

Freedom First: How Open Source Can Save Our Digital Future

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Ir. Erik Mols

Colofon

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Introduction: A Journey Through Code, Freedom, and the Future of Technology

In a world where technology shapes our lives more profoundly than ever, the battle for digital sovereignty, transparency, and freedom is not just a technical debate—it's a fight for the soul of our society. "**Freedom First: How Open Source Can Save Our Digital Future** " is more than a memoir or a manifesto; it is a call to arms for anyone who believes that technology should empower, not enslave.

This book traces the evolution of open-source software and hardware from the tinkering days of the Commodore 64 to the founding of **OpenSource Science (OS-SCi)**, the world's first fully open-source institution of higher education. It is a deeply personal story of discovery, resistance, and innovation, written by **Ir. Erik Mols**, a visionary educator, entrepreneur, and open-source evangelist. With a background in both IT and biology, and over two decades of experience teaching software engineering, data science, and AI, Erik has dedicated his career to bridging the gap between proprietary dominance and the open-source future. His journey—from developing IT curricula for private universities to founding OS-SCi in December 2022—reflects a lifelong commitment to making technology accessible, collaborative, and free.

At OS-SCi, Erik and his team are reshaping education by offering modular, hands-on training in Linux, Python, security, data science, and more. The institute's mission is clear: to equip the next generation of developers with the skills and ethical foundation to build a future where technology is not controlled by a few, but shaped by a global community. OS-SCi stands as a beacon for open-source education, fostering a culture of transparency, collaboration, and real-world impact. Through initiatives like paid bounties for contributions to projects such as Lomiri, OS-SCi is not just teaching open-source tools; it is building a movement.

This book explores how open-source principles—collaboration, transparency, and community—can dismantle the chains of digital colonialism and proprietary lock-in. It delves into the importance of open-source education, the dangers of algorithmic echo chambers, and the transformative potential of open-source tools in government, business, and everyday life. It is a reminder that the future of technology is not predetermined—it's ours to build, one line of code, one open standard, and one shared idea at a time.

Whether you're a developer, an educator, a policymaker, or simply a curious mind, this journey invites you to question the status quo, to explore the possibilities of open-source alternatives, and to join a movement that is reshaping the digital landscape. The story begins here—where code meets conscience, and freedom is not just a feature, but the foundation of a new digital world.

Why this matters:

Erik Mols' vision for OS-SCi is rooted in the belief that education should be accessible, collaborative, and relevant. By sharing his personal and professional journey, this book aims to inspire a new generation to embrace open-source values and contribute to a more open, innovative, and equitable technological future. For more about OS-SCi's mission and programs, visit os-sci.com

Table of Contents

Freedom First: How Open Source Can Save Our Digital Future.....	1
Freedom First: How Open Source Can Save Our Digital Future.....	3
Colofon.....	4
Introduction: A Journey Through Code, Freedom, and the Future of Technology.....	5
My Personal Open Source #FOSS #FLOSS Journey.....	8
The New Chains: How America's Digital Empire Replaced Old Colonialism, and How the World is Fighting Back.....	10
How Open Hardware Shaped Our Past: A Journey from the Seventies to Today.....	17
The History of Open Source: From Academic Roots to Global Movement.....	20
Four Freedoms of Open Source.....	23
Open Source and Communism: A Comparative Analysis.....	25
Sovereignty by Open Source.....	27
Bridging the Digital Divide: A Generational Journey Through Technological Evolution.....	29
Education as an Institute.....	32
Tech Developments in Light of Dystopian Science Fiction: Risks and Mitigation through Open-Source Software and Hardware.....	36
AI and the Carpenter: A Modern Day Analogy.....	41
Public Money, Public Code: The Importance of Open Source in Government Software Development.....	44
Jumping on the Hype Train: Misled by Fake Specialists.....	46
Is the Downfall of the East India Companies a History Lesson for Big Tech?.....	48
Understanding Open Source Licenses: Why It's Important for Any Developer.....	53
How to Influence the Five Cultural Dimensions of Open Source.....	56
A Global Reply: Building Better Alternatives to Big Tech, From Europe to India and Southeast Asia.....	61
Breaking the Algorithmic Echo Chamber: How Open-Source Education Can Set Us Free.....	68
Open Source Beyond the License: Sustainability, Sovereignty, and the Ethics of Contribution, and Why China Is Right.....	71
Echoes of Resistance: Comparing Societal Reactions to the Industrial and AI Revolutions.....	75
Unbiased Open News.....	79
The Software Wars: Fight for Freedom.....	82
Why Is Open Washing a Thing?.....	84
EEE: Embrace, Extend, Exterminate—Misuse of FOSS Communities.....	86
Beehive Organization of a Free and Open Source Community.....	89
Clearview AI Dutch Fine and the Problem of Globalization.....	93
Open vs. Closed: The State of AI Code Creation Platforms in 2025.....	96
The Rise and Impact of Big Tech: A Critical Analysis.....	100
The Ticking Time Bomb: Why Sticking with Windows 10 After October 2025 Could Be Your Biggest Mistake.....	103
The Impact of Early-2025 AI Tools on Open-Source Developer Productivity.....	107
The Paradox of Tough Image Software: When Cool Meets Proprietary.....	110
AI Clickworkers Abuse.....	113
The Viral Nature of Spreadsheet Programs like Excel in Organizational Data Management.....	115
The Future of Ethical AI: Responsible Licensing and the Integration of Large Language Models.....	117
Revolutionary Open Source AI: The Secret Weapon Against Tech's Dark Side You Need to Know!.....	120
The End of X11: A Catalyst for Lomiri's Breakthrough on the Desktop.....	123
The Success Story of Debian Edu: Empowering Education with Open Source.....	126

