

What Steam Can Teach Mainframes

Allan Zander

CEO, *DataKinetics*

My father passed away recently, and I found myself thinking about him. He had many hobbies, but only one that caught my attention: building small-scale models. He had a steam train from when he was a boy, and at times, he would work on a small model railroad. Of course, I “helped” him, which sparked a bit of passion and interest in wanting to build a model railroad of my own.

Reflecting on his model steam train led me to think about steam as a transformative technology. Do we mainframe enthusiasts have a lesson to learn from the steam engine?

As a mainframer, I am quick to respond to the “all aboard!” conductor’s song that the mainframe isn’t going anywhere. We insiders know how much mainframes power the world’s financial systems, how important the code is that runs those systems, and how critical the mainframe infrastructure is to those networks. It’s true that ATM transactions, credit card processing, consumer data analytics, census number crunching, payroll processing, transaction recording, and insurance underwriting occur thanks to Big Iron.

But let’s be cautious. While I believe there is comfort for many years ahead in the mainframe space, the one thing we can count on is change.

The First Act

When the steam engine was created, it was seen as a marvel. Sure, some critics noted that steam engines were remarkably expensive, and they required a team of talented individuals to keep them running and humming along. Sound familiar? However, the engineering and systems supporting steam energy were solid. The developers thought that they could control steam to an amazing extent.

It was not only the steam locomotive that changed the world; harnessing steam was a key catalyst of the Industrial Revolution. Steam appeared everywhere that needed mechanical energy, and people were convinced that the world would run on steam.

“Already the steam-engine works our mines, impels our ships, excavates our ports and our rivers, forges iron, fashions wood, grinds grain, spins and weaves our cloths, transports the heaviest burdens, etc. It appears that it must some day serve as a universal motor, and be substituted for animal power, waterfalls, and air currents.”— Sadi Carnot, 1824

Even though steam was life-changing, it didn’t stop with moving a locomotive. Next came superheaters created to heat steam beyond the temperature at which water boils. (Imagine convincing a room of executives that now you need extra special boiled water).

A steam superheater’s primary benefit is that it significantly increases the efficiency of a steam power plant. Superheated steam has a higher energy content than saturated (normal) steam, which allows for better turbine performance and improved heat transfer in industrial applications. It also reduced the risk of hydraulic water surges (water hammer) and corrosion.

Act Two: It’s Electric

Of course, progress dictates that change is inevitable. A second Industrial Revolution hit as electricity became cheaper to transfer to homes and businesses than steam. As might be expected, electricity faced critics too. Electric companies took out ads aimed at businesses, touting the benefits of electricity for efficiency and safety.

Electricity was considered more of a scientific curiosity than a useful phenomenon until the last part of the nineteenth century. I imagine the people behind steam saying things like, “Well, of course, electricity is an option, but that’s mostly replacing gas and for lights. Factories have large investments in steam power, and they’re not likely to change and adopt electrical engines and systems. I can see niche applications for electricity – maybe for locomotives that need to run underground where steam isn’t as practical, but electricity depends on a huge, distributed infrastructure. I think we will see steam for a long while.”

Thomas Edison opened the first commercial power plant, and now, electricity is ubiquitous. We hardly think about it. When was the last time an ad tried to convince you to try electricity?

The Third Act

Then, the mainframe came along, pioneering and propelling the third Industrial Revolution: the digital age. Problems that previously took a human mathematician 20 hours to solve took about 30 seconds for the ENIAC. Industries requiring robust computing capabilities quickly adopted mainframes.

Like steam and electricity, once they were embraced, new industries built up around them. The mainframe became not only a key business system but, at times, even a source of differentiation. Competitors offered scalability and reliability to do more—and faster—than any other company.

I bet the conversations in the board rooms about buying the first mainframe sounded eerily similar to the conversations about buying the first steam engine for a factory, and the first electric wiring for a hotel.

That steam superheater novelty of its day is comparable to in-memory technology in the mainframe. In-memory technology helps address effectively manage I/O in a mainframe. I/O contributes to the mainframe's legendary scalability, but it's also among the highest drivers of cost. Managing memory means managing computing efficiency and computational performance. Improved efficiency and performance then increase the value of the investments, ultimately attracting more revenue—exactly what management seeks. And why not? Everyone wants to reduce maintenance costs while simultaneously increasing productivity with the same investment.

The digital era prioritizes speed, scalability, and real-time access to information, relying on in-memory computing to enable new applications and architectures. In-memory technology has advanced dramatically from early mainframe systems—where memory was limited and optimized for large-scale batch processing—to systems where vast amounts of data can be processed in real time for faster and more flexible applications across industries.

The Fourth Act

Here we are now, somewhere at the beginning still of the fourth Industrial Revolution, where the biological and computational worlds may start to fuse together. Things like AI, robotics, 3D printing, and quantum computing may create applications that we can't even conceive of yet.

Perhaps learning a bit from the steam revolution, I've built my career and a great company in DataKinetics. (DataKinetics is a bit like a specialized superheater company of the steam era, and we have risen to become the gorilla in our space). I'm proud of our mainframe heritage and still enamored by steam. I appreciate it as a mechanical engineer; it appeals to the whimsy of a one-day retirement project, and it brought me closer to my father as we bonded over one of his hobbies.

"But looking around today – I don't see many steam engines. One day that will be true for the mainframe."

In the meantime, like the steam engine, let's be grateful for a great platform. Let's innovate around it. Both the mainframe and steam boosted major industrial revolutions. I am proud to say – and I believe --that the mainframe will be around for a very long time still. However, complacency breeds quickly, and in being dismissive or singularly focused, the next thing you know, there are suddenly no steam engines.

The steam era and digital era are both marked by technological revolutions that reshaped societies, economies, and cultures. Both have driven massive societal change, but the digital era is arguably more profound in its speed and scope of transformation. Let's take pride in the platform that still powers the world's financial systems, but not have so much hubris that we ignore the history of steam.

All aboard!

