the provider to expand the range of services its agent offers, and so on. Most of the big companies have this initiative in several forms (Meta, Microsoft, Apple, Alphabet) and of course Open AI and many private companies are trying here too.

Trojan horse potential

It's not hard to see a scenario where chatbots and agents become a primary, if not the primary, way we interface with digital. The more utility these AI services have, the more time we will spend with them. The more time spent with an interface, the more potential there is to monetize that, in some form, such as expanding the range of services offered, encroaching on the time spent/monetization of existing digital providers, including of course the mega companies. As one example, Anthropic has a service and Google is likely to make one available (Jarvis) that can partially take over a computer. Having that direct a relationship could in theory allow the provider to displace other services quite easily. *We do believe the level of competition between the mega companies, by and large, is now increasing.*

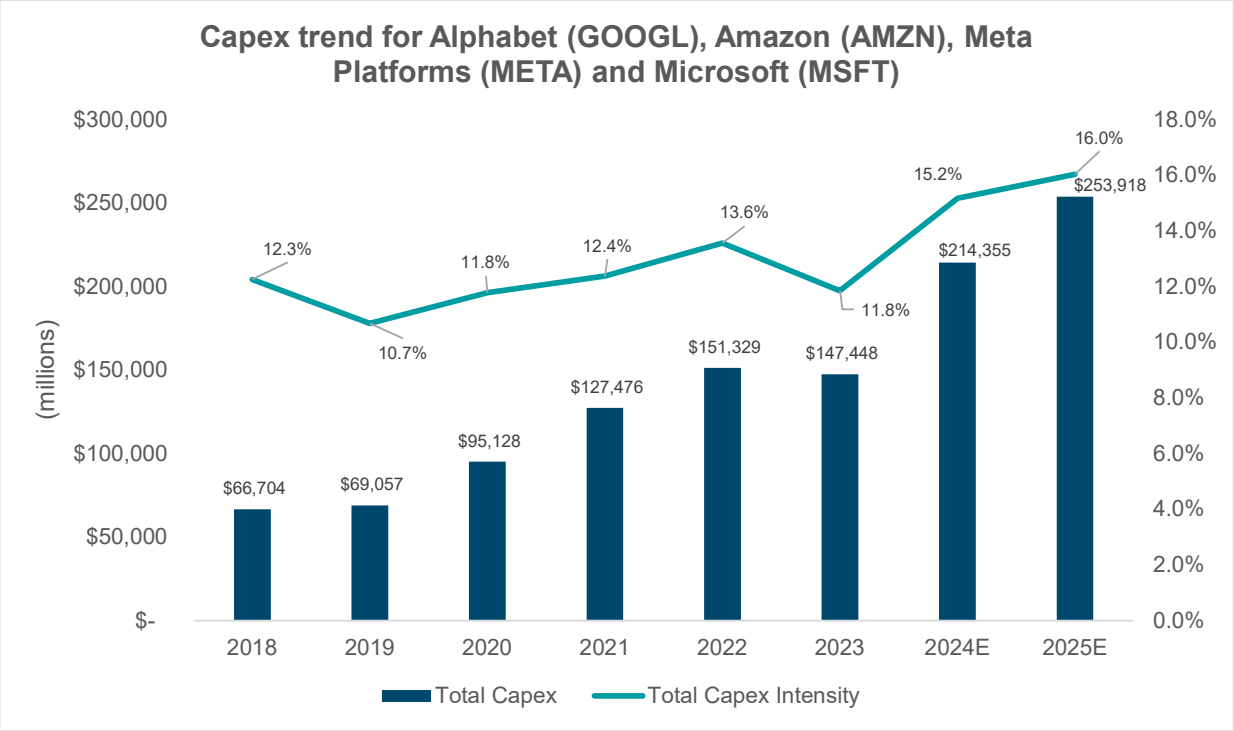
Gen AI is existential for the big companies, and they are therefore not likely to slow spending near term

The Mega companies recognize that a primary source of their vast competitive advantage is the global digital platform. Consider how different the world would be if we didn't have this infrastructure. Would these companies exist? These companies also recognize that this infrastructure is about to be turbocharged by intelligence everywhere, perhaps reshuffling the balance of industry power. They have the vast balance sheets and free cash flow to keep spending. At least two CEOs (Meta Platforms, Alphabet) have stated publicly their concerns about underspending, paraphrased, "The risk of underinvesting in AI is greater than the risk of overinvesting." So, it appears the spending by this large cohort will likely continue for at least the next few quarters. Importantly, this competitive mindset, that is the fear of falling behind in a very powerful technology, is operative at the sovereign level too. Multiple countries such as Japan, South Korea, China, Singapore, France, Israel, Sweden, Denmark, Dubai, Saudi Arabia, and others have undertaken substantial projects to build AI capacity.