Enhancing Freedom and Sovereignty with Debian Edu Linux, Lomiri, and RISC-V Hardware.....	130
The Rise of RISC-V: A New Era in Computing Architecture.....	132
The Imperative of Open Source Software in EU Governmental Organizations.....	135
Nextcloud Hub 10: A Leap Forward in Open-Source Collaboration and Productivity.....	138
Revolutionizing AI: How Bagel's Unified Multimodal Pretraining is Changing the Generative AI Landscape.....	140
Unleashing the Power of AI: A Comprehensive Guide to Manus, Lovable, Grok, N8n, and Mancer	144
Open Source and Open Hardware in the OSI Model: The Backbone of Modern Networking.....	147
Teaching Kids Open Source Technology: A Path to Innovation and Progress.....	150
The Evolution of Linux Desktop Managers: A Journey from X Window System to Lomiri.....	153
GPT4All and Open Source LLMs: Empowering Innovation Over Proprietary Tools.....	156
Why Matrix is a Better Choice Than Telegram or Signal (and What Delta Chat Has to Offer).....	158
Successful Replacing Microsoft Office with Open Source Technology.....	161
Replacing the Entire Adobe Software Stack.....	164
A FOSS Software Stack for Private Persons and Small Businesses.....	166
Free and Open Source Large Language Models (LLMs) Should Be the Basis for the Future of AI	168
Choosing a Programming Language, and What Makes Them Green?.....	170
Generative AI and Education.....	172
Why Green Software Should Be FOSS.....	176
AI License Infringement.....	178
The Importance of Open Source in Mitigating AI Incidents: A Case Study of Grok and the Role of OS-SCi.....	179
The Implications of Facebook's New AI Tool: A Dystopian Future and the Open-Source Resistance	182
Revolutionizing Data Center Efficiency: How a Simple Open Source Code Change Can Slash Energy Use by 45%.....	184
The Day All Communication Stopped: The Meshtastic Solution.....	186
Bibliography.....	188

My Personal Open Source #FOSS #FLOSS Journey

So let's start with the dirty facts: I was born in 1970, after the first moon landing. Some scientists believe that over 500 years from now, people will mark December 7, 1972, as the beginning of the second Middle Ages, because on that day the last humans walked on the moon. And no, I am not a boomer, considering I was born after 1965. But for me, all talk about generations is a load of bollocks. There are people who can adapt to changes and people who cannot, and age does not play a role in this—it's all about mentality.

I grew up in a time of huge technological changes. My parents bought their first color TV, we got a landline telephone, and also our first Atari gaming system in 1978. Still, imagine my grandmother, who was born in 1897: she saw the first car driving through the city, watched the Zeppelin Hindenburg fly over Tilburg, saw all the Belgian refugees flooding into Tilburg during the First World War, was part of the resistance in the Second World War, but also sat before the television and watched the successful Apollo 11 mission: "The Eagle has landed." There has been no generation that has experienced so many technological advancements in their lives as the generation of my grandparents. As I discussed in my previous blog, the startup of the IT businesses worldwide was quite messy. Everybody started copying code, and there was no proprietary software.

