

# The Impact Of Innovative Technologies: Trial To Scale

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## Abstract

Implementing innovative technology is difficult and counterintuitive to traditional business operations. There is a tremendous amount of work that is needed to take a standard such as SCTE-130 for advanced advertising or SMPTE's BXF for metadata exchange (which both represent several modules) to a full-scale end-to-end system ready for production. Work is required across multiple functional groups to implement new technology while preserving and migrating traditional business. Consider these examples: Engineering – Multi-Vendor Integration; Sales & Marketing – New Business Model; and Implementation Operations – Workflow Management and Optimization. Without this additional work, innovative technologies will not migrate from trials to wide adoptions. It is up to operators and the vendor community to take the initiative to bridge the gap between innovative technology and widely deployed technology.

## Managing the Technological Shift

Throughout history, the media industries have evolved and changed as new, innovative technology has emerged. The need to continuously evolve the media industry has never been greater. Traditional Broadcast, Cable, Internet and Mobile businesses are converging. New competitors and disruptive technology like streaming video (Netflix, Hulu), IP-enabled TV (GoogleTV, Yahoo Widgets) and Mobile TV, to name a few, are entering into the business. The successful development and implementation of innovative technologies at an industry level require cooperation of operators and vendors. The cooperation is needed across functional areas consisting of engineers, operations, marketing and business groups.

## Innovative Technology Adoption Process

Throughout the new technology implementation lifecycle, patterns tend to emerge that enable us to better predict when they are in the deployment lifecycle. Three distinct phases are observed, which James M. Utterback in "Mastering the Dynamics of Innovation" refers to as the Fluid or Design Phase, Transitional Phase, and Specific or Refinement Phase. The Design phase is when innovative technology is invented and, in many cases, refined through industry-standard bodies. In the Transitional Phase, innovative technology emerges from technical concepts and standards to production products. In the Refinement Phase, innovative technology evolves to mainstream technology.

Throughout the adoption phases, there is an evolutionary process or pattern for the development of the technology (product innovation) and the development of the business- and operational-processes (process innovation). These patterns "indicate that relationships exist between product and process changes, the state of evolution on an industry" (Utterback, 1996, p. vii).

As new technology evolves, an inflection point emerges when the product innovation and process innovation cross. At this point, there is transition from a primarily engineering- and standard-driven development to a business- and operations-driven development. This transition point is where innovative technology emerges from a technical capability to market deployment and

wide-scale industry adoption. Progressing from technical capabilities to market adoption is one of the most difficult steps for new, innovative technology.

According to Govindarajan and Trimble in "The Other Side of Innovation: Solving the Execution Challenge," the crux of the challenge is that business organizations are not designed for innovation; they are designed for ongoing operations." Moving from the Design Phase through the Transitional Phase requires new, innovative technology to integrate with existing technology, business practices and operations. In order to succeed, steps need to be taken to minimize and manage the change to the existing business.

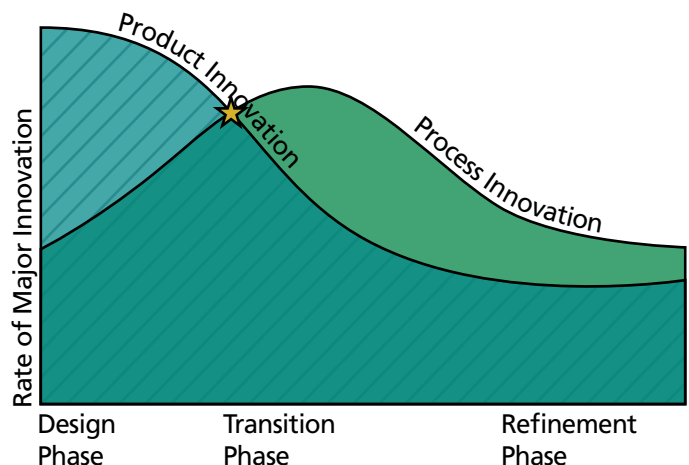


Figure 1. Phases of industrial innovation illustrate the progression in which new products and process innovation go through (Utterback, 1996, p. 91).

