



03.03.2026

| The Era of Micro- Innovation

How the new Era of Software Generation disrupts the Software as a Service (SaaS) model but brings Opportunities for Tech-Independence

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**| 81% of Companies
consider Low-Code
Development to be of
Strategic Importance in
their Organization.**

\ KPMG (Global Tech Report, 2024)

**We argue it goes
beyond Firms.**

| Abstract

Europe faces a structural dependency on non-European AI infrastructure that poses macroeconomic and geopolitical risks comparable to the energy dependencies exposed by the 2022 Ukraine crisis. While the United States captured over \$109 billion in private AI investment in 2024 alone — roughly twelve times more than any other single country — European cloud markets remain 70% controlled by three US-based hyperscalers (Stanford HAI, 2025; Synergy Research Group, 2025).

This paper argues that these dependencies are not merely the result of underinvestment. They are the structural outcome of traditional software economics, in which the need to amortize high R&D costs across thousands of licenses makes competition against scaled incumbents financially irrational. Europe has not failed to compete; the model itself made competition impossible.

The central argument of this paper is that AI fundamentally inverts this logic. When highly customized software can be generated for a few euros, the upfront R&D cost that historically required massive scale to recover effectively disappears. This enables what we term micro-competition: a structural condition in which enterprises can become their own software producers, mediated by European-built generation platforms rather than dependent on foreign hyperscalers. Contrary to the prevailing narrative that AI inherently reinforces Big Tech monopolies, we argue it creates the first realistic economic pathway to European software independence.

Realizing this opportunity requires overcoming three core challenges: securing regional computing capacity, fostering societal and political determination, and directing capital toward the infrastructure-critical domain of software generation — built, hosted, and governed within European jurisdictions.

The Dependency

Diagnosis: Europe as a Consumer of Foreign AI

By Laurin Appel



Europe's position in the global AI landscape is increasingly that of a consumer and regulator rather than a producer. The Stanford AI Index 2025 documents this asymmetry in stark terms: US-based institutions produced 40 notable AI models in 2024, China produced 15, and Europe produced three (Stanford HAI, 2025). Private AI investment in the United States reached \$109.1 billion in 2024, while the entire European Union and the United Kingdom combined attracted roughly \$17.5 billion — a gap that has widened, not narrowed, over recent years (Stanford HAI, 2025). In generative AI specifically, US investment exceeded that of the EU and UK combined by over \$25 billion (Stanford HAI, 2025).

This asymmetry extends to infrastructure. According to Synergy Research Group (2025), European cloud providers hold only approximately 15% of their own regional market, down from 29% in 2017. Amazon Web Services, Microsoft Azure, and Google Cloud together command around 70% of Europe's cloud infrastructure market, with the two largest European providers — SAP and Deutsche Telekom — each holding roughly 2% (Synergy Research Group, 2025). The European Commission itself acknowledges the problem: as of 2024, only 13.5% of EU companies use AI, compared to 78% of organisations reporting AI adoption globally (European Commission, 2025a; McKinsey, 2024).

Mario Draghi's landmark 2024 report on European competitiveness framed this gap as existential. Europe, the report concludes, "largely missed out on the digital revolution led by the internet" and now risks repeating this failure with artificial intelligence (Draghi, 2024). Draghi called for an additional €750–800 billion in annual investment to close the innovation gap with the US and China — approximately 4–5% of EU GDP — with advanced technology, including AI, identified as a primary area for action (Draghi, 2024).

Why AI Dependency is a Geopolitical Vulnerability

By Laurin Appel



The argument for European AI sovereignty is not merely industrial; it is geopolitical. The Carnegie Endowment for International Peace has characterised the current moment as one in which "state rationales increasingly figure in leading countries' digital sectors," fusing geopolitical and commercial strategies into unified geoeconomic agendas (Mügge, 2024; Ulnicane, 2024). The Brookings Institution similarly observes that control over strategic digital resources has become paramount to decisionmakers globally (Csernaton, 2023). Three dimensions of this vulnerability deserve particular attention:

\Infrastructure leverage When approximately 70% of Europe's cloud infrastructure is controlled by US-headquartered corporations, the dependency is not abstract. The Atlantic Council's 2026 assessment of European digital sovereignty notes that the 2025 Starlink episode, in which the United States leveraged control over a commercial communications system to exert pressure on Ukraine, served as a warning about reliance on critical infrastructure (Burwell & Propp, 2026). In cloud computing or AI services, European enterprises and public institutions would have limited fallback capacity.