When I went to high school (Odulphus Lyceum Tilburg), I went to one of the most modern schools in the Netherlands. This is a personal evaluation with hindsight, but I believe it's true. In our school, we had a computer room filled with Commodore 64 computers. Each Friday afternoon, we were allowed to sit and play/work with the computers. It was a time of sharing code, copying tapes, typing code from magazines, and experimenting. I was hooked, and my life changed forever. For us, there was no difference between proprietary software and open source; we were 13 years old and having fun.

After saving some money and a final donation from my parents, we got our own Commodore 64 computer in December 1983, and the journey really could start.

It was a time when we were busy copying both proprietary and open-source software. We developed programming skills to not only create our own software but also to remove copy protections from proprietary software.

When I went to university in 1988, I got the possibility to work with personal computers. It was the days of no hard drive and booting DOS from a floppy. I bought my first PC in 1989. It was a time when we continuously upgraded our computers, switching hardware, extending memory, new video cards, and, of course, a modem to connect to bulletin boards.

In 1993, a friend of mine showed that he had installed a new operating system on an older PC. This operating system was Linux. For me, this was interesting enough to also install Linux on a second PC to start playing with it. At that moment, I still had no clue about proprietary versus #FOSS #FLOSS software. After finishing my studies, I became a professor of IT at a skills university.

While in part-time running the Computer Recycle Factory, which was owned by the university. The computers we were recycling were destined for the poor, and we delivered them with Linux. This experience with open source software changed everything. This experience made me change the curriculum, which coincided with the launch of Ubuntu in 2004. Ubuntu offered gratis DVDs for

students and professors, and we started with educating the students on Linux. It was the beginning of a real experience and struggle. We maintained our Linux education for about two years, when we were forced to switch back to proprietary software. At that moment, I didn't understand the reasoning; I was young and naive, not understanding that Big Tech was paying the universities to influence the curriculum.

The struggle continued for many years. Sometimes we had success, and a bit later the open source parts of the curriculum were removed. In 2006, I became a professor of bioinformatics, which was an entirely different world. In the biosciences, open source was the standard. I learned and experienced that #FOSS #FLOSS was a real option. In 2011, I changed my career to become a part-time professor of software engineering and a part-time entrepreneur. Again, it was difficult to use open source in the curriculum, but for me, I was still teaching Java and Python, which were both open source technologies. In 2017, I became a full-time academic entrepreneur, which enabled me to choose the projects and technologies I liked. This path led to the founding of OpenSource Science in December 2022.

The New Chains: How America's Digital Empire Replaced Old Colonialism, and How the World is Fighting Back

co-authored by: ing. M. Yaqin MSc

Prologue: The Liberators Who Never Left

The year was 1945. The war was over. Europe lay in ruins, its cities bombed to skeletal remains, its people starving. From the west came the Americans, not as conquerors, but as liberators. They brought food, medicine, and the promise of a new world order. In Asia, too, they arrived as saviors, helping push back imperial Japan and supporting independence movements in India and the Pacific. The Marshall Plan rebuilt Europe's factories. The Bretton Woods agreement stabilized global finance. The world breathed again.

But the Americans did not truly leave.

They left their soldiers, yes, most of them. But they left something far more enduring: the dollar, the microchip, and the illusion of choice. By the time the last GI boarded a ship home, a new empire was already taking shape. It would not rule through governors and viceroys, but through banking systems, silicon, and server farms. It would not demand tribute in gold, but in data, dependence, and deference. This was not the colonialism of the past. This was something subtler, more insidious. This was neo-colonialism, American style.

And no one saw the chains being forged.

Chapter 1: The Dollar's Iron Grip

The first chain was invisible: money.

In 1944, as the war still raged, 44 nations gathered in Bretton Woods, New Hampshire, to design a new financial order. The British pushed for their pound. The Americans insisted on the dollar. The Americans won. The dollar became the world's reserve currency, the lifeblood of global trade. Oil, gold, grain, everything would be bought and sold in dollars. If you wanted to trade, you needed greenbacks.

At first, it seemed like a fair deal. The dollar was stable. The American economy was booming. But then came the petrodollar system. In the 1970s, the US struck a deal with Saudi Arabia: sell oil in dollars, and we'll protect your kingdom. One by one, every oil-producing nation fell in line. If you wanted fuel, you needed dollars. If you wanted dollars, you needed to play by America's rules.

