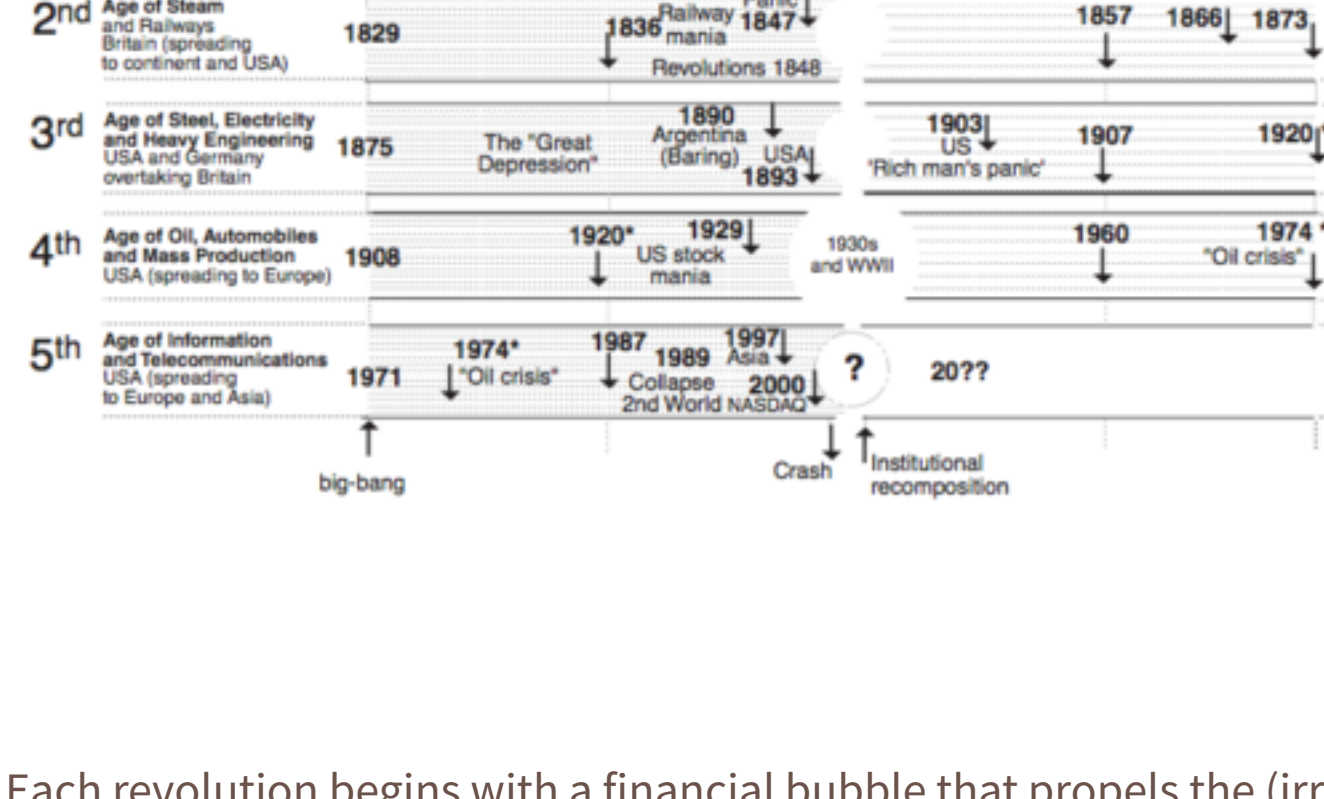


## The computing deployment phase



Technological revolutions happen in two main phases: the installation phase and the deployment phase. Here's a chart (from [this excellent book](#) by Carlota Perez [via](#) Fred Wilson) showing the four previous technological revolutions and the first part of the current one:



Each revolution begins with a financial bubble that propels the (irrationally) rapid "installation" of the new technology. Then there's a crash, followed by a recovery and then a long period of productive growth as the new technology is "deployed" throughout other industries as well as society more broadly. Eventually the revolution runs its course and a new technological revolution begins.

