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From FAANG to MANGOS The Reconfiguration of Technology Value in the Age of Artificial Intelligence

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Abstract – This article will explore a major shift in the valuation of technology companies by investors, engineers, and enterprises. For over a decade, the excitement in the market has been focused on the companies that could attract human attention: the ones that could get people to use social media, streaming, search and online retail, which have been popularly known as the FAANGs Facebook (now Meta), Apple, Amazon, Netflix and Google (now Alphabet). A newer grouping, dubbed informally MANGOES, is comprised of companies that make the machinery of artificial intelligence and frontier technology, such as Meta, Anthropic, Nvidia, Google, OpenAI and SpaceX. The article examines the selling shovels in a gold rush paradigm and how value is shifting from consumer-facing platforms to the companies that provide the computing infrastructure, foundation models and advanced engineering. It examines the technical means for this change, the economic forces that support it, the societal advantages and disadvantages, and the strategic blunders of the current leadership. The discussion is designed to be easily understood by the public, but also to be analytically sound. The present moment is not the end of an era, but the beginning of another, and the article provides cautious advice on the mistakes to be avoided in the coming years by savvy decision makers.

Keywords: Artificial intelligence, Technology investment, Computing infrastructure, Foundation models, market concentration, Frontier technology, Enterprise strategy, Digital economy.

1. INTRODUCTION

Financial markets have been known to boil down complicated truths into catchy jargon. A concise acronym can spread much like wildfire and for a large portion of the last decade, one such acronym was the main way to talk about technology. The term FAANG was created to describe the companies that have come to represent modern digital life like Facebook, Apple, Amazon, Netflix and Google. These companies had a similar growth impetus. Whether it was advertising, subscriptions, devices, or commerce, they were very effective at getting people to pay attention to them and making money. The longer that people are on their screens, the more valuable these companies are.

A different sort of technological revolution is now putting that logic to the test. The key question for investors and strategists has changed to “what can AI do” and especially with these large systems that are trained on massive amounts of data. The old one was easy Who is the focus of more attention. The less talked about but more important question that is now arising is: who owns the machinery which makes intelligent systems possible. A new acronym has emerged in the investment world to reflect this shift: “MANGOES” (Meta, Anthropic, Nvidia, Google, OpenAI, and SpaceX). Some of these are well-known

incumbents with a new pivot towards AI. Others are comparatively new companies that have rapidly grown and developed the tools, models, and infrastructure that the new era is based on.

The difference is important as it indicates where confidence, talent and capital are going. The old prospecting proverb is a helpful understanding of the moment. During a gold rush, it is not the miners who are searching for the next claim who make it, it's the merchants who supply shovels, picks and provisions to anyone who comes along. The biggest winners of the artificial intelligence boom could be the makers of specialized chips, cloud capacity and the models that underlie the many applications that are layered on top of them.

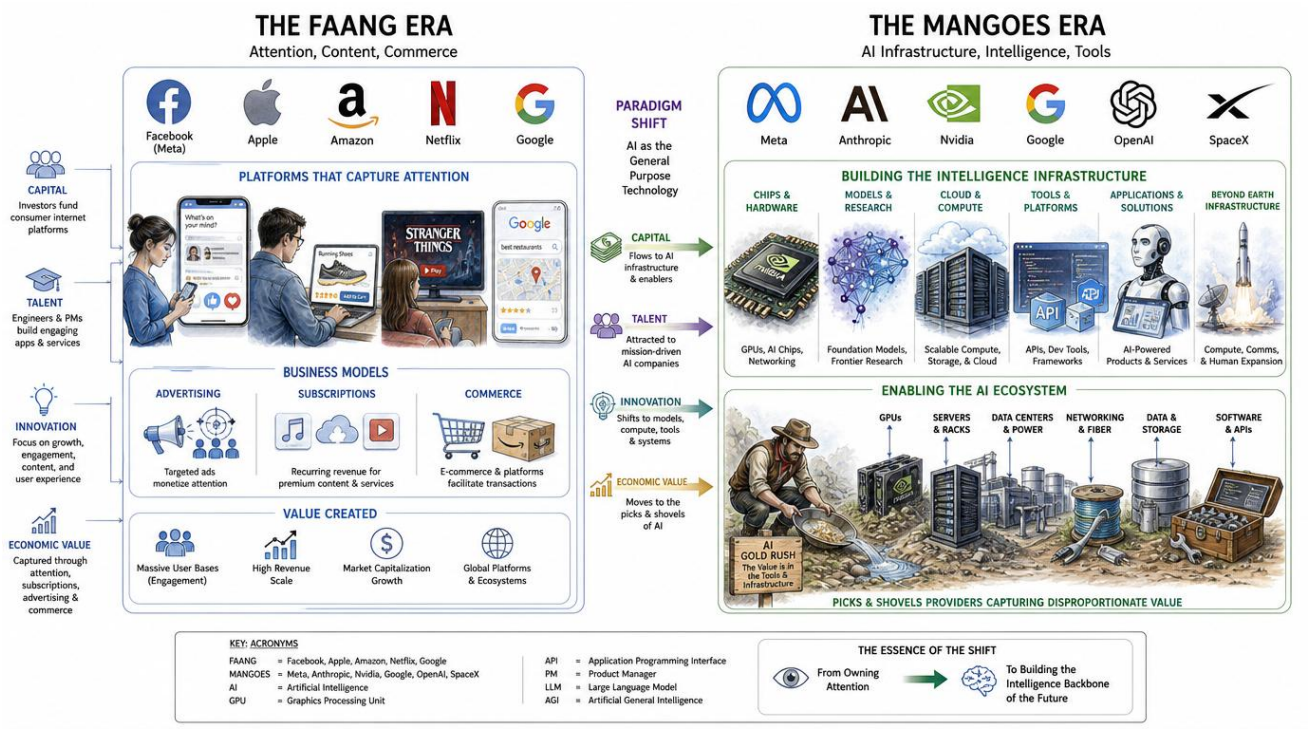

Fig -1: The FAANG Era Vs THE MANGOES Era

This article aims to do just that, and to do it in a non-technical way. It explains the technologies and the economics that has underpinned them, the advantages and dangers for society, and the mistakes that current leaders have committed en route. It's not saying that the old giants are becoming irrelevant, as some of them are still one of the most valuable companies in the world. Instead, it notes that the technology landscape is changing and what this transition implies for the regular people, working professionals and the institutions which need to adjust to a world that is increasingly shaped by intelligent machines.

2. OBJECTIVE OF THE ARTICLE

There are three aims to this article. First, it aims to explain, in layman's terms, the fundamental shift in the markets for technology, and why the perceived hierarchy of technology companies is being overturned. Second, it attempts to offer an analytical perspective of the technical and economic factors that are powering the shift from attention-based business models to infrastructure and frontier capabilities,

based on observation and not speculation. Third, it aims to provide positive and forward-looking advice, looking at some of the leadership failures in the sector, to help future business, policy and civil society leaders avoid similar pitfalls. The article assumes it's a matter of public knowledge, and that the ramifications of the age of artificial intelligence will be far more widespread than just the boardrooms and trading floors where these acronyms are invented.

3. METHODOLOGY

This is not an experimental but descriptive and interpretive approach. It combines publicly available data from corporate disclosures, regulatory filings, reliable financial reporting, technical documentation on machine learning, and well-publicized industry advancements up to the end of 2025 and early 2026. Assumptions have been made with caution as regards company valuations, capital expenditure, and market position as private companies disclose these numbers selectively and valuations may change very quickly. The article avoids false precision and uses measured ranges and qualitative description where precise numbers are uncertain.

The writing was based on three principles. The first being balance. The article does not seek to show any company, individual, nation, or community in an undue bad light and recognizes the real achievements of the companies mentioned as well as their faults. The second is verifiability. When discussing the function of technologies and or the behavior of markets, it is based on existing knowledge and not on speculation, and statements that are of a forward-looking nature are explicitly marked as interpretation. The third is access. Technical ideas are presented in a non-technical way, using analogy and simple language, this allows the reasoning to be followed by a general reader without prior technical knowledge.

As this is a rapidly changing field, the analysis is based on knowledge at the time of writing. Figures are intended to be indicative only and readers are advised to check current sources for the most up-to-date location. The goal is all along a perspective based on information, not prediction, and the conclusions are given as reasoned interpretation subject to change as events unfold.