India learned this the hard way. In 1991, with its economy in freefall, New Delhi turned to the IMF for a bailout. The price? Structural adjustment. Open your markets. Deregulate your industries. Let American corporations in. India complied. Its sovereignty eroded, one loan condition at a time.

Europe, too, found itself trapped. When the US sanctioned Iran in 2012, it didn't just cut off American banks, it threatened any bank, anywhere, that dared to trade with Tehran. Even European

firms, operating under EU law, folded. The message was clear: The dollar was not just currency. It was a weapon.

And then came SWIFT, the global messaging system that moves money between banks. Headquartered in Belgium, but controlled by the US. When Washington decided to cut Russia off in 2022, SWIFT obeyed. European companies, suddenly unable to pay for Russian gas, watched their energy bills skyrocket. The EU had rules. The US had leverage.

Chapter 2: The Silicon Noose

The second chain was technology.

In the 1990s, the internet arrived like a revolution. It was open. It was free. It was American. By the time the world realized what was happening, the giants had already risen: Google, Apple, Microsoft, Amazon, Facebook. They didn't just build platforms, they built empires.

Take Ireland. In 2020, the European Union's highest court struck down the Privacy Shield, a deal that allowed data to flow between the EU and the US. The reason? American surveillance laws, FISA 702, the CLOUD Act, gave the US government backdoor access to European data. The Irish Data Protection Commission ordered Meta (then Facebook) to stop sending European user data to America. Meta warned that without a new deal, it might have to shut down Facebook and Instagram in Europe.

Think about that. A private company, headquartered in California, was telling an entire continent: Comply with our government's spying, or lose your social media.

Europe had laws, GDPR, the world's strictest data protection regime. But what good were laws when the infrastructure itself was owned by America? German hospitals using US cloud services discovered that patient records could be seized by US intelligence. French officials pushing for a "sovereign cloud" found that their only options were AWS, Azure, or Google Cloud, all subject to US jurisdiction.

India faced the same dilemma. In 2020, the Modi government banned TikTok, WeChat, and 200 other Chinese apps, citing national security. But what replaced them? YouTube, WhatsApp, Instagram, all American, all extracting data, all answerable to US courts. When India passed its Digital Personal Data Protection Act in 2023, mandating that citizen data stay within the country, it ran into a problem: 60% of India's government data was still hosted on AWS and Google Cloud.

The irony was bitter. India had fought for independence from the British. Now, its digital future was being dictated from Silicon Valley and Langley.

Chapter 3: The Illusion of Choice

The most brilliant trick of neo-colonialism is making dependence feel like freedom.

Europe thought it had a choice, until it didn't. When the US pressured allies to ban Huawei from 5G networks, Germany and the UK complied, despite no evidence of spying. The cost? Billions in delays, years of lost progress. When the US restricted semiconductor exports to China, European chipmakers like ASML found themselves caught in the crossfire, their sales to China suddenly illegal under US law.

India, meanwhile, had built a \$200 billion IT services industry, only to see its lifeblood, H-1B visas for skilled workers, cut off by Trump in 2020. Thousands of Indian engineers, the backbone of global tech support, were suddenly stranded. The message was clear: America's needs came first.

And then there were the app stores. Apple and Google take 30% of every transaction on their platforms. When India's startups tried to build alternatives, they were blocked, outpriced, or bought out. The US didn't need to send in the Marines. It had App Store policies.

Chapter 4: The Rebellion Begins

But empires, even digital ones, provoke resistance.

In Brussels, a quiet revolution was brewing. The Digital Markets Act (2022) forced Apple to allow sideloading, letting users install apps without the App Store's 30% cut. The Digital Services Act (2024) demanded transparency from Facebook and Google, threatening fines of up to 6% of global revenue for violations. France launched SecNumCloud, a certification for "trusted" cloud providers, no US companies allowed. But when French agencies went looking for a sovereign cloud, they found that the only "European" options were often just AWS and Azure with a local logo slapped on.

India, too, fought back. The Unified Payments Interface (UPI), a homegrown payments system, saved \$1 billion a year in Visa and Mastercard fees. The Public Tech Platform for Frictionless Credit used open-source code to let small businesses access loans, without Wall Street middlemen. And when the US threatened sanctions over India's purchase of Russian oil, New Delhi started trading in rupees.

But the deepest resistance was happening in the code itself.

Chapter 5: The Open-Source Uprising

If the problem was proprietary control, the solution was open rebellion.