In the transition from installation to deployment, the bulk of the entrepreneurial activity moves "up the stack". For example, in the installation phase of the automobile revolution, the action was in building cars. In the deployment phase, the action shifted to the app layer: the highway system, shipping, suburbanization, big box retail, etc.

This pattern is repeating itself in the computing/internet revolution. Most of the successful startups in the 90s built core infrastructure (e.g. optical switching) whereas most of the successful startups since then built applications on top of that infrastructure (e.g. search). The next phase should see startups higher in the stack.

According to historical patterns, these would be ones that require deeper cultural change or deeper integration into existing industries.

Some questions to consider:

- What industries are the best candidates for the next phase of deployment? The likely candidates are the information-intensive mega-industries that have been only superficially affected by the internet thus far: education, healthcare, and finance. Note that deployment doesn't just mean creating, say, a healthcare or education app. It means refactoring an industry into its "optimal structure" - what the industry would look like if rebuilt from scratch using the new technology.

- How long will this deployment period last? Most people - at least in the tech industry - think it's just getting started. From the inside, it looks like one big revolution with lots of smaller, internal revolutions (PC, internet, mobile, etc). Each smaller revolution extends the duration and impact of the core revolution.

- Where will this innovation take place? The historical pattern suggests it will become more geographically diffuse over time. Detroit was the main beneficiary of the first part of the automobile revolution. Lots of other places benefited from the second part. This is the main reason to be bullish on "application layer" cities like New York and LA. It also suggests that entrepreneurs will increasingly have multi-disciplinary expertise.

26 Comments    cdixon

Recommend 6    Tweet    Share    Sort by Best

**kidmercury** 7 years ago

i call the next phase the governance layer because it is really about internet-based networks (i.e. platforms) disrupting the nation-state as a model of governance. that's the real deal, and all roads eventually go down that path. amazon's new virtual currency is another example -- the virtual currency is going to be the breakthrough moment, akin to what search is for the application layer. as an amzn fanboy i applaud their efforts here, although it's a game that favors a startup for sure.

this next phase is also one in which the primary basis of competition is more about governance than about software development.

**efemurl** → kidmercury 7 years ago

governance and capital are linked. in my view both are ready to be disputed. i think that this disruption will happen from the bottom up. i think when this disruption will happen very quickly and that many companies that exist in current codified frameworks of capital will literally be unable to react.

**fredwilson** 7 years ago

i left a comment yesterday chris but it didn't get posted because i was on gogo on a plane and we dropped below 10k ft. oh well. i will try to recall exactly what i said.

this is a great analysis of Carlota's thesis in the context of the internet. i particularly like the insight that there are many smaller revolutions (mobile, social) inside the bigger one which extend its life. that's a great way to think about it.

as you know Carlota is the bible at USV. we come back to her often. i like the idea that the deeper cultural change is what is next and have been saying that for a while now.

**Adrian Bye** 7 years ago edited

two additional thoughts:

- it will be interesting to see which algorithms drive the next phases. eg google and facebook both came out of the "distributed trust network" algorithm: <http://en.wikipedia.org/wik...>
- its always nice to mention "structure of scientific revolutions" in topics like these.. and that the innovators will either be young or new to the industries they disrupt.

**chris dixon** → Adrian Bye 7 years ago

structure of scientific revolutions is one of my favorite books. Carlota Perez mentions it but I wasn't sure how to fit it in this post.

**David Miller** 7 years ago

There is one big business you left out - the biggest one of all with maybe the most potential - government. Not that many entrepreneurs really want to build a business that targets government.

Maybe the counter-intuitive play is to focus there.

**Marc Vogtman** → David Miller 7 years ago

I agree. We're giving it a go. [govtribe.com](http://govtribe.com) [facebook.com/GovTribe](https://facebook.com/GovTribe)

**chris dixon** → David Miller 7 years ago

Agreed.

**brisbourne** 7 years ago

Finance is the other mega information heavy industry that is ripe for disruption, to my mind.