4. FROM EYEBALLS TO ENGINES

4.1 Understanding the Conceptual Shift

The attention of humans is a resource that appeared to be virtually limitless, on which the older generation of technology champions prospered. Social networks, video sites, search engines, and online marketplaces fought each other for a larger share of each person's waking hours Attention was measurable, packageable, and marketable to advertisers, or had the potential to be converted into subscription and purchase. Users, engagement, and time spent were used to measure success. The business logic was simple and elegant and for many years, it was able to generate amazing returns. That logic hasn't been thrown away with the advent of artificial intelligence, but rather, there's a new layer underneath it. The systems that are starting to capture imagination are not only organizing information or displaying content, but they are also creating text, images, software and analysis that used to be done by humans. The creation of such systems requires resources of a very different nature. It has a lot of computing power, special hardware, large amounts of data and scarce engineering skills. The firms that provide these ingredients have a structural significance as almost every ambitious application relies on them.

That's where the conceptual change is. The shift of value is from the surface where users experience polished products to the foundations where the actual capability is produced. An attention-economy company wonders: How to keep people engaged. An infrastructure era company wants to know how to make intelligence cheaper, faster, and more capable. The two questions are similar but test different skills.

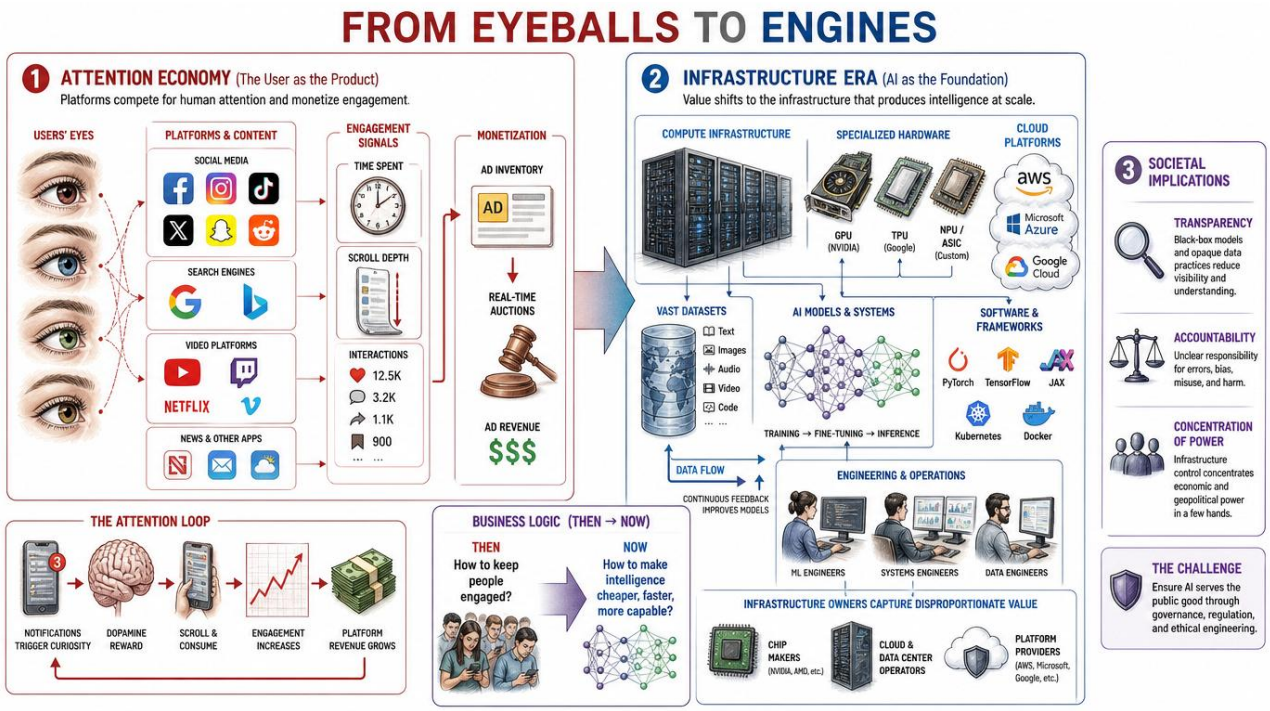

Fig -2: From Eyeballs to Engines

The takeaway for investors is that sustainable returns could lie with the owner of the rare and critical raw materials. While a consumer application can be outcompeted by a better competitor in a flash, the chips and the cloud infrastructure under thousands of applications are a bit more defensible. For the wider public, the transition is an indication of the growing influence of technologies, which are produced by organisations that most people don't have direct contact with, and which introduces new issues of transparency, accountability, and concentration of power that this article will revisit.

5. SELLING SHOVELS IN A GOLD RUSH THE ANALYTICAL LENS

The gold rush is a cliché yet one that is educational. In the nineteenth-century gold rushes, not all the prospectors who came to the goldfields were successful. Many came back worse off than they were when they went out. The profits were more likely to be consistent with the person who sold the tools, the provisions, and the transport, since he she benefited from the success of all the participants. When applied to the artificial intelligence craze, the analogy illuminates the reason behind the meteoric rise of some companies. The prospectors are the myriad startups and established companies that are in a hurry to create products that are intelligent systems. Some will be a great success; many will not. The sellers of the key inputs are the shovel-sellers. The first of these is the top designer of the specialised processors that train and run these systems, whose hardware has become so important that the commercial

success of its hardware is considered a litmus test for the entire field. It's accompanied by the cloud vendors who offer computing power to rent, and the laboratories that provide the models which are then adapted by others.

The lens has its boundaries that should be recognized. The gold rush can slow down, and shovels won't sell when it is not as easy to get the gold as originally thought. If the results of AI turn out to be less than expected, the providers of infrastructure would be hit as hard as anyone. The job has a lot of power, but it is not untouchable.

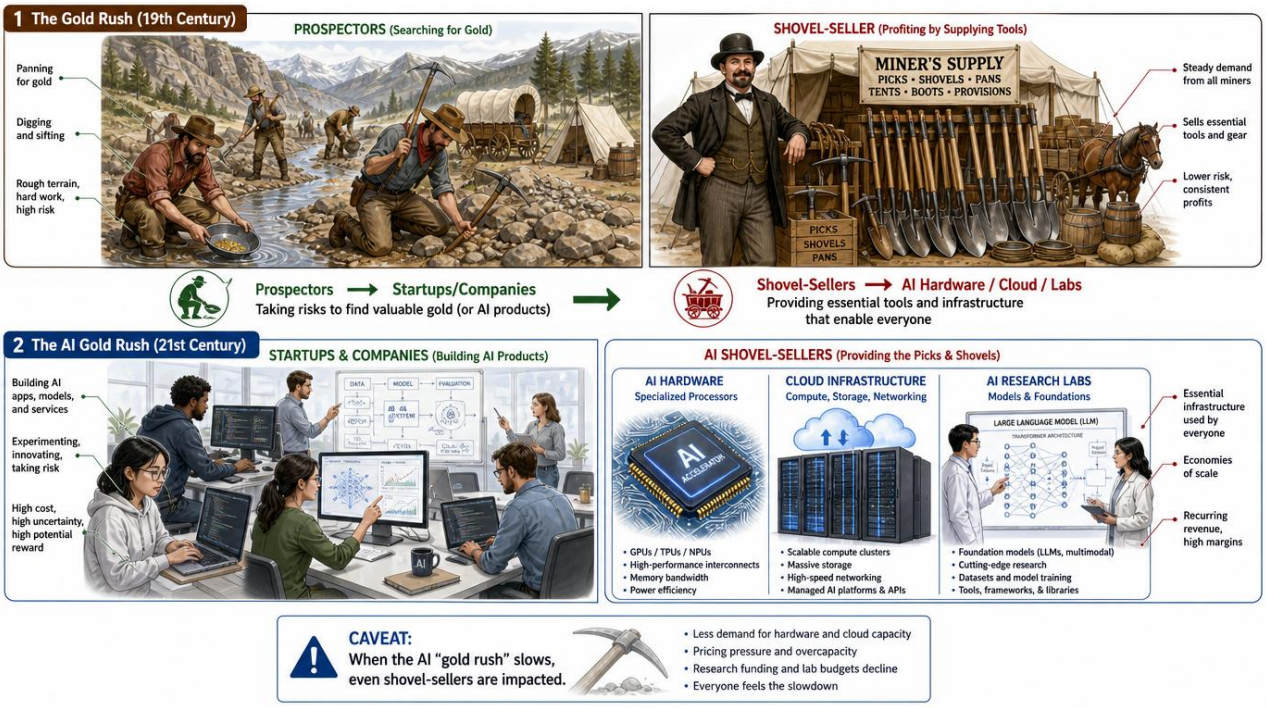

Fig -3: Selling Shovels in a Gold Rush the Analytical Lens

Nevertheless, framing is useful to understand the investor behaviour. The support of the supplier of the essential tools is, in a way, a bet on the activity rather than on any venture. Spreads the bet out over the field. That's why capital and attention has been directed to the companies that enable intelligence, not the ones that just use it, and to the newer group of companies that are builders of capability, not attention grabbers.

