

## Why is Transformation so Difficult?

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It has been many years now since the concept of telecommunications transformation emerged, and yet we seem to be having a hard time getting there. Looking at the last time such a fundamental change was made leads to the conclusion that to achieve transformation, telecommunications companies (Telcos) need to learn to do business with small innovative technology start-up companies and to use business cases to help all portions of their companies to understand the need to implement the resulting innovative technology.



There are forces driving the Transformation effort. As early as 2012, a senior executive of Deutsche Telekom stated publicly that the current methods of operating and orchestrating Telco networks are resulting in a non-linear increase in operating costs. This increase in costs along with pricing pressure has been cited the reason for dramatic reductions dividends by many Telcos including Orange and Deutsche Telekom. About the same time SDN (Software Defined Networking) and NFV (Network Function Virtualization) appeared. As Google, Facebook, and Amazon started to combine SDN and NFV with their Cloud technologies, some Telcos started studying how they operate and orchestrate their networks.

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AT&T appears to have been the most prominent early advocate of transformation motivated by a market capitalization perspective. Senior AT&T executives started speaking publicly about Transformation and AT&T quarterly reports began to have prominent sections dedicated to transformation. Early in this process, AT&T tied transformation to virtualization. Virtualization is the foundation for end-to-end orchestration. It is essentially moving from a concept of networks as a bunch of physical devices tied together in a particular way, to a software-centric view where the network is a collection of software elements cooperating to deliver a service. Thus, in December of 2017, a broad industry consortium (<http://pipelinepub.com/networks/1407>) reduced it to, “end to end orchestration to automate network operations enabling real time service composition.”

## What history has taught us

So, the question is, after more than five years, where is the industry? The answer is not very far. To understand why, it is helpful to look back at the last time Telcos had to make a change of similar significance. This software-centric orchestration to provide real time automation instead of hooking

up boxes, is a change of the order of magnitude, as the move from mechanical switches to electronic switches. It is helpful to look at what that entailed from a technical and business perspective so we can learn from it.

In the mechanical switching era there were buildings in every neighborhood; two or three stories; covering a good part of a city block filled to the ceiling with mechanical switches. The noise was so great that staff had to wear ear protection. These buildings were called Central Telephone Exchanges and corresponded to the exchange portion of the telephone number. The switches were electrical mechanical. That is, electrical (electrical motors, only mechanical logic) not electronic (electronic logic, storage, etc.). The skill set required to operate these networks in the mechanical era was a combination of mechanical engineers, mechanics, real estate managers, and electrical engineering.

The transition to electronic switching had a dramatic effect on facilities and skill sets. With electronic switches, there was still a need for punch-down blocks to terminate the local loop twisted pairs. The punch-down blocks and the mechanical switches took up one small corner of one floor of the Central Telephone Exchanges. Thus, there was a large real estate transition that resulted in the smaller Central Telephone Offices of today. So, at the end of the transition, the skill sets required included wiring technicians, but had changed from mechanical engineering, electrical engineering, and mechanics; to electronic engineering. Without this tremendous “transformation”, we would not have the all IP networks of today.

## How did it happen?

In the immediate post World War II era, the original AT&T was a vertically integrated monopoly. The operating companies that provided communications services were fed by Western Electric. That is, Western Electric produced all the components the operating companies used. Western Electric, in turn, was fed by the original Bell Labs. Bell Labs was where the transistor (fundamental building block of today’s semiconductors) was invented. It had the electronic expertise that resulted in the development of the technology for electronic switches. Bell Labs built prototypes and showed them to Western Electric. Western Electric didn’t try to sell the prototypes as products. Rather, it took the fundamental technology and used it to build a system designed from the ground up to be a product. The operating companies didn’t have a lot of input. They were told that, on this date, electronic switches would be available. On that date, mechanical switches would no longer be available. And at a certain point, they stopped stocking parts for repairing mechanical switches. This was not driven by business cases developed by the operating companies.

During this time in Europe, telecommunications services were provided by government postal administrations called PTT’s (Postal Telegraph and Telephone Administrations). The PTT’s were struggling to recover from the devastation of WW II. Also, the European Union had not yet taken hold and there was fear that there would be another European war. So, having the most effective telecommunications network was seen as a critical national security issue. As a result, each government tried to develop a strong domestic telecommunications equipment supplier and often had partial or complete ownership of it. Examples include Siemens in Germany and Alcatel in France. As Europeans rebuilt, they looked to the USA for technology leadership. So, when AT&T started rolling out electronic switches, the leading European governments directed their domestic suppliers to develop electronic switches and their PTT’s to buy electronic switches, if they could from domestic suppliers, if not from Western Electric. Again, no business cases.

Many parts of Asia and Africa were also devastated by WWII. Other parts of Asia, Africa, and Latin America, still employed manual plug-board based switching. As these regions recovered and developed, they followed the USA and Europe. So, the pattern was much the same around the globe: no business cases, mandated move to electronic switching.

After the move to electronic switching, AT&T was broken up. The operating companies are what became Baby Bells and Long Lines; while Bell Labs got broken up into three pieces: Telcordia (now part of Ericsson), Lucent; and AT&T Long Lines. Then AT&T Long Lines merged with McCaw Cellular and two of the Baby Bells to become today’s AT&T – a quite different organization. One of the key differences is that it doesn’t own an equipment company. Meanwhile

the PTT's were privatized. That is, they became private corporations with stockholders. However, in many cases, governments retained ownership positions. Concurrently, the government owned organizations that had produced telecommunications equipment became privatized, with some government ownership of stock. Then, the equipment companies entered a period of consolidation. Finally, mainline computer companies such as IBM, HP, Dell, etc. established positions in the telecommunications service provider's IT departments and a few large software vendors provided OSS and BSS systems. So, this is the environment transformation faces today.

## Are we there yet?

There are several Telcos in Europe and Asia that have made key contributions to efforts that underlie transformation - some of them earlier than AT&T. But, AT&T, in a way, coined the term and its very senior executives took a leadership role in reporting on progress around transformation in their quarterly and annual reports to stockholders.

Senior management mandated transformation and the new Bell Labs set to work. They produced eComp that did the industry a great service by showing the vision. eComp was the equivalent of the original Bell Labs' early electronic switch prototypes. But, there was no Western Electric to take the prototype and start from scratch to build a product. So, they turned to the large established vendors that seem to be good stand-ins for Western Electric. The problem is that these vendors have teams composed of legacy skill sets. It is like asking the mechanical switch engineers to produce an electronic switch. To make things even more complicated, the established vendors have profitable businesses based on legacy technology and business models. Thus, they have a disincentive to change. Similarly, there are now fiefdoms in today's larger, more complex Telcos, that are reluctant to embrace new technology.

In today's world, the forward-looking solutions come from small start-ups. For example, VMware's pioneering work as a small start-up played a key role in the explosive growth of cloud computing. If Amazon had done business in the same way that Telcos had, Cloud Computing would not have happened.

If the Telcos really believe the transformation is imperative, they will have to learn to do business with small innovative technology start-ups. As part of this learning process, they will have to learn how to prepare strong business cases that can be used internally to get their organizations moving in sync to implement the innovative technology necessary to make transformation a reality. Bell Labs and other Telcos advanced technology departments doing demos and prototypes will not result in transformation. The ultimate threat is that if the Telcos don't transform and meet modern requirements, other forms will emerge and relegate the Telcos to history's dust bin. Some see this as an idle threat and then look at efforts to do it by Google and Facebook and begin to wonder.