\Regulatory asymmetry The EU AI Act represents the world's first comprehensive regulatory framework for artificial intelligence. However, as Bologa (2026) demonstrates, the effectiveness of regulation as a sovereignty-enhancing instrument depends on whether European firms exist to benefit from the domestic market conditions that regulation creates. Regulating technologies that are entirely developed and hosted elsewhere produces compliance costs without corresponding industrial gains (Bologa, 2026).

\Data sovereignty The General Data Protection Regulation (GDPR) established Europe as a global standard-setter for data protection. Yet the practical value of data sovereignty erodes when the infrastructure processing that data is controlled by non-European entities operating under different legal jurisdictions. Cross-border data flows, cloud act provisions, and extraterritorial legal claims create a structural tension between Europe's data protection ambitions and its infrastructure reality (Mügge, 2024).

The big Opportunity in Micro-Innovation (An analytical Outlook)

By Kristof Hackethal



The traditional Software-as-a-Service (SaaS) model is facing a fundamental disruption that challenges its long-term viability. At the core of this shift is the drastic reduction in code generation costs, which fundamentally alters the classic "build versus buy" equation for enterprises. As the barriers to software creation are lowered (democratizing development and reducing lock-out effects previously upheld by exclusive software engineering domain knowledge) building highly individualized software optimized for specific corporate contexts becomes economically superior to buying standardized licenses. Consequently, the central enterprise challenge is shifting from "who do we need to implement this?" to the deceptively complex question of "what exactly do we need?".

\Declining Cost of Syntax - Yet Growing Importance of Architecture

Generative AI does not merely translate languages; it translates intent into Python. As the value of pure syntax generation approaches zero, the premium on architectural and conceptual knowledge rises significantly. In other words, generating standalone syntax is not enough to replace traditional software development. Our technical analysis, *Beyond the Demo*, highlights that while LLMs excel at probabilistic token generation, they inherently fail at systematic requirements engineering and architectural planning (mAI, 2026). Overcoming this bottleneck requires moving beyond raw syntax generation toward semi-deterministic orchestration that embeds complex software architecture directly into the framework. This is where platforms like mAI introduce themselves. This also transition redefines professional roles, moving away from narrow technical specializations toward a generalist "innovator" profile. While the industry has already witnessed developer layoffs among tech giants, though senior architectural roles remain more resilient, the commoditization of code is undeniable. However: We must be honest about the impending wave of automation: its cost-saving potential is enormous, and it will inevitably lead to structural workforce reductions across various profiles, not just efficiency

gains. Policymakers and business leaders face a stark choice. We can attempt to erect protectionist barriers for short-term preservation, knowing that global competitors will not hesitate to adopt these efficiencies, or we can aggressively drive this technological evolution ourselves. Opting for the latter is crucial to retaining strategic agency within Germany and the EU, ensuring we do not stumble blindly into the next technological dependency.