6. THE TECHNOLOGIES BEHIND THE TRANSITION

6.1 How Modern Artificial Intelligence Works

It's useful to first understand in simple terms what the current generation of Artificial Intelligence (AI) is doing. The essence is big models that have been trained to identify patterns in vast amounts of data. For example, a language model is fed a large collection of text and trained to the statistics of word and idea relationships. After training it can generate new text that is coherent and contextually relevant, not by recalling stored answers, but by predicting what is likely to come next, based on all that it has observed. It was made viable by a model design called the transformer, which was developed in the second half of the 2010s. Previous methods operated serially and thus were not able to capture much context and were

not very efficient in training. The transformer enabled the models to consider the importance of multiple information at once, which is technically referred to as attention. This enabled much bigger models to be trained on much bigger data sets and capability grew exponentially with size.

This means that there are three ingredients that contribute to development. The first is data, which is the raw material of patterns to be learned. The third is capacity, the amount of storage space required to store the models themselves, which can be hundreds of gigabytes. Third is talent the relative handful of researchers and engineers who know how to design, train and improve these systems. The most sophisticated research focuses on the area where all three ingredients are plentiful, and each ingredient is expensive.

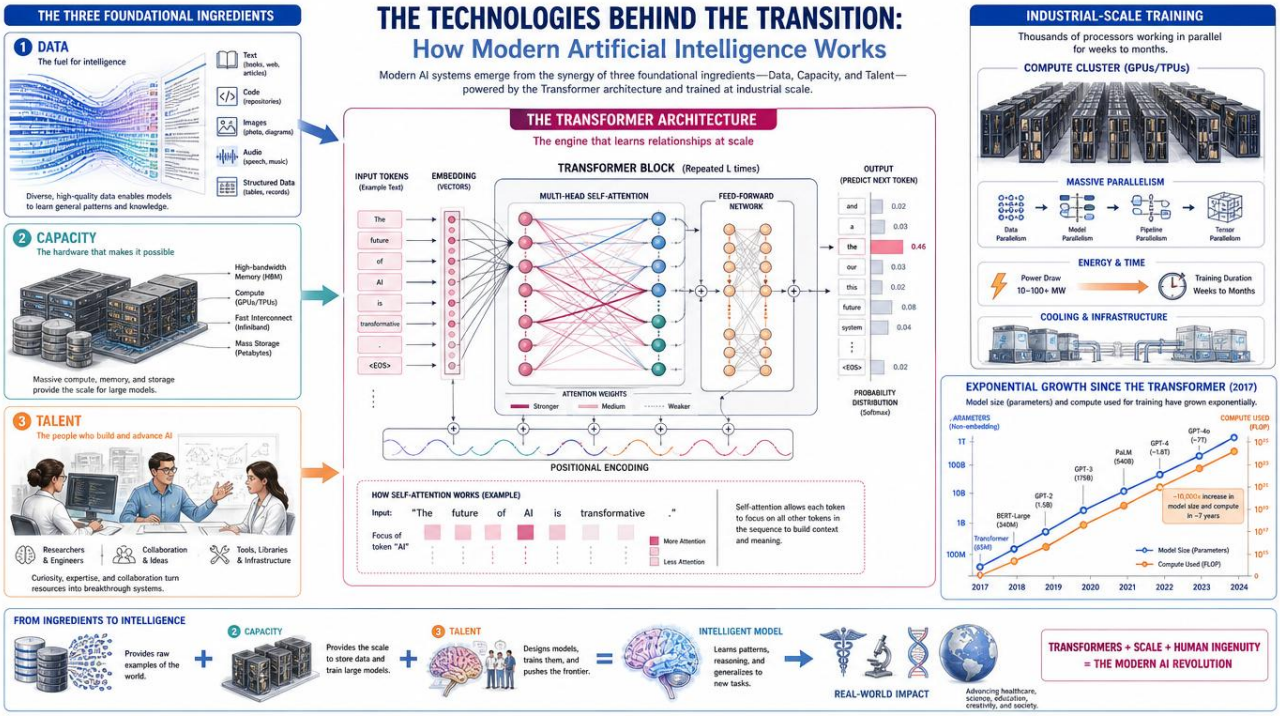

Fig -4: The Technologies Behind the Transition

This is why the infrastructure providers are important from a structural point of view. It can take thousands of specialised processors to train a frontier model, and they can be run for weeks or months, using electricity on an industrial scale. Not many organisations can afford this, hence the fact that so many applications are based on a handful of basic models and are deployed on a handful of computing platforms. Technology is transformative, but it's also very costly and that is why it centralizes power in the hands of those who control the foundations.

7. THE HARDWARE BACKBONE WHY SPECIALISED CHIPS BECAME THE NEW STRATEGIC RESOURCE

Specialised hardware is the backbone of artificial intelligence, the software is what you see, but the hardware is what makes it possible. The chips used to train and run large models are not the kind of processors that are used in a typical computer. They are designed to do a lot of mathematical operations in parallel, and that is what training a neural network requires. This specialization has transformed a class

of hardware into one of the world's most important products. This processor supplier has thus become one of the most valuable companies in the world, and at times valued at more than several trillion dollars. It is also since its position is supported by a software environment that has been adopted by software developers over many years, and it is difficult and expensive to change to other alternatives. The hardware dominance and software lock-in have created a strong position.

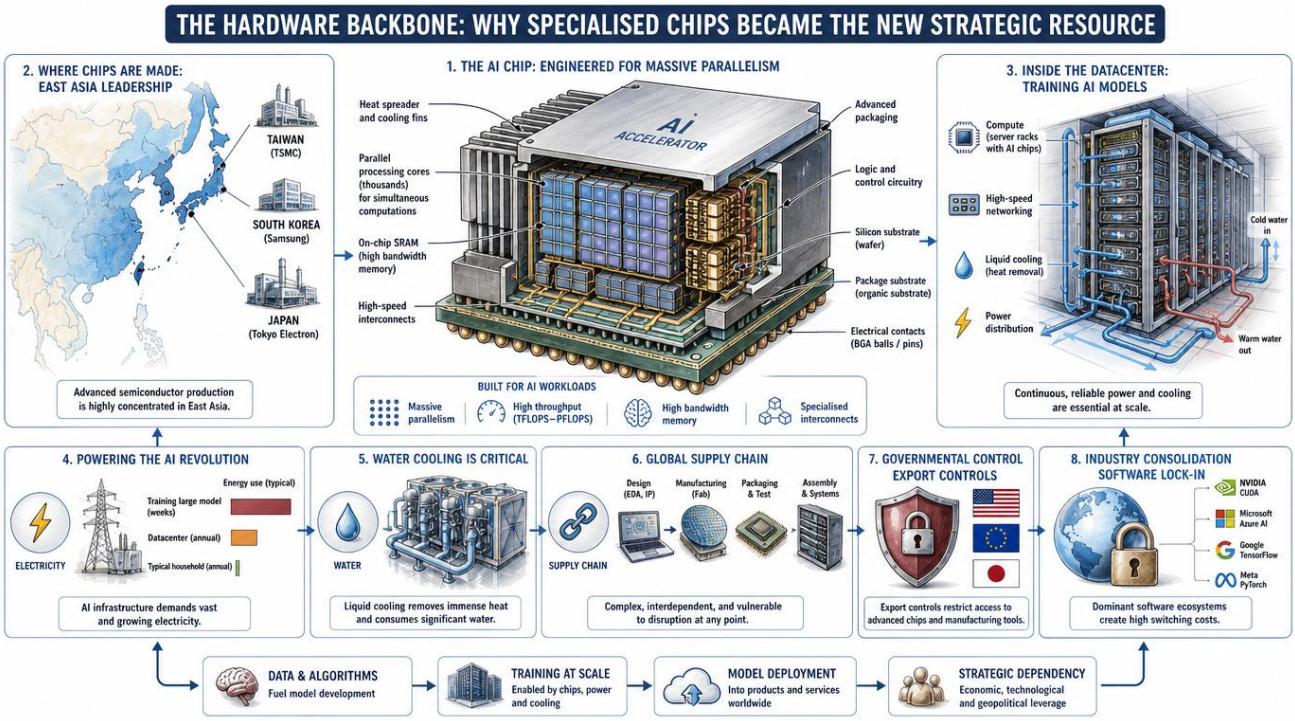

Fig –5: The Hardware Backbone Why Specialised Chips Became The New Strategic Recourse