We believe, to the extent there is a decline in spending on AI infrastructure over the next year, which we don't currently anticipate, it would be because of: a) Near-term overcapacity of AI infrastructure – which still appears to be significantly supply constrained; b) "Scaling" benefits of larger/smarter models slows – a robust topic of debate; or c) Lack of "monetization" of Gen AI investments – given the multitude of ways this investment is monetized, we do not currently see this as a factor.

Monetization

In 2024 the four biggest spenders on capital expenditures (capex) (Alphabet, Meta, Microsoft, and Amazon) are expected to spend $214B in capex, an increase of 45% versus the $147B spend in 2023, and a sizeable portion of this growth in capex is for Gen AI. Current expectations are that capex for this group will grow 18-20% in 2025, which is below the growth of 2024, but still a high level. So, the very reasonable question about the return on capital has become topical, especially as this level of capex is causing an acceleration in the growth of reported depreciation and amortization expense, and capital intensity is rising.



Sources: FactSet and company documents post Q3 2024 earnings reports. Past performance is not a guarantee of future results. Forecasts are not a reliable indicator of future returns. Forecasts are based on assumptions, estimates, views and hypothetical models or analyses, which might prove inaccurate or incorrect.

It's hard to tie direct/new/incremental revenue to this investment right now. But there are many ways to monetize. Consider that as users we pay literally nothing to use Google Search, social media applications, or so much of the content available online. But they certainly have a lot of profitable revenue! In software, it's common to add more and more features to new packages and to charge more. AI should fit right in with that approach. And the even harder thing to measure is how much AI improves online services. Recommendation engines are constantly being tweaked/improved and one (of many) ways is to use AI to improve recommendations in an effort to drive more engagement and therefore advertising revenue. But it's not so easy to tease out how much exactly is being improved by AI. We are not saying all AI monetization models will fit into these categories, but the important thing is that if you have audience and engagement, there typically are ways to monetize. Many of the new leaders in the technology communications sector owe their success to monetizing their large installed bases, even though it wasn't evident how they would so in the early years.