In Munich, the city government ditched Microsoft Windows for Linux, saving millions in licensing fees. In Kerala, schools switched to free, open-source software, teaching students that technology didn't have to come from California. In Brussels, policymakers whispered about RISC-V, an open-source chip design that could break Intel and ARM's monopoly.

And then there was cryptocurrency. Not the speculative trading, the idea. A currency without banks. A payment system without SWIFT. When the US froze Russia's dollar reserves in 2022, the message was received loud and clear: If your money is in dollars, it's not really yours. The European Central Bank accelerated its digital euro. India's central bank tested the e-rupee. Even the IMF, that bastion of dollar dominance, began exploring central bank digital currencies.

But the real revolution was in open-source everything:

- Software: Linux, Signal, Nextcloud, tools that no government could shut down.
- Hardware: RISC-V chips, designed in the open, manufactured anywhere.
- Finance: Decentralized exchanges, peer-to-peer lending, no Wall Street required.
- Knowledge: Wikipedia, Sci-Hub, open-access science, breaking the grip of Elsevier and Springer, who charge \$10 billion a year for research funded by public money.

The goal was clear: Build a parallel system. One that couldn't be sanctioned. One that couldn't be switched off.

The Bitcoin Revolution: A Weapon Against Financial Colonialism

As the Bitcoin network grew, there arose a need for more efficient ways to trade digital assets. This led to the development of altcoins and tokens, often built on existing blockchain platforms such as Ethereum. Ethereum introduced the concept of 'smart contracts,' self-executing contracts with the terms directly written into code, which laid the foundation for the rise of decentralized applications (dApps).

Peer-to-peer trading was further facilitated by platforms that allowed users to trade directly with one another without the intervention of centralized exchanges or even without access to the internet. These platforms provided an alternative means of trading, which was especially important in regions where access to traditional financial services was limited.

The shift to Web 3.0 and the Meta-economy

The evolution of Bitcoin and blockchain technology laid the groundwork for Web 3.0, the next generation of the internet. Unlike Web 2.0, where central platforms such as Google and Facebook control user data, Web 3.0 enables users to own and control their own data.

Web 3.0 uses decentralized networks, blockchain technology, and peer-to-peer interactions to create a more open and transparent internet. Users can participate in decentralized finance (DeFi), digital marketplaces, and other applications that provide them with direct control and ownership of their digital assets.

This shift has led to the emergence of the 'meta-economy,' a digital economy in which value is created, traded, and managed within virtual environments. In this economy, users can engage in virtual worlds, digital marketplaces, and other online ecosystems that enable economic activity without the involvement of traditional financial institutions.

Economic implications

The rise of Bitcoin, blockchain technology, and Web 3.0 has far-reaching implications for the global economy. It has changed the way we think about money, ownership, and value exchange. Through the decentralization of financial systems, individuals worldwide can access financial services even in regions where traditional banks are absent.

Moreover, the emergence of decentralized applications and the meta-economy has created new opportunities for economic activity within virtual environments. Users can participate in digital marketplaces, virtual worlds, and other online ecosystems that generate economic value without the intervention of traditional financial institutions.

Chapter 6: The Fight Ahead

The story isn't over.

Europe's sovereign cloud is still mostly running on American servers. India's digital public infrastructure is open-source, but its data centers? Still in the hands of AWS and Google. The dollar

remains king. The Silicon Valley giants are lobbying, litigating, and delaying every attempt at regulation.

But the cracks are showing.

When the US cut off Huawei from global chip supplies, China didn't collapse, it doubled down on domestic production. When Europe's GAIA-X cloud project launched, critics called it a Trojan horse for AWS. But the fact that it exists at all is a sign: The world is looking for an exit.

The question is no longer if the American digital empire will fall, but when, and what will replace it. Will it be a fragmented internet, with each region locked behind its own Great Firewall? Or will it be something new, a truly open, decentralized web, where sovereignty isn't just a legal concept, but a technical reality?

The tools are there:

- Open-source software to replace Windows and iOS.
- RISC-V chips to break Intel's monopoly.
- Public, permissionless blockchains to replace SWIFT.
- Community-owned mesh networks to bypass Comcast and Verizon.

The choice is stark: Stay chained to the empire, or build something free.

The Builders of the New World: OS-SCi, MonFlo, and AnalyseCentre

While governments and corporations fight over the old system, a new generation of builders is creating the tools for a post-colonial digital future.