These chips are not just important to commerce, but to strategy as well. Advanced semiconductors have become a national interest for governments, which are now implementing export controls and industrial policies to ensure supply and to prevent competitors from using them. The production of the most sophisticated chips is also highly concentrated, with just a handful of factories, mostly in East Asia, thus introducing a geopolitical element of fragility. If something were to disrupt that delicate supply chain, it would have repercussions throughout the tech industry. The takeaway for the layman is that the age of AI is grounded on a physical reality that can be easily overlooked. Many of the discussions are about chatbots and nifty uses, but all of this requires an industrial foundation of chips, data centres, electricity, and cooling. This physical dependence has real-world implications, such as significant energy use, strain on power systems and the need for water to cool things down. It also implies that the seeming magic of smart software is based on finite, contested and increasingly geopolitical supply chains, factories, and natural resources.

8. THE NEW CHAMPIONS AND WHAT THEY BUILD

Companies lumped into the newer acronym have different roles in the artificial-intelligence world, and knowing why they're grouped together sheds light on why they're grouped together. Some are well

established companies that have adapted to the new priorities; others are younger companies, which emerged with the boom.

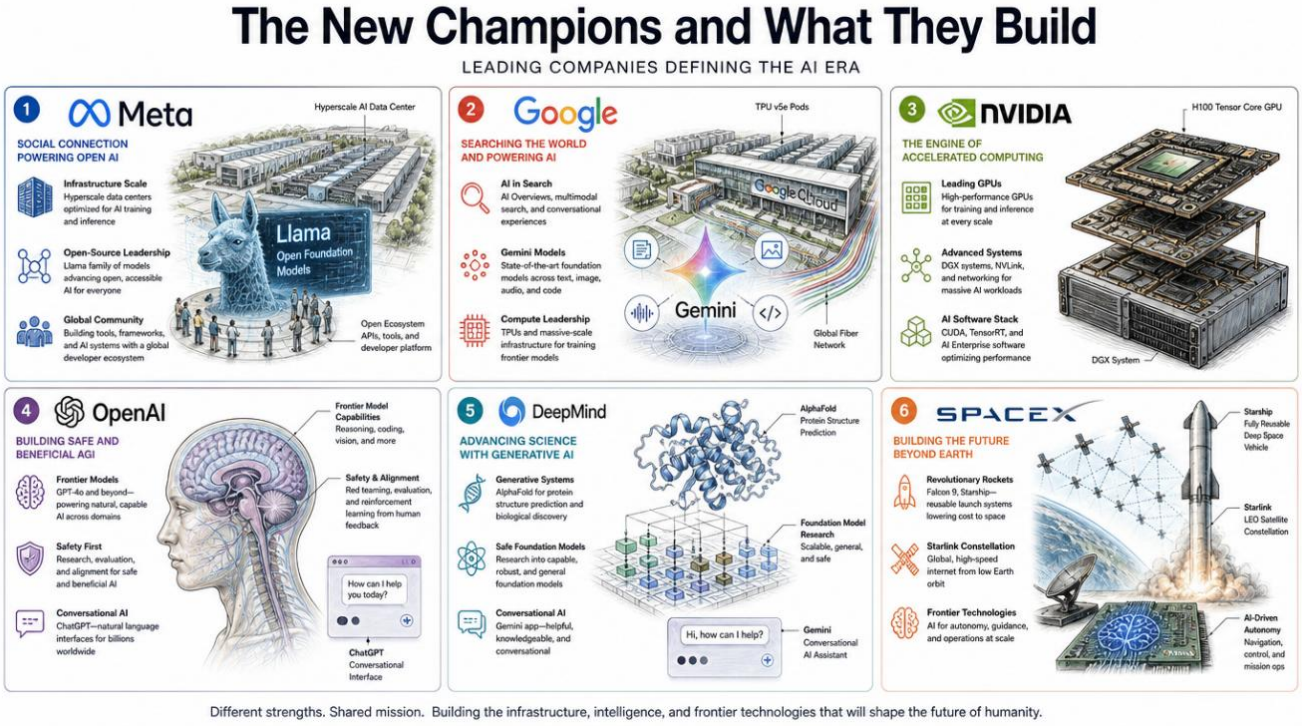

Fig -6: The New Champions and What They Build

But among the incumbents, the parent company of the biggest social networks has invested tens of billions of dollars to create sophisticated models and the infrastructure to support them, including a decision to open-source some of its models so that others can use them. A search and advertising giant that has been around for a long time, under a holding company, is trying to protect its traditional business, while pouring a lot of money into its models and computing power, and is aware of the potential for radically altering the way people look for information. Both are examples of how former attention economy leaders are trying to keep up. The top chip designer, among the best known of the new era, provides the hardware for a lot of the field, as noted above. Two well-known research institutes, one of which popularized generative systems with a widely used conversational product, and another, created by researchers with a strong emphasis on safety and reliability, have emerged as key providers of the foundation models adapted by numerous applications. Both have seen massive investment and valuations of hundreds of billions of dollars something that would have seemed hard to believe a few years ago for these young organisations.

The last one is unique, as it is not a first and foremost AI business. A business that has made its way into the grouping is one that has succeeded in the commercial space industry and is a good example of the frontier-building mentality that investors are increasingly looking for. Its supremacy in payload launching and deployment of satellite networks is just as much of a reflection of the capital hungry and ambitious engineering that typifies the overall transition. The fact that it was included indicates that the new investment thesis is not just about AI, but also about companies that are solving the most difficult technical challenges, be it in computing, robotics, or space. These companies together are a mix of

incumbent companies that have been repositioned, and companies that are new and ambitious, and not so much united by a single product as by a shared focus on developing foundational capability.

9. THE BUSINESS MODELS POWERING THE ARTIFICIAL INTELLIGENCE ECONOMY

The new champions' business models are quite different from the advertising and subscription based models of the past. The revenue from the infrastructure providers is from the sale or rental of the means of production. The chip designer benefits from the sale of the hardware to any company developing an advanced system, so it gets a general benefit from the boom and doesn't need to be successful in the specific application. The cloud platforms charge customers based on the number of resources they use and charge by the hour.