### Significant Characteristics in Industrial Innovation

In Figure 2, Significant Characteristics in Industrial Innovation, James M. Utterback applies the three phases to product, process, competition and organization.

#### Historical Example

The introduction of High Definition Television (HDTV) has had a wide-scale impact across the media ecosystem and has taken years to become a mainstream technology.

Design Phase- It all started back in 1972 as an innovative technology when the International Telecommunication Union's radio telecommunication sector (ITU-R) established the IWP 11/6 working group that was chartered with developing a single, international HDTV standard. Next, the Digital HDTV Grand Alliance group, consisting of seven companies and institutions, conducted field tests at 199 sites by 1996. At the same time, the FCC officially adopted standard resolution (1080, 720 and 480) and frame rates (24, 25, 30). The first nationwide launch, in 1998, was available only in specially equipped theaters.

Transitional Phase – Implementation of HD technology was a turbulent and uncertain time. Content providers, service operators and the consumer electronic industry had to take a leap of faith and invest in the new technology in the hopes that the market and consumers would follow over time. There were naysayers and holdouts, but over several years, more and more companies implemented the technology. Some companies, like DirecTV, were early adopters and successfully used their position as a competitive advantage, which spurred the industry to catch up.

More recently, 3D and Advanced Advertising technologies are entering the transition phase.

Refinement Phase – HD technology is continually evolving; the pace of the innovation has slowed down in the Broadcast and Cable TV industries. Major HD innovations are now in new distributions platforms like HD Internet streaming and gaming platforms.

	Design Phase	Transitional Phase	Refinement Phase
Innovation	Frequent major product changes	Major process changes required by rising demand	Incremental for product and with cumulative improvements in productivity and quality
Source of Innovation	Industry pioneer: product users	Manufacturer: users	Often suppliers
Products	Diverse designs, often customized	At least one product design, stable enough to have significant production volume	Mostly undifferentiated, standard products
Production Processes	Flexible and inefficient, major changes easily accommodated	Becoming more rigid, with changes occurring in major steps	Efficient, capital intensive, and rigid; cost of change high
R&D	Focus unspecified because of high degree of technical uncertainty	Focus on specific product features once dominant design emerges	Focus on incremental product technologies: emphasis on process technology
Equipment	General purpose requiring skilled labor	Some sub processes automated, creating islands of automation	Special purpose, mostly automatic, with labor focused on tending and monitoring equipment
Plant	Small scale, located near user or source of innovation	General purpose with specialized sections	Large scale, highly specific to particular products
Cost of Process Change	Low	Moderate	High
Competitors	Few, but growing in numbers with widely fluctuating market shares	Many, but declining in numbers after emergence of dominant design	Few; classic oligopoly with stable market shares
Basis of Competition	Functional product performance	Product variation; fitness for use	Price
Organizational Control	Informal and entrepreneurial	Through project and task groups	Structure, rules, and goals
Vulnerabilities of Industry Leaders	To imitators, and patent challenges; to successful product breakthroughs	To more efficient and higher-quality producers	To technological innovations that present superior product substitutes

Figure 2: Significant Characteristics in Industrial Innovation, Utterback, 1994, developed p.94-95).

## Product Innovation

The development path for the product (technology) can vary, but is generally driven by market demand or from innovative technical capabilities. Market- or end consumer-driven technologies are typically well-defined and tend to be extensions to existing products. On the other hand, innovative technologies start out as engineering evaluations of technical capabilities and evolve into products over time. In the media industry, large-scale, innovative technologies tend to be defined by standard bodies. In general, the goal of standard bodies is to accelerate deployments, increase cross-vendor compatibility, and reduce costs.

### Standards

The development of industry standards can accelerate the transition from technical capabilities to market adoption. Unfortunately, standards also have the propensity to stagnate innovative technologies due to standard fragmentation, ambiguity, cross-industry overlapping standards and implementation complexities.