OS-SCi: The Open-Source University for a Sovereign Digital Future

While traditional education funnels students into jobs at Google, Meta, or Wall Street banks, OS-SCi is rewiring the system. Based in the Netherlands but operating globally, OS-SCi isn't just another coding bootcamp, it's a radical rethinking of tech education. Its mission? To train the builders of a decentralized world.

At the heart of OS-SCi is a modular, open-source curriculum, think of it as Lego blocks for learning. Students don't just memorize syntax; they master the fundamentals: Logics, Security, Open-Source Development, and Decentralized Systems. Whether it's Linux, Rust, Python, or blockchain, the focus is on understanding the code that runs the world, and how to take control of it.

But OS-SCi doesn't work alone. It's partnering with universities across Europe, India, and beyond, helping them adopt its open-source programs, either in part or as a full alternative to proprietary tech education. In India, universities are integrating OS-SCi's Ubuntu Touch and Odoo development tracks to train the next generation of open-source entrepreneurs. In Europe, institutions are using its Software Security and Cloud Sovereignty modules to teach students how to build systems that can't be hijacked by Big Tech. And in Africa and Southeast Asia, OS-SCi's low-cost, high-impact courses are giving students skills that big corporations can't monopolize.

The real magic happens at **OS-SCi's Hackathons**. These aren't your typical coding competitions. They're battlegrounds for digital sovereignty, where students tackle real-world problems:

- Building open-source alternatives to proprietary software.
- Creating decentralized apps that bypass Big Tech's walled gardens.
- Designing secure, privacy-first tools that governments can't backdoor.

The best part? The winners get hired. Not by Silicon Valley giants, but by open-source companies, decentralized startups, and sovereign tech initiatives. Past Hackathon winners have gone on to work at European digital identity projects, Indian fintech rebels, and even MonFlo itself. One team built a decentralized social media platform, and now they're funded to turn it into a real product. Another developed a self-hosted cloud solution, now used by small businesses avoiding AWS lock-in.

OS-SCi isn't just teaching code. It's building an army of engineers who can replace the old system, one open-source project at a time. And with partnerships expanding in Thailand, the Philippines, Indonesia, and Vietnam, that army is growing fast.

This is education as resistance. A place where students don't just get jobs, they take back the future.

MonFlo: The Bank of the Future, Built for Sovereignty

While traditional banks enforce the rules of the old financial empire, Monflo is rewriting them.

Imagine a bank that doesn't just hold your money, it gives you real control. Monflo is a licensed financial institution with the power to issue IBAN accounts, just like any European bank. But unlike the old guard, Monflo doesn't lock you into a system where your money is subject to arbitrary freezes, inflation, or geopolitical whims. Instead, it automatically converts euros into e-Euros, a digital, programmable version of the euro that lives on open, decentralized rails. This opens up the possibility for value to be transferred instantly. No more waiting days for cross-border transfers. No more SWIFT fees or middlemen. Just instant, low-cost transactions that work anywhere in the world.

But Monflo doesn't stop at fiat. It's also a gateway to the new financial system. Want to buy Bitcoin or Ether? You can do it seamlessly, right from your account. No need for shady exchanges or complicated on-ramps. Monflo bridges the gap between traditional finance and the decentralized future, making it easy to move in and out of crypto without the hassle.

This isn't just banking. It's financial sovereignty. A place where your money is yours, not held hostage by bureaucrats, bankers, or border controls. Where you can pay in euros, hold in crypto, or convert to stablecoins with a tap. Where censorship-resistant money isn't a fantasy, but a feature.

In a world where banks can freeze your accounts (ask the Canadian truckers of 2022) or governments can seize your assets (ask the Russians in 2022), Monflo is building a parallel financial system, one that respects your freedom as much as your funds. It's not a bank. It's a declaration of independence.

AnalyseCentre: Fighting the Information Wars

And then we have **AnalyseCentre**, fighting the information wars. In an age where algorithms decide what you see, what you believe, and even who you vote for, AnalyseCentre uses open data and AI to expose manipulation, track disinformation, and hold power accountable while promoting social innovation. Through education, consultancy, and innovative projects, it teaches organizations and leaders to use AI responsibly, recognize patterns, solve complex societal problems, and design sustainable strategies aligned with long-term goals. At the same time, AnalyseCentre supports organizations and government ministries in implementing AI to scale societal impact. Additionally, it provides thesis guidance and supports graduation projects on AI, systemic change, and complex problem-solving, applying its expertise to create practical, future-proof solutions.