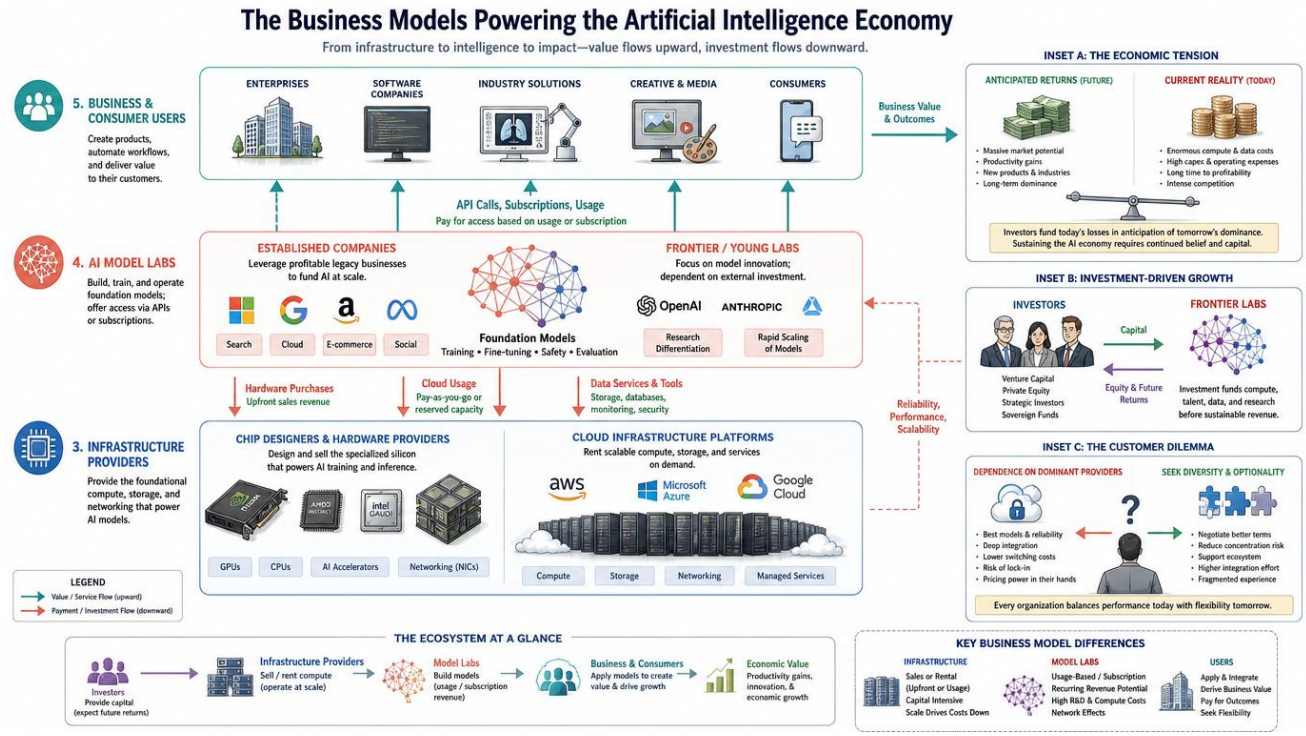

Fig -7: The Business Models Powering the Artificial Intelligence Economy

The model labs are different in turn. They usually allow access to their systems via programming interfaces, and charge developers based on the number of times their systems are used and provide subscription products directly to consumers and businesses. This is a usage-based pricing, which is in line with the revenue they wish to receive in accordance with the level of activity their models can accommodate. But it is a unique challenge for these organisations. The frontier models are very costly to train and run, and several of the top labs are not profitable but have huge investments and are running them. They are largely based on the anticipated future returns and not on current cash generation.

This is based on the expectation of the future, and this is an important tension. The companies in the grouping are established, with profitable businesses advertising or devices, for example, that finance their AI plans. The younger labs are not yet as well established financially and rely on the trust of investors. If that confidence is shaken, or if the costs of computation don't drop as much as they are counting on,

then their situation would be a lot more precarious than the numbers on their heads would indicate. For businesses that are taking these technologies on board, the business-model implications are real. The advantage of building a foundation model is that it is quick and cheap to do so, but it also means that they are dependent on a supplier whose price, terms, and availability may change. Many organisations are thus considering the benefits of just using a few dominant providers and the benefits of diversity and control. Decisions here will impact competition for years and companies providing the foundations know that they are only as secure as customers' lack of alternatives.

10. THE ECONOMICS CAPITAL, CONCENTRATION, AND THE COST OF COMPUTE

The AI era is characterized by the economics of its super-capital intensive nature. The costs of building and running the infrastructure for frontier systems are enormous and can only be mobilised by the largest organisations, or the best funded startups. The top companies are spending tens of billions of dollars per year on data centre infrastructure, processors, and power. This level of spending clearly benefits those with ample funds, and it tends to focus talent on a few players.

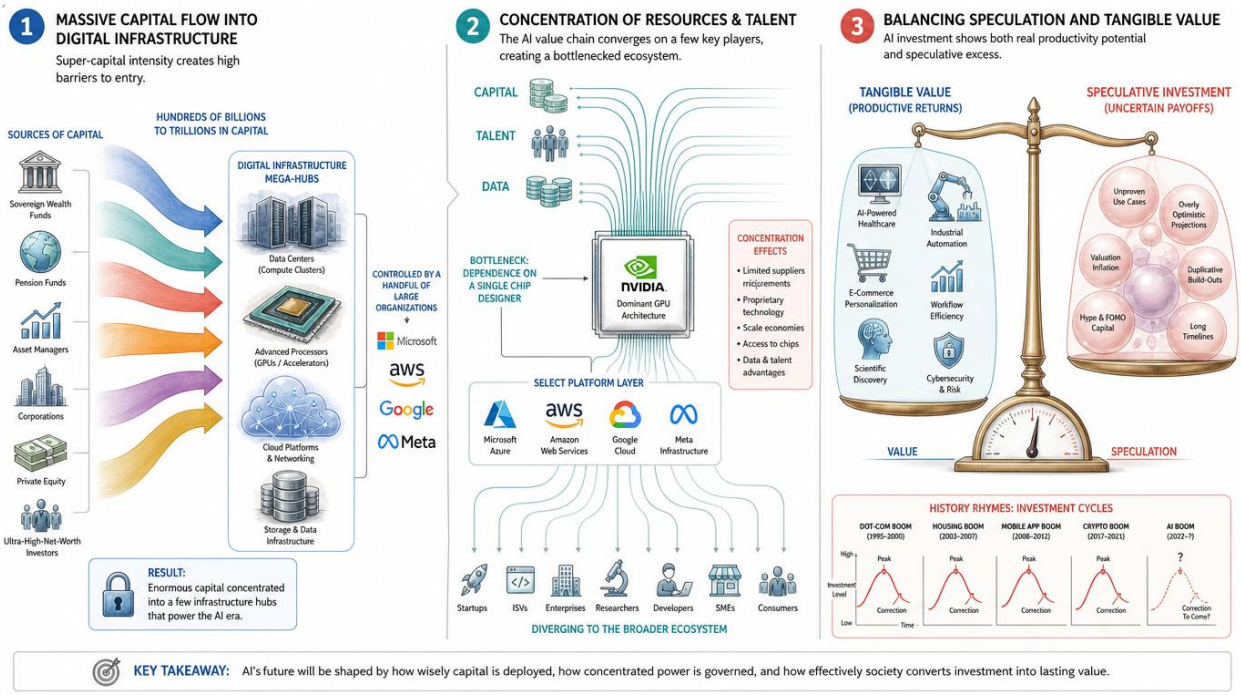

Fig -8: The Economics Capital, Concentration, and the Cost of Compute

Concentration has economic implications that should be analyzed in a cool manner. On the other hand, it allows for fast development, resources are concentrated where they can be most effective to make progress in the field. However, it does bring up some valid issues of competition, pricing leverage, and the robustness of an ecosystem reliant on a handful of suppliers. If a large proportion of an industry is dependent on a single chip designer and a few cloud platforms, an issue with any of these ripples across the industry.

Another economic aspect is the difference between investment and the proven return. There's been a huge influx of capital into space, in the hope that AI will create proportionate value in the economy.

Already some of that value can be seen in productivity improvements and new products. But a significant part of the spending now is on benefits that have yet to be fully realised. History has precedents in previous technology booms, when real long-term change was marred by overinvestment and painful correction. For instance, the internet revolution was real and permanent, but there was a speculative bubble that took place before real value was created, which destroyed a lot of wealth. That's not to say that the current frenzy is unwarranted, just that caution is advisable. Given the history of AI, the most probable scenario is that AI will be transformative in the long run, but will have its share of volatility, some dismal failures in certain sectors and a separation of the true winners from the overvalued pretenders. Technology is important, and the market is volatile: it's important for readers as investors, employees, or citizens to sort out the enduring value of the technology from the more transient excitement of the market.

