Software-Driven Ecosystems

By: Mark Cummings, Ph.D.

There is a general sense in the telecommunications industry that software will drive us forward. But we face a problem obtaining and on-boarding the innovative software that we need. Last month, we described the situation in part one. Here we discuss how we got here and how we may evolve to the desperately needed software-driven ecosystem.

How we got here

The telecommunications industry started out with fully manual infrastructures. The first step in automation was to replace human operators with mechanical switches. Digitization started with ESSs (Electrical Switching Systems) and proceeded through packet switching. This whole digitization wave was implemented with hard-wired logic appliances—boxes—that could be and were treated as if they were mechanical systems.

With the advent of SDR, SDN, and cloud computing we are now on the leading edge of a wave of softwarization. Infrastructure is no longer static and can no longer be treated as if it were composed of mechanical things. Unfortunately, human organizations don't change as fast nor as easily as today's technology. The challenge for the telecommunications industry is to change its ecosystem in accordance with this fundamental change in technology.

Leadership, particularly thought leadership, is needed to do this. The best way is for leading companies to have board members, a CEO, and a few mid-level staff supported by a few consultants and analysts with the necessary technical experience and insights to guide their companies to the kind of sustainable software innovation ecosystem that is so desperately needed.

Early in the evolution of the telecommunications ecosystem, service providers were either private companies, government organizations, or combinations of private and government structures. Whatever their structure, they were vertically integrated with discrete groups, divisions, and subsidiaries focused on service provisioning, equipment manufacturing and support, and R&D. These were all effectively under one operational and financial structure. Those that had a private ownership component were monopolies operating within their defined service area while under public utility regulatory control.

During the period commonly called "deregulation," the vertical integration structures were broken up (with the exception of China, which will be discussed below). The equipment companies were spun off into separate companies. Over time, all of these equipment companies were merged into a very small number of large infrastructure vendors.

The R&D groups were split, with some portions going to the equipment companies and some portions to the service providers. In either case, with the move to competition instead of monopoly, R&D was seen as an expensive overhead. It started to shrink. During the 2000 recession triggered by the dot-com bust—and even more so during the recession that began in 2008—this shrinkage accelerated.

With this shrinkage came a focus on productization and low-level mechanistic functions rather than on innovation. Regulators were espousing open competition but continuing

to put a “regulatory finger on the scale.” This, amid geopolitical forces, resulted in many seeing telecommunications as a national security issue. At the same time, the standards groups continued to operate within the context of the mechanical paradigm. All of this created a circular feedback loop that reinforced the mechanical paradigm (see Figure 1, next page).

Startups tried to step in to fill the software innovation void. But this mechanical paradigm and its accompanying large complex infrequent RFPs either killed the start-ups or drove them into other industries.

The result for CSPs are fragile networks that are expensive to operate. Large legacy vendors have tried to repackage existing product lines with new names. Both are ripe for disruption. New entrants such as the airborne and LEO (Low Earth Orbiting Satellite) initiatives are setting out to do this. Amazon, Google and Facebook stand in the wings. Rakuten is deploying a software-driven network in Japan. Yet others may still be in stealth mode.

Although China hasn’t gone on the same path, it has achieved much the same result as it maintains government control through subsidization. This arrangement, in addition to its handling of intellectual property, has essentially brought it to the same point. A detailed discussion of this will be covered in a follow-on article.

Figure 1 - Feedback Loop Reinforcing Mechanistic Paradigm

The Management Dilemma

Because of the way the business has evolved, telecommunications industry senior management has come to be dominated by people with backgrounds in law, finance, and marketing, with good political skills. These people tend to pick ‘their tech guy’ to whom they look for help when they feel they need it. The problem has been that this tech guy has often been focused on building an internal empire around a single tech initiative and so tends to develop a problematic outlook. This problematic outlook can be characterized by an overconfidence in his own technical competence and a syndrome we’ll call Not Invented Here (NIH). Until the advent of softwarization, this was not great but not disastrous. Now, it is a real stumbling block.

These internal tech guys do not have the necessary expertise to make the needed transition to softwarization. Even worse, they risk blocking themselves and others from learning. An example may help to illustrate. One such tech guy, in a recent conversation with an outside technologist, maintained that there was, and could only be, one virtualization layer in an information system. He was told that Intel processors today have an internal virtualization layer that exposes an X86 instruction set externally and uses a different architecture internally, and that there are many virtualization layers above that. He was so confident in his view that he rejected all this real-world data.

On the other hand, there are a few people in the industry who have been trying to act as thought leaders in this area. Until recently, they have been ‘voices in the wilderness.’ Many have ignored them. A few have recognized that these people have been pointing at a real problem, but they felt that the problem was too big to tackle. Recently, some of these people have begun to find each other and started to try to find

ways of reinforcing each other.

So, senior management doesn't have the needed expertise to correctly respond to the softwarization wave. The people they turn to not only don't have it, they act as blockers. The few articulate people that understand the problem are just beginning to find each other.

Making Required Changes

With this background, it becomes clear that the telecommunications industry has to, as the adage goes, 'pull itself up by its bootstraps.' That is, although a few thought leaders recognize both the problem and have the expertise needed to solve it, the industry as a whole has both leadership and support staff that tend to be struggling with softwarization.

Some years ago, many senior telecommunications executives and board members started visiting Google, Facebook, Amazon, and other digitally native companies to learn how they did things. They then returned to their organizations and tried to preach the Silicon Valley mantra. Unfortunately, the telecommunications industry is fundamentally different from the web industry. Though the web and telecommunications may have some similarities, there are key structural differences.

In the end, this initiative didn't work. At best, it turned into a set of distractions that tried to support higher stock prices—before Wall Street saw through them.

Making this kind of fundamental change is not easy. It will probably require efforts coming from several directions. Leadership from the top by leading telecommunications companies is important. Involving CEOs with the right understanding and background is key. Support for involved CEOs from at least one of their board members—with the right understanding and background—is also important.

Where will these people come from? There are many potential sources, including people with enterprise IT or ICT experience; financial systems development, deployment, or maintenance experience; or some of the people who have been already trying to act as thought leaders. This effort may mean bringing in new leadership blood. At least one company has already started this process.

But senior leadership is not enough. There have to be people at the working level to make change work. Finding and supporting the few internal staff members who have been working without much support up until now is important. At the same time, it is important to recognize that when you first reach out to them, they may be very frustrated.

Another key vector that can help are the outside forces such technical and business consultants and Wall Street analysts. Here again, there are likely to be only a few thought leaders at this point.

Finally, informal communication between these different people may help give them the reinforcing feedback necessary for the confidence and stick-to-it-ive-ness required.

Achieving a Software-Driven Ecosystem

A friend of mine says that no one really likes change, and that if someone tells you that they like change, what they really mean is that they like watching other people change. They don't actually want to change themselves.

It is important to recognize that the changes required are not easy. But current industry conditions make it both necessary and possible to achieve a software-driven ecosystem that will propel the telecommunications industry to another generation of success.