Epilogue: The EverythingOpen Manifesto

This is not just a story about technology. It's a story about power.

The Americans didn't conquer the world with tanks. They conquered it with default settings. With "I agree" terms and conditions. With the quiet assumption that there was no alternative.

But there is.

Open-source software. Open hardware. Open finance. Open science.

This is how we break the chains.

Not by building walls, but by building bridges, to a world where no single nation controls the code we run, the money we spend, or the knowledge we share.

The first step is to see the chains.

The next is to cut them.

Final Thought: *"First they ignore you. Then they laugh at you. Then they fight you. Then you win."*
— Mahatma Gandhi (who would have hated proprietary software)

How Open Hardware Shaped Our Past: A Journey from the Seventies to Today

In this blog, we will explore the importance of open hardware and its connection to open source. We'll begin with a brief historical overview.

Many people believe that FOSH (Free and Open Source Hardware) and FOSS (Free and Open Source Software) are recent concepts from the past few decades. However, this is not entirely accurate.

I grew up in the seventies in Tilburg, a city in the south of the Netherlands. When my parents purchased a new TV, refrigerator, or radio, the device came with two manuals. Two manuals? Yes, but why?

One of the manuals was the standard operation manual that you are familiar with. The second manual, however, was different. It included a technical drawing and a parts list of the device. If the device broke down, you could solder out the damaged part, hop on your bike, and ride to the "Radiobeurs" to buy a new part for a few cents. At home, you could solder in the new part, and the device would work again. Was this Open Hardware or not?

As we have seen in the previous paragraphs, the world was different in the seventies. Open Hardware was the norm, and no one could have imagined that we would end up in the throwaway economy of the twenty-first century.

Throughout my entire youth, my parents used the same refrigerator, TV, and radio. However, something began to change in the mid-eighties. While electronic devices had a lifespan of a decade or more in the seventies, this started to shift. I genuinely believe that the hardware produced today is of lesser quality. Can it get any worse?

There are even companies that produce devices that are impossible to open. Sometimes, it's even worse: the user agreement states that you are not allowed to open the device you purchased yourself.

The Rise of the Open Source Movement (1980s - 1990s)

Open Source Software (OSS):

- The 1980s saw the formalization of the open source movement with the founding of the Free Software Foundation (FSF) by Richard Stallman in 1985. Stallman's GNU Project aimed to create a free and open operating system.
- The 1990s marked a significant milestone with the release of the Linux kernel by Linus Torvalds in 1991. Linux became a symbol of the power of collaborative, open source development.

Open Hardware:

- The open hardware movement began to gain traction in the 1990s, inspired by the principles of open source software. Projects like the Open Graphics Project and the Open Hardware Certification Program emerged, promoting the sharing of hardware designs.

- The establishment of the Open Hardware Summit in 2010 further solidified the movement, providing a platform for advocates and practitioners to share ideas and collaborate.

The Modern Era (2000s - Present)

Open Source Software (OSS):

- The 2000s witnessed the widespread adoption of open source software in both personal and enterprise environments. Projects like Apache, Mozilla Firefox, and Android demonstrated the viability and benefits of open source development.
- The rise of platforms like GitHub facilitated global collaboration, making it easier for developers to contribute to open source projects.

Open Hardware:

- The open hardware movement has seen significant growth in the 21st century, driven by the maker movement and the proliferation of affordable manufacturing technologies like 3D printing.
- Notable projects include Arduino, an open-source electronics platform, and Raspberry Pi, a low-cost, open-source computer. These projects have democratized access to technology, enabling hobbyists, educators, and professionals to create and innovate.
- The Open Source Hardware Association (OSHW) was founded in 2012 to promote and protect open hardware, providing a formal definition and certification process for open hardware projects.

The Intersection of Open Hardware and Open Source Software

The relationship between open hardware and open source software is symbiotic. Open hardware benefits from the collaborative development models pioneered by the open source software community. Conversely, open hardware projects often rely on open source software to function, creating a seamless ecosystem of open technologies.

- **Collaboration and Community:** Both movements emphasize the importance of community and collaboration. Open source software communities have provided a blueprint for how open hardware projects can thrive through shared knowledge and collective effort.
- **Innovation and Accessibility:** The open hardware movement has made technology more accessible, enabling a broader range of people to participate in technological innovation. This aligns with the open source software ethos of democratizing access to technology.
- **Educational Impact:** Both open hardware and open source software have had a profound impact on education. They provide valuable resources for learning and experimentation, fostering a new generation of innovators and problem-solvers.