Thinking about Perez - the fifth revolution has looked different to the first four. If we lump PCs and the internet together then the volatile middle phase has been going on for a v-e-r-y-l-o-n-g-t-i-m-e, and if we separate them then the sixth revolution started before the deployment phase of the fifth had long to play out. I think that viewing the PC and internet as separate revolutions better explains what I've seen - we've had the lion's share of improvements across all industries from plain old computers, but we've barely started with networks. You can see this in the companies that lead the revolutions too. Dell has just gone private, HP is in terminal decline, Microsoft is running to stand still, whilst Google, Facebook and Amazon are growing fast.

**erainge** 7 years ago

Thanks for pointing out the book and nice chart. Perhaps the next phase, or the current phase, is also about a shift in perspective. For example the dominant US view of the current phase is about "IT" while at the same time a European view sees "ICT" (which is also evident in Asia). In the current phase, the use of mobility and communications is striking in social, political, economic, etc contexts. Mobile broadband is expanding the possibilities beyond the use cases we already know. So perhaps the innovations for the deployment phase will be in how practitioners apply the technology, rather than in the geographic diffusion that you suggest.

**Semil Shah** 7 years ago

The last phrase of the last sentence would make for another post in and of itself, a great topic.

**Dhiraj Kacker** 7 years ago

Thanks for pointing out the book - somehow I missed Fred's original post on it.

As for your "questions to consider" I find my self answering "It depends" more than anything else. Are these questions from the PoV of an entrepreneur hunting for ideas or a VC looking to invest (in which case it will be much more bottoms up specific to certain problems/sectors); is it from the PoV of a VC/PE fund looking to expand focus on certain sectors or geographies; is it from the PoV of a company looking to expand geographically say into an emerging market from a developed market and wondering about time-to-scale for its offering; is it from the PoV of a pension fund thinking of long term capital allocation; or is it from the PoV of someone working on public policy and government investments.

It really depends.

**Douglas Crets** 7 years ago

Healthcare, government, mobile, cloud, ecommerce, information in general

**Marc Vogtman** 7 years ago

Nice way to contextualize tech innovation. I see that one other commenters mentioned the government as an industry primed for deployment. I couldn't agree more. I and two partners recently started GovTribe ([facebook.com/GovTribe](http://facebook.com/GovTribe)), a s/w company targeting the government contracting industry. "...information-intensive mega-industries that have been only superficially affected by the Internet thus far." Couldn't have said it better.

I wrote a blog post for our site inspired by the questions you raise here. <http://govtribe.com/blog/20...>

**Louis Beryl** 7 years ago

The global nature of the internet, the efficiency of better cheaper business models and speed with which new ideas can spread, and the network effects that lead to winner take all scenarios make me wonder - is this deployment phase likely to be shorter than in the past? And will the benefit in terms of the power of IT/Mobile, but ultimately will a relatively smaller number of companies take away huge amounts of the profits in this phase? Do we think this will be in lots of new companies - or the companies controlling the large networks?

**Richard Trovatten** 7 years ago

I'm curious when you mention education. Why do you think education has been able to keep real transformation at bay for so long, and how do you think digital will be able to change it? What possible futures can we expect?

**chris dixon** → Richard Trovatten 7 years ago

Why has it taken so long? Good question. Possible answers: 1) complicated economics with multiple paying parties, 2) importance of brands for credentialing, 3) in k-12, regulations and unions, 4) not enough entrepreneurs focused on it.

**kiran bhanushali** 7 years ago

Chris the current phase of smartphone growth and tablets in the enterprise is another deployment phase in this case?

**chris dixon** → kiran bhanushali 7 years ago

Phones/tablets are certainly an enabler of deployment in the enterprise.

**howardlindzon** 7 years ago

FedEx is up 2500 percent since the 80's which means down in the stack is going to remain plenty important in picking winners. And let's not leave out autos and plain fuel choice yet again.

Load more comments

Subscribe    Add Disqus to your site    Disqus' Privacy Policy    DISQUS

PROUDLY POWERED BY WORDPRESS

THEME: HEXA BY WORDPRESS.COM.