\Prediction of Micro-Innovation & -Competition This brings us to a crucial, counterintuitive opportunity. While the prevailing narrative suggests that AI inherently strengthens existing Big Tech monopolies, the current evolution actually enables "micro-competition", which can be understood as a structural shift that can foster European technological independence. The current European reliance on US tech firms seems absolute; if access were suddenly restricted, the European economy would face severe disruption. This dependency is not accidental. It is the structural outcome of traditional software economics, and understanding its mechanics is essential to understanding why AI changes the game entirely. The classical SaaS model is built on a fundamental cost structure: a provider must invest heavily in R&D upfront to build a product, then recover those costs through license volume at scale. To become profitable, a new entrant needs thousands of paying customers, which means competing on price against incumbents who have already amortized their R&D across millions of users. This creates a self-reinforcing lock-in: The more a platform scales, the cheaper its marginal cost per user becomes, making it structurally impossible for new competitors to undercut on price while also covering their initial investment. Venture capital can bridge this gap temporarily, but rarely for the sole purpose of reducing geopolitical dependency. The result is a market that systematically consolidates around a handful of hyperscalers. Not because they build better software, but because the economics of the model make competition irrational. AI-driven internal code generation shatters this paradigm — but not simply because software becomes cheaper to write. The deeper shift is that the entire cost logic inverts. When a highly customized software product can be generated for a few euros, the R&D cost does not need to be recovered across thousands of licenses as there is effectively no upfront R&D cost to recover. A solution built for one enterprise, optimized for its specific processes and context, can be economically viable at a user base of one. This is what we mean by micro-competition: not thousands of startups challenging Microsoft head-on, but a structural condition in which every enterprise can become, in effect, its own software producer — mediated by platforms that provide generation infrastructure rather than finished products. The economic model of a platform like mAI reflects this inversion directly. Rather than funding centralized R&D and recouping it through license volume, the platform passes on primarily infrastructural costs. The user assumes the conceptual and operational R&D work through prompting and requirement specification. This means the platform does not need to sell thousands of licenses for any given application. It works even if a single enterprise is the sole user of a generated solution.

Variable costs can be set substantially below what hyperscalers require, because hyperscalers carry the administrative overhead of centralized product development and ongoing maintenance at scale. In contrast, mAI sees the upcoming wave not in scaling products but instead in scaling innovation potential.

The Status-Quo European Response & its Limitations

By Laurin Appel



Image: European Commission

European policymakers have recognised the urgency to act on Artificial Intelligence, its threats, and its opportunities. In April 2025, the European Commission published the AI Continent Action Plan, which aims to position the EU as a global AI leader through five strategic pillars: computing infrastructure, data access, sectoral AI adoption, talent development, and regulatory simplification (European Commission, 2025b). The plan builds on the InvestAI initiative announced in February 2025, which aims to mobilise €200 billion for AI investment across Europe, including €20 billion specifically for up to five AI Gigafactories capable of training frontier models (European Commission, 2025a).


These are substantial commitments. However, they face structural headwinds. Only about 10% of the InvestAI headline figure represents genuinely new funding; the remainder leverages existing digital funds and public-private partnerships (European Policy Centre, 2025). One year after the Draghi report, monitoring by the European Policy Innovation Council found that only 11.2% of its 383 recommendations had been fully implemented (EPIC, 2025). The EU's venture capital ecosystem remains a fraction of its American counterpart — the share of global VC funds raised in the EU stands at roughly 5%, compared to 52% in the US (Draghi, 2024).

More fundamentally, large-scale infrastructure programmes operate on timelines measured in years, while the AI landscape is shifting in months. DeepSeek's emergence in early 2025 demonstrated that competitive AI models can be developed at a fraction of previously assumed costs, challenging the premise that only massive compute expenditure enables meaningful AI capability (Carnegie Endowment, 2025). For European competitiveness, the

implication is twofold: the infrastructure gap matters, but the application layer — where AI models are translated into usable, enterprise-grade software — is where Europe can compete more rapidly.

The Application Layer: Where Europe Can Win

By Laurin Appel



Europe's comparative advantage does not lie in replicating Silicon Valley's model of frontier model development. It lies in the application layer: building solutions that are architecturally sound, compliant by design, and optimised for the specific requirements of European enterprises and regulatory environments.

This is precisely the space occupied by companies like mAI. Rather than treating large language models as finished products, mAI's APA (Application Programming Application) framework treats them as interchangeable components within a semi-deterministic architectural chassis — reducing dependency on any single model provider to a replaceable engine rather than a structural foundation (mAI, 2026). The platform is built, hosted, and operated entirely in Germany, with server infrastructure under European jurisdiction.