We believe it is our fundamental right to have access to the blueprints of the devices we purchase with our hard-earned money. We should have the right to open the devices we buy, study how they operate, make modifications, and even resell them.

However, some hardware companies seem to think that we should be grateful just to be allowed to touch their devices.

If we consider the combination of hardware and software, we see that it is often very difficult to build a device that is entirely Free and Open Source Hardware (FOSH) and Free and Open Source Software (FOSS). For example, take my Linux Ubuntu 24.04 laptop: while the operating system is fully open source, the hardware is not. There are multiple chipsets on the board for which I have no blueprints or understanding of how they function. Even the software is not entirely open source.

Yes, Linux is open source, but on the hardware layer, it has to use the UEFI BIOS provided by the Taiwanese manufacturer Clevo. Additionally, the Nvidia 2080 video card has its own proprietary BIOS.

There is still much to fight for.

A promising development is RISC-V. The Reduced Instruction Set Computing V platform is fully open source and open hardware, and the first motherboards are now available for purchase. It is even possible to buy a RISC-V laptop. Together with our colleagues from the UBports community, we hope to build an Ubuntu Touch RISC-V phablet with Lomiri by 2026. We believe this development could contribute to a future where all hardware and software are open again.

The History of Open Source: From Academic Roots to Global Movement

Introduction

The open source movement has fundamentally transformed the software industry by promoting collaboration, transparency, and freedom in software development. From its early roots in academic and hacker culture to the creation of foundational projects and organizations, open source has reshaped how software is built, shared, and commercialized. This blog post presents a detailed timeline of the open source movement from its inception to the conception of Open Source Science (OS-SCi) in 2022, highlighting key milestones, pivotal figures, and major projects that have defined this transformative journey.

Detailed Open Source Timeline

Year	Event Description	Key Figures Involved	Significant Projects/Technologies Introduced
1950s	Early computing era: Software freely shared among academics and researchers; SHARE users group founded (1955).	MIT researchers, SHARE members	Early mainframe software, collaborative computing culture
1960s	Hacker culture emerges at MIT, centered around the Tech Model Railroad Club and MIT AI Lab.	William Eccles, Jack Dennis, Marvin Minsky	PDP-1 minicomputer, early AI and computing experiments
1970s	Transition from open software sharing to proprietary software models; CONTU decision (1974).	Legal and industry figures	Proprietary software licensing begins
1983	Richard Stallman launches the GNU Project to create a free operating system.	Richard Stallman	GNU Project, Free Software Movement begins
1985	Free Software Foundation (FSF) founded to promote free software and enforce the GNU GPL.	Richard Stallman	GNU General Public License (GPL), GNU Manifesto
1991	Linus Torvalds creates the Linux kernel, a pivotal open source operating system.	Linus Torvalds	Linux kernel
1995	Apache HTTP Server released, becoming the dominant web server software.	Apache Group (later ASF)	Apache HTTP Server
1998	Term "open source" coined; Open Source Initiative (OSI) founded; Netscape open sources its browser.	Eric Raymond, Bruce Perens, Linus Torvalds	Mozilla project, Open Source Definition
1999	Apache Software Foundation (ASF) incorporated; Red Hat and VA Linux IPOs mark commercialization.	ASF founders, Red Hat, VA Linux	ASF formed, Linux commercialization
2004	Mozilla Firefox released as a free and open source web browser.	Mozilla Foundation	Mozilla Firefox
2022	Open Source Science Initiative (OS-SCi) launched by Prof. Ir. Erik Mols, focusing on training the next generation of FOSS engineers.	Prof. Ir. Erik Mols	OS-SCi initiative for scientific discovery

Early Foundations and Hacker Culture (1950s–1970s)

Early computing at MIT

The open source movement's roots lie in the 1950s when software was freely exchanged among researchers and academics. Institutions like MIT fostered a culture of openness and experimentation, with groups such as the Tech Model Railroad Club pioneering the hacker ethos. The PDP-1 minicomputer at MIT in 1961 became a focal point for early hackers who explored computing's potential through playful innovation. This culture valued sharing, modification, and collaborative improvement of software, setting the stage for the open source philosophy (Levy, 1984; OSNews, 2024).