11. HOW THESE TECHNOLOGIES HELP SOCIETY

But, outside of markets and valuations, the technologies at the heart of this change have a lot to offer regular people, and that should be acknowledged. Trained in biological and clinical data, models in medicine are helping to speed up the discovery of new treatments and to help interpret medical images, enabling doctors to diagnose more accurately and earlier. The work that used to take months of lab work in some cases can be narrowed and guided by computational prediction, with promise for long intractable diseases.

Fig -9: How these Technologies Help Society

In the field of education, intelligent systems can provide low cost personalised tutoring, which can adjust the explanation to a learner's learning speed and fill the gaps that cannot be solved in a class. It is an

important increase in access to knowledge for those in areas where teachers are scarce or resources are limited. In day-to-day tasks, these tools help in writing, analyzing, translating, and software development, enabling people to do more and save time for tasks that machines can't do judgment and creativity. One real benefit is accessibility. Real-time translation between languages and description of images aloud or speech-to-text systems provide opportunities for people who are not speaking the same language and people with disabilities. General scientific research is also improved, because models can sift through large amounts of literature, make suggestions for hypotheses and find patterns that a human researcher may have missed.

Those benefits are real, but they're not automatic or even, and it would be a disservice to suggest otherwise. Automation of tasks that people used to do can lead to displacement of people, as the same tools can empower them. The same systems can mislead, as they can sometimes make confident statements that are just wrong. Moreover, the advantages of this are likely to go to people who have already got good infrastructure, education, and connectivity, leaving the gap between them and less fortunate people to grow. A balanced perspective thus has two truths in it. The technologies have significant potential to improve health, education, accessibility and productivity, and delivering on this potential across the board will take some deliberate action to ensure access, disruption of livelihoods and human oversight to prevent serious consequences when errors occur. The benefits are not guaranteed but can be achieved by making the right decisions.

12. NEW PUBLIC KNOWLEDGE EMERGING FROM THE ARTIFICIAL INTELLIGENCE ERA

A less noticed aspect of this time is the change in the public perception of technology. Ten years ago, the words neural network, training data and inference were mainly used by experts. Today, these concepts are common in everyday parlance, and a general understanding of how an intelligent system learns from data and how it can sometimes be wrong has spread to a wide audience. This spread of knowledge is significant as an informed public is better able to interact with the options for these technologies provide.

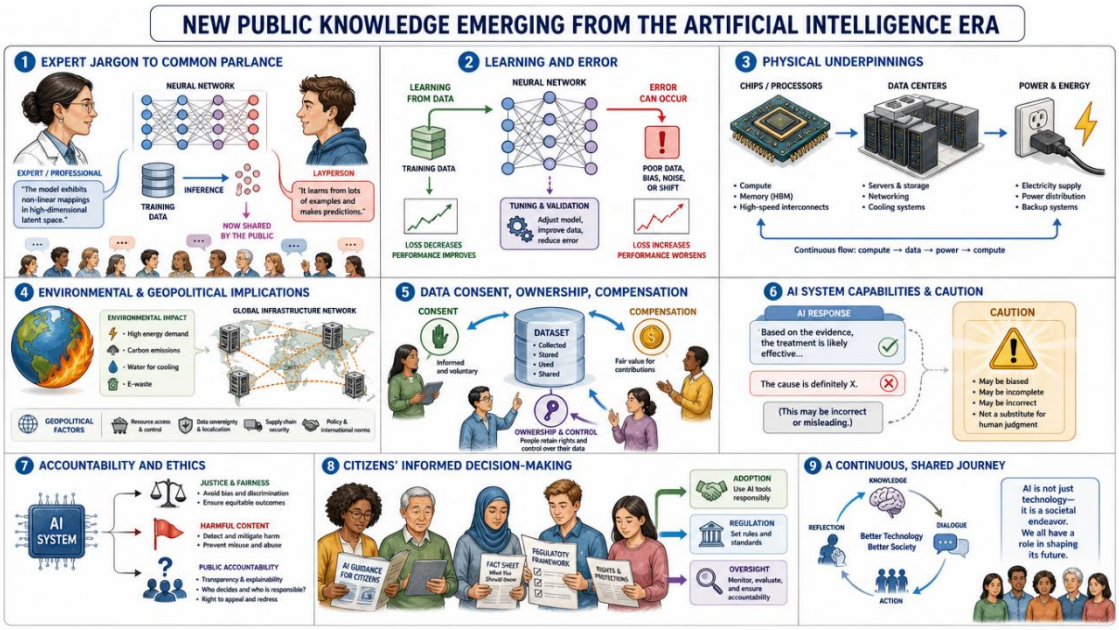

Fig -10: New Public Knowledge Emerging From the Artificial Intelligence Era

The period has also revealed some truths which were not apparent before. Many now understand that the convenience that these applications provide has a massive physical underpinning of chips, data centres, and electricity, and that it has environmental and geopolitical implications. As more people become aware of the fact that the data that these systems are trained on is derived from somewhere, it's raised crucial issues of consent, compensation, and ownership, especially since it is often the collective work of human writers, artists, and conversations. In turn, the public has been educated on the capabilities of such systems. Confident sounding but false output has become a topic of conversation and users should now be aware of the need to be cautious about information they receive from machines. This is an important lesson to learn because it helps to balance the notion that anything produced using technology is necessarily authoritative.

Perhaps most importantly, time has given rise to real questions of accountability which were easy to overlook. If there is a consequential decision in a system, who is responsible? Where lies the responsibility to prevent harmful content in models. They are not just technical issues, but social and ethical ones, and it's good that they are now in discussion, as it means that collective awareness is advancing. This is growing public awareness that will have an impact in the future. Citizens who are knowledgeable about the basics make better decisions regarding regulation, adoption, and oversight of societies. The challenge is to make sure that this understanding does not become a part-time enthusiasm or a part-time fear, but rather an informed assessment, for which smart decisions are needed.

13. WHERE PRESENT LEADERSHIP HAS ERRED IN JUDGEMENT AND FORESIGHT

A candid awareness article should not only look at the achievements, but also the shortcomings, and leadership throughout this sector and oversight have made some mistakes that need to be understood so they don't have to be repeated. These observations are provided analytically, that is, in the context of decisions and patterns, not at individuals.

One of the common errors has been the tendency to deploy potent systems quickly and then to the public without a full understanding of their actions and impacts. At times, the rush to be first has outweighed the need for careful consideration of safety, accuracy, and social impact. The predictable harm of systems generating information with confidence is that when they are deployed on a large scale, it becomes the responsibility of the user to verify the truth when they may not have the means to do so.

The second mistake was a lack of candour in respect of limitations. Marketing has at times outpaced technical reality and led the public, and even the institutions, to believe more than is justified in these systems. Don't overestimate the capability just because it looks good it can get you into situations that have serious repercussions, such as healthcare, law or critical infrastructure.

The third pattern relates to how the data that these systems are based on are treated. The creative and intellectual work of many has been utilised to teach commercial systems without their knowledge or permission, and the issues of fairness have been tackled grudgingly and at a slow pace. It's been a bit of a cop-out not to interact with creators and the public more proactively.

In terms of oversight, public institutions and regulators have often lagged and been too disjointed to match technology. Rules have often come after harms have been realised, and there has been a lack of uniformity in rules across jurisdictions, leading to confusion. This is partly understandable in the face of the rapidity of change, but it is a symptom of a larger lack of investment in developing skills in wise governance.