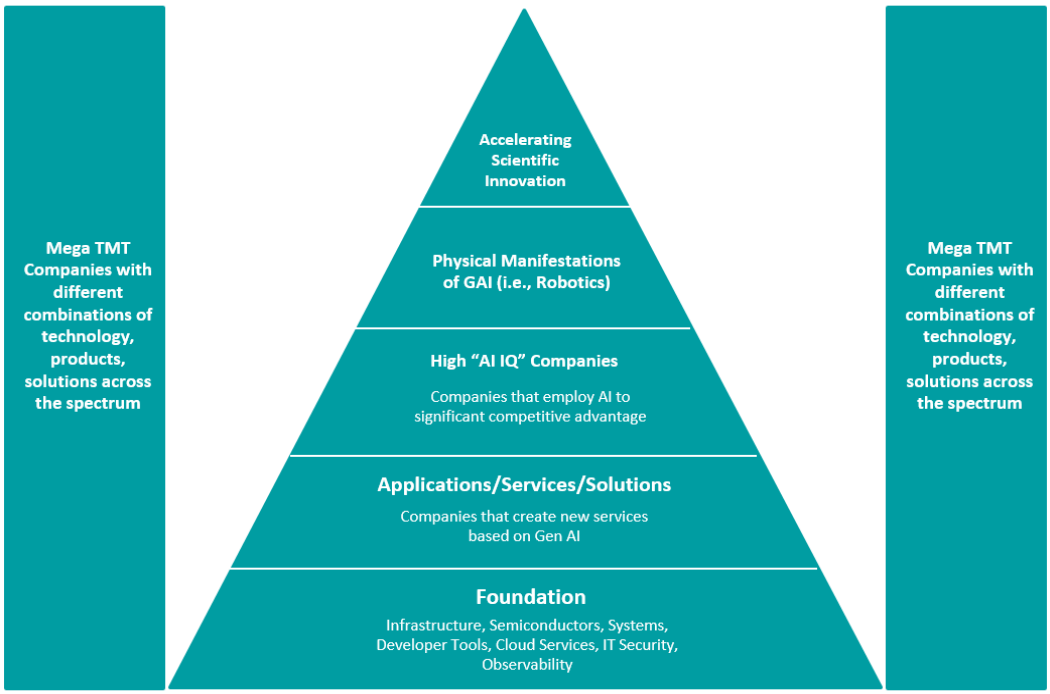
Investing roadmap/implications

We've laid out an investing framework in prior publications. It is below with the addition of "Physical AI" which includes physical manifestations of Gen AI capability. In this category is robotics, which dramatically benefit from learning by watching (what Gen AI is on a very fundamental level) rather than the prescriptive programming approach used prior to Gen AI. Autonomous driving is one example in this category.

Two years after the kickoff of the modern AI era, we are still firmly in the first phase, the buildout of AI infrastructure. That shouldn't be surprising considering how long it took for the Internet and Mobile to become ubiquitous and fast. Investment in AI infrastructure should go on for quite a while if there truly will be Intelligence Everywhere, but we also

acknowledge it isn't likely to be a straight line up, even if the long-term trendline remains up. That is to say, at some point in the next 1-2 years it's likely there will be a decline in spending on AI infrastructure. The harder questions are when will it happen, how much will it go down, and when will the spending resume, which it very likely will if "intelligence" is to be embedded in the digital world.

In 2025 there is likely to be a lot more development in the next phase, software and services, as commercially available services become more enterprise grade, and as the many technology pilots go into production and scale up. We expect there to be meaningful new incremental opportunities here, but also risks. The risk of disruption to some existing software services is high given the power of Gen AI platforms. AI-first companies, or those that can harness AI better than others, will become increasingly apparent. And accelerating scientific and technological discovery will likely start to pick up in the background, but there may not be directly investable ways to monetize at this point. Finally, as we've argued above the mega companies have much to gain, and possibly lose, as machine intelligence proliferates. How that plays out across the "group" of mega companies is difficult to assess given they are truly different from one another and address very different markets. The reality may just be more dispersion across their operating and financial performance, which is our base case expectation.



Intelligence Everywhere: Abundant change and potential opportunity

A defining feature of the technology, science, and communications groups is change. Innovation brings new ways of doing things that can be very disruptive to the status quo. Of course this can present investment risks and opportunities. Fundamental understanding and research are naturally significant assets for an investment manager in dealing with the characteristically high level of business volatility inherent in this universe. While there have been many themes over the last 30 years, since the Internet kicked off the modern digital age, only a few have been truly profound. The Internet, Mobile, and Cloud have been the biggest, and we've argued here that AI is both an extension of that opportunity, and a key and significant trend on its own. As managers deeply focused on fundamentals, we couldn't ask for a more promising situation, a large dynamic universe with Intelligence Everywhere likely poised to act as a big new agent for change and growth.

Glossary

Artificial intelligence is the theory and development of computer systems able to perform tasks normally requiring human intelligence.

Generative AI is a type of artificial intelligence that broadly describes machine learning systems capable of generating text, images, code or other types of content, often in response to a prompt entered by a user.

Capital expenditure (capex) are funds used by a company to acquire or upgrade physical assets such as property, industrial buildings or equipment.

Capital intensity is defined as capital expenditures divided by revenue.

Diversification refers to the dispersal of investments across asset types, geographies and so on with the aim of reducing risk or boosting risk-adjusted returns.

Generative AI is a type of artificial intelligence technology that broadly describes machine learning systems capable of generating text, images, code or other types of content, often in response to a prompt entered by a user.

Magnificent 7 is a group of high-performing and influential companies in the U.S. stock market: Alphabet (GOOGL), Amazon (AMZN), Apple (AAPL), Meta Platforms (META), Microsoft (MSFT), NVIDIA (NVDA), and Tesla (TSLA).

Return on capital is defined as free cash flow divided by invested capital.

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