This approach addresses all three dimensions of the sovereignty challenge simultaneously. At the infrastructure level, European hosting ensures that enterprise data remains under GDPR jurisdiction without reliance on foreign cloud act provisions. At the regulatory level, compliance is implemented as an architectural principle rather than an afterthought — what mAI terms "compliance by design." At the industrial level, European-built AI solutions create the domestic enterprise ecosystem that makes regulatory frameworks economically productive rather than merely restrictive.

The broader strategic logic is consistent with Draghi's diagnosis: Europe's challenge is not a lack of innovation but a failure to translate innovation into commercially competitive products and services (Draghi, 2024). With 74% of companies reporting positive outcomes in initial AI pilots but only 31% succeeding in scaling those solutions — and regulatory compliance (38%) and

risk management (32%) cited as the leading barriers (KPMG, 2024; Deloitte, 2025) — the bottleneck is precisely the "last mile" where AI prototypes must become production-ready, secure, and maintainable enterprise software.

Conclusion: Sovereignty is Built, Not Declared

Technological sovereignty cannot be achieved through regulation or investment alone. It requires a functioning industrial ecosystem in which European companies develop, host, and maintain the AI-powered tools that European enterprises depend on. Every enterprise software solution built on non-European infrastructure deepens a dependency that regulation alone cannot reverse.

The path forward is pragmatic rather than protectionist. Europe does not need to build its own frontier models to achieve meaningful AI sovereignty. It needs to ensure that the layer between those models and enterprise value creation is controlled by European actors, governed by European law, and optimised for European requirements. This is not a theoretical aspiration; it is a commercially viable proposition that companies like mAI are already executing.

The question is no longer whether Europe needs technological sovereignty in AI. The Draghi report, the AI Continent Action Plan, and the shifting geopolitical landscape have settled that debate. The question is whether European enterprises and policymakers will act quickly enough to build it — before the dependencies become irreversible

| About mAI

mAI is a prompt-based "Autonomous Enterprise Innovation" platform start-up from Hamburg that enables SMEs and enterprise customers to develop tailor-made business software. mAI delivers production-ready software solutions for companies in minutes that go beyond proof-of-concepts. While the market is dominated by no-code tools that act as simple wrappers around proprietary models, mAI addresses the fundamental challenges of AI-generated software: scalability, maintainability, and enterprise compliance.

To this end, mAI uses its internally developed APA framework (Application Programming Application), which guides users through the interactive recording of user requirements, the integration of a novel product manager functionality to eliminate missing context, and the provision of the final security module for orchestrating and generating secure and maintainable code by the APA architect - all in a guided environment for the best possible user experience. With mAI-APA, companies can develop, test and roll out software in a short period of time. When it comes to deployment, mAI also relies on proven standards: companies do not have to deploy their software in shared spaces, but instead experience a new level of security and trust through individual, company-specific virtual machines (VMs) with servers located in Germany.

At mAI, we know that generative artificial intelligence has limitations that we will not be able to compensate for with more powerful models in the next five years, nor are they ones that we want to unleash unchecked on critical areas of enterprise software. If the security of your processes is important to you, take a second look. Modular, adaptive intelligence (mAI) stands for a solid framework on which you can build and grow.



About the Authors



Laurin Appel is focused on bringing technology and economic demand together. He has multiple years of experience in tech-strategy, management consulting, and start-up experience, as well as an academic background in industrial engineering. His work bridges the gap between technological vision and the necessities of the now.



Kristof Hackethal is a technology entrepreneur and AI-focused professional with an industry & academic background in AI strategy, human–AI interaction, and enterprise software architecture. His work bridges academic research and real-world application, informed by research experience at leading institutions such as ETH Zurich.

| Legal Disclosure

EXIST Funding

We are proud to be funded by the science-driven EXIST program financed by ...



Kofinanziert von der
Europäischen Union

Gefördert durch:



Bundesministerium
für Wirtschaft
und Energie

aufgrund eines Beschlusses
des Deutschen Bundestages



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