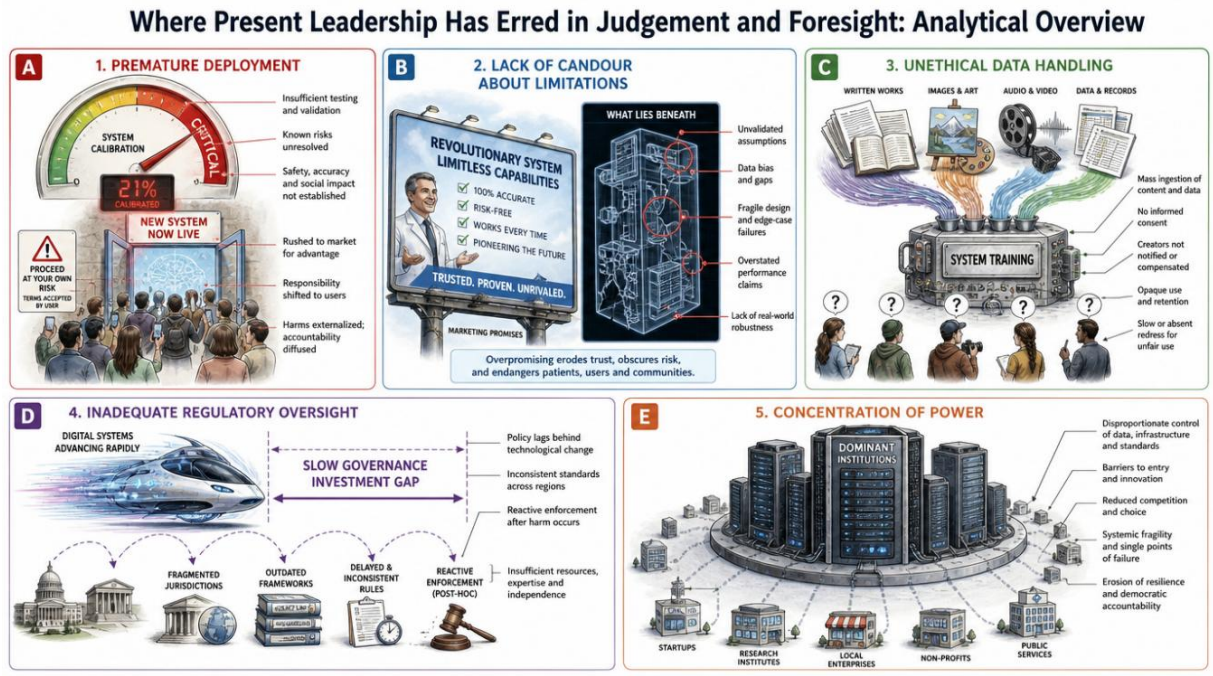

Fig -11: Present Leadership Has Erred In Judgement and Foresight Analytical Overview

Last, there has been a lack of focus on concentration of power. The risk of competition and resilience arising from the concentration of critical capabilities in a very small number of organisations, and the lack of transparency, has been insufficiently and too late addressed. None of these errors is irreparable, but it is necessary to admit them in an honest way, as a basis for rectifying them.

14. LESSONS FOR THE FUTURE MISTAKES TO AVOID

From the errors mentioned, a number of lessons can be drawn for those who will set the tone for the next step as leaders, policymakers, professionals or citizens. These are provided as helpful advice and not as a rule.

The first lesson is to avoid using the powerful systems until their behaviour is well understood. While speed is good, recklessness is costly and the cost to some is greater than to others. Time for testing, independent review and for a gradual rollout is not a barrier to progress, it is a protection for it.

The second lesson is to be honest and forthright about what these systems can and cannot do. Too much of anything is too much and leads to mistrust and abuse. Explicit indication of weaknesses, such as the frequent generation of believable mistakes, allows the users to use the appropriate judgement and only use automated systems when their reliability is indeed adequate.

The third lesson is about fairness towards those who make these systems possible. Early and clear communication with the trainers of training data, and reasonable consent and compensation mechanisms, are both ethical and wise as grievances will eventually find their way to the courts and to reputational damage.

The fourth lesson is that you should invest in human capacity and not consider automation as a mere replacement of human. Systems that enhance human judgment, that keep the person in the loop for

consequential decisions and that are supported with real support for the person whose work is disrupted are more likely to create better and lasting results than those that seek displacement for the sake of it.

The fifth lesson is for Public Institutions. Policymaking calls for early investment in technical skills, inter-jurisdictional coordination to minimize confusion, and design policies that preempt harms. A well-informed and proportionate oversight is good for the public and industry as stability and trust is in the interest of all.

Fig -12: Lessons for the Future Mistakes to Avoid

The last lesson is to not take concentration lightly. Diversity of suppliers, openness where appropriate and resilience against the failure of any single point is a good thing for a healthy ecosystem. Decision makers, such as enterprises selecting technology partners, should consider long-term resilience in addition to short-term convenience, and understand that reliance on a few providers can be risky, and can only be appreciated once it happens.

15. WHAT THIS MEANS FOR ENTERPRISES

The transition to infrastructure and frontier capability has direct and tangible consequences for companies, especially for those not in the technology industry. Most of the business will not develop their own foundation models, as it's simply beyond their budget and capabilities. Rather, they will use the tools provided by the dominant providers, and incorporate intelligent systems in the customer service, analysis, operations and product development areas. While this adoption can provide valuable efficiency and capability, it can also result in dependencies which should be managed appropriately.

Many organisations have to deal with the central strategic question on convenience versus control. Using a few top providers provides speed, sophistication and the benefit of not having to make a huge

investment up front. But it also puts the enterprise at risk for the pricing, terms of service and ongoing availability of the suppliers. A company with a fundamental business model that relies on an external model can be exposed to external changes that it can't control. Therefore, wise businesses are looking for options that offer flexibility, including systems that allow for a seamless transition between providers, data ownership, and minimizing their exposure to any one provider, when there is a risk.

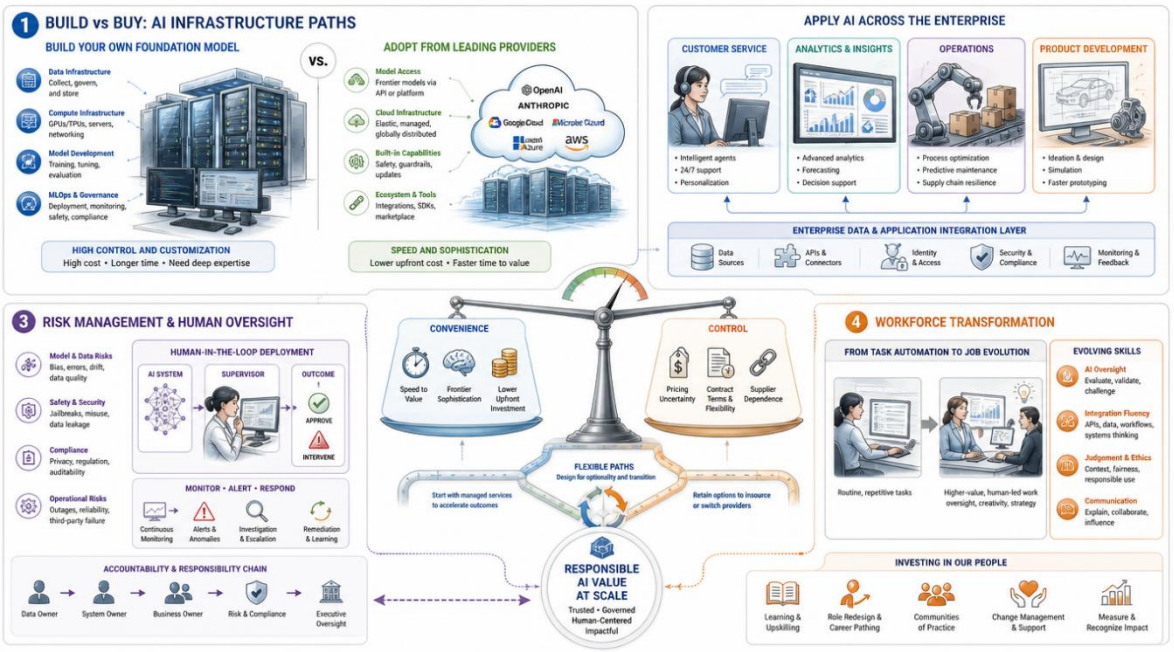

Fig -13: Means for Enterprises

Another factor is expectation and risk management. Intelligent systems can be very powerful but not perfect and when applied in environments where mistakes have serious repercussions, there must be human supervision and clear responsibility. Companies that jump on the automation bandwagon without proper precautions run risks of operational, legal and reputation issues. Those who are careful and considerate about adoption, and who are aware of the reliability and the people involved are more likely to experience a long term gain.

There's a workforce component, too. The technologies will transform and redefine many jobs, eliminate some and generate need for other skills such as oversight, integration, and judgement. Companies that invest in enabling their employees to adjust to the technology, as opposed to simply using it to cut down on staff, are more likely to create more capable and committed organisations. The transition is not just a technical issue, it's also a human issue. Overall, the age is one that will be richly rewarded with businesses that have the drive and the caution to harness these technologies and the ability to see past the limitations, mistakes and disturbances that reckless adoption can bring.

16. THE GEOPOLITICS OF INTELLIGENCE SOVEREIGNTY, SUPPLY CHAINS, AND NATIONAL STRATEGY

The shift to an infrastructure-centred technology economy has implications that are far more than just commercial, but also statecraft. Semiconductors have become important strategic resources like energy or critical minerals for governments, given that advanced artificial intelligence requires a small range of

specialised chips, and that much of this is produced in a handful of factories in a single part of East Asia. Several key economies have implemented export controls, domestic manufacturing incentives and investment screening to ensure access and restrict competitors' capabilities. While such measures may seem appropriate from a national-security point of view, they incur a cost. They disrupt the global supply chain, increase prices, and can lead to redundant investments that the world does not require.

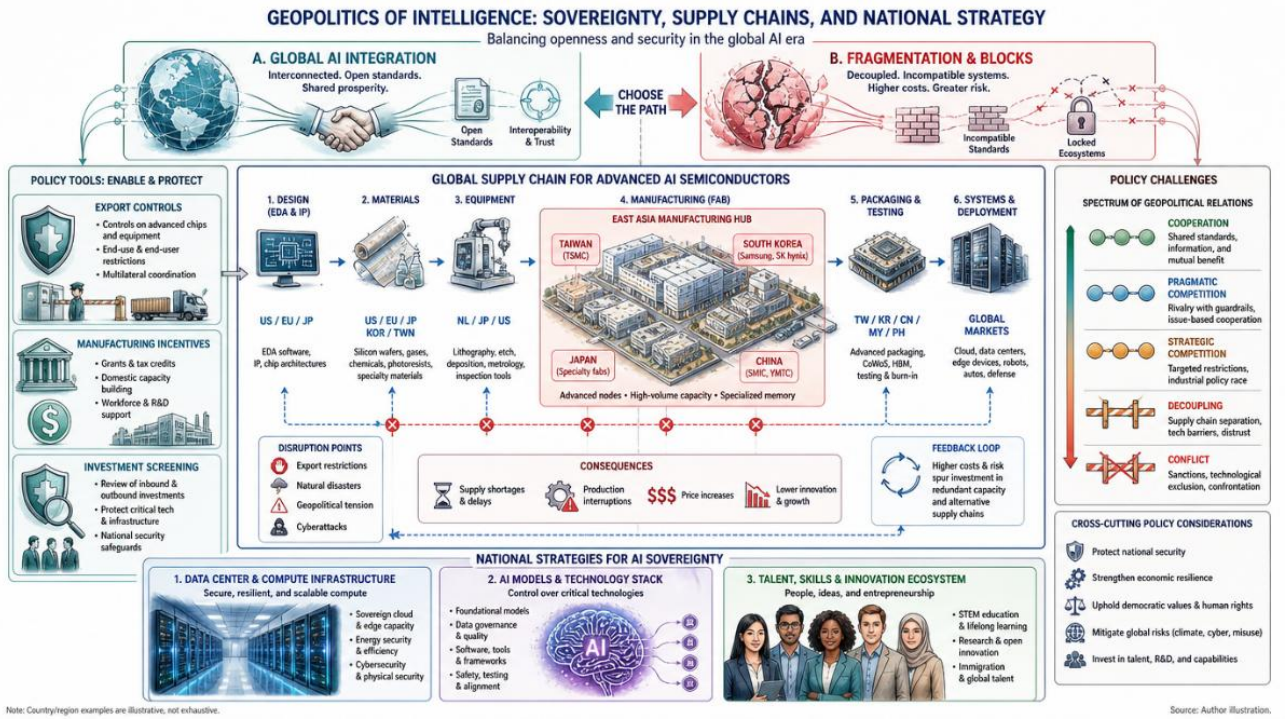

Fig -14: Geopolitics of Intelligence Sovereignty Supply Chains and National Strategy

A second aspect is that of sovereign capability. Many countries are now seeking to build their own models, data centres, and talent pools, and no longer want to rely completely on foreign suppliers, because they feel that such overreliance on foreign suppliers on such fundamental technology is a strategic risk. While this is a sensible impulse, it needs to be balanced with the efficiency of the shared infrastructure, and the real challenge of replicating frontier capability.

The moral for the rest of us is that the competition of AI is getting mixed up in the competition of states. This entanglement might speed up the advancement of one another via competition, or it might split the field into incompatible blocks, hinder the spread of beneficial applications and increase international tension. The challenge for the policy makers is to ensure that legitimate security interests are maintained while cooperation, openness and shared standards for development which is safe and broadly beneficial are maintained. If managed well, this equilibrium can help maintain resilience and continuity; if managed poorly, it can turn into another arena of zero-sum conflict and become a tool of mutual benefit for the human species.

17. RESEARCH GAP

There is much discussion about this transition, but there are still some things that we don't know and that need to be studied. The first relates to investment and realised value. Investment in AI infrastructure is huge, and investments are made with the hope of significant returns, but there is little independent or

thorough measurement of the productivity gains that have been realized in various industries of the economy. A significant amount of evidence is informal or provided by those who have an interest in positive results. More careful and unbiased analysis of the real value of these technologies and where they are not, would significantly enhance the decision-making process.

The second gap is with regards to the long term effects of concentration. The dangers of relying on a handful of suppliers are well known in theory, but the impact of such concentration on competition, innovation, prices and resilience over time is poorly understood. The dynamics of an economy where the key capability is held by a few organisations is poorly understood and historical analogies are incomplete.

The third gap relates to social and labour issues of adoption. The forecasts of displacement and job creation are plentiful, but rigorous longitudinal research on the impact of these technologies on work, at various levels of income, industry and region, is limited. In the absence of this evidence, policy responses can be based on speculation and not fact.

The fourth gap is with respect to environmental impact. As large-scale computing becomes more common, the energy and water requirements of computing are increasingly talked about, but there is still no clear and complete picture of the overall environmental impact of the AI infrastructure, and what it will look like when technology scales up. This is very important in terms of evaluating sustainability of current trends.

Lastly, there is a lack of understanding of governance. There is no clear consensus on how to effectively regulate fast developing and powerful technologies, across a variety of jurisdictions, while not stifling positive innovation. Comparative research on the various regulatory systems and their results would contribute to learning from each other. To close these gaps is not just an academic exercise, but necessary to ensure that decisions made in this early stage are based on evidence and not enthusiasm.

18. CONCLUSION

The shift in financial labelling from companies that defined the technology to those that underpin the development of AI is a shift in the true nature of the tech. The new cluster of companies a mix of established players and daring new entrants, is an indication of an aligned movement in the perception of investors, engineers and enterprises where value is to be found. The selling shovels in a gold rush example succinctly illustrates the point: in an age of smart machines, lasting competitive edge goes to the providers of key input computing power, models, and cutting-edge engineering.

But this article has been in favor of a more measured interpretation. The proud old boys of the past are not gone, some of the most valuable and capable businesses of all time are still around, and many are now striving to become the leaders of the new era. The shift in the center of gravity is occurring, but the ground is not being abandoned, it's being layered. Meanwhile, the massive investment in the sector is largely based on unproven promise and history has taught us that true change can go hand in hand with speculative frenzies. One of the most valuable traits a discerning observer can have is to separate the enduring importance of technology from the more transient frenzy of the market.

The technologies driving this shift have great potential in medicine, education, accessibility, and productivity, but it is not a certainty that will come to fruition unless it is planned for and acted upon. The mistakes that have been made up to now early deployment, exaggerated claims, bad treatment of those who develop systems that they are training on, disjointed and ineffective oversight and a lack of focus on

concentration are telling in part because they can be fixed. The lessons to be learned from them suggest a more judicious way of deployment: with care, with honesty, with fairness, with investment in human capacity, with foresight in governing, and with caution against overdependence.

The best thing the average citizen can learn may be a sense of empowerment. The age of artificial intelligence is one that is said to be happening to society, and that there's nothing we can do about it. More accurately it's a series of decisions made by people and institutions, decisions which can be influenced by informed participation. The future that these technologies will create will be the result of wisdom or carelessness that is exercised in the present. The vast force of this moment can only be harnessed to widely shared benefit through the informed public, candid leadership, and thoughtful policy community.

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