Standard Fragmentation - Due to the complexity of the media industry, innovative technology standards cross multiple functional and product areas, resulting in the need to compartmentalize or fragment the standard implementation across multiple, independent pieces. This enables greater flexibility and increased competition, but also increases implementation complexities, since multiple vendors are required to integrate in order to offer a complete solution.

Standard Ambiguity - Since most standards are developed by committees consisting of multiple competitive companies, standards tend to be somewhat vague and lack necessary implementation specifics. The interpretation and implementation of the standards are left to the service providers and operators, resulting in increased integration complexity.

To mitigate standard ambiguity and fragmentation, it is recommended that vendors develop API and actively integrate with one another. Also, service operators can speed up the process by defining specific integration requirements for their operations. A great example of this is CableLabs development of an emulator for the SCTE-130 advanced advertising standard. The emulator allows cable operators to define profiles that detail specific implementation parameters for their systems. Vendors can use the emulator to test their systems to determine if they are compliant with specific cable operator implementation requirements.

Overlapping Cross-Industry Standards - As the media entertainment industry continues to reach across traditional distribution boundaries (Broadcast, Cable Networks, Cable TV, Satellite, Internet, Mobile, etc.), there is a need for tighter cooperation. Standards developed for one industry have an impact on others. This has been a known issue for some time, and there are liaisons across standards bodies that watch and help resolve overlaps.

## Process Innovation

Implementation of innovative technology requires operators to productize and operationalize new technology into their existing ecosystem. In order to do so, they need to make many short-term and long-term decisions.

### Business Models

Business models need to be developed that predict the revenue and justify the cost of innovative technology. Determining how to price and sell new technology is a key decision that tends to stall the implementation. Typically, innovative technology brings new ways to package and sell the technology to the end consumer. Fundamental changes to existing models can be very disruptive to the existing business.

Throughout the development process, it is recommended that operators and vendors discuss potential business models with the end consumer. This can be accomplished by working with marketing groups to conduct focus groups or establish advisory boards.

## Standards

Determine which standards to support and how best to implement them. Is the standard mature? Have vendors implemented the standard? Will the standard allow for future new ideas, innovative enhancements and next-generational products?

### Operations

Innovative technologies are trialed and deployed on a small scale in order to demonstrate and refine the technology. Typically, trials start out with dedicated equipment and operations. In order for the technology to scale up, the new technology should be incorporated with the service providers' traditional operations.

It is important to note that current operations are usually evaluated based on their efficiencies and reliability; new technology can be seen as an impedance to these objectives, at least in the short run. Efforts are needed to ease the impact and minimize the change.

### Legacy Equipment

Implementing innovative technology typically involves making a decision to upgrade or replace legacy technology. Since legacy equipment is proven technology that supports current operations, upgrading or replacing needs to be carefully considered and planned.

The decision to replace or modify legacy equipment should be evaluated on a case-by-case basis, with consideration of existing and future performance and reliability demands.

## Study – Dynamic VOD Advertising

To illustrate the challenges with implementing innovative technology, let's analyze the emerging dynamic VOD ad insertion technology. Dynamic VOD represents the capability to target or place advertisements based on the demographic profile of the viewer.

The concept for Dynamic VOD has been around for quite some time. The Cable TV industry began to develop standards in 2006, with the formation of the SCTE Digital Video Subcommittee 629 (DVS629) and then the publishing of the first major SCTE-130 standards in 2008. Since then, there have been numerous vendors that have developed to the SCTE-130 standards and have conducted several technical trials.

### Innovation Phase:

Academic research has shown that patterns emerge, and certain stages of innovative technology can be predicted and forecasted. Dynamic VOD has reached the inflection point between product innovation and process innovation. We know this by examining the maturity of the technology (the product) and the immaturity of the business/operations (the process).

Product - Dynamic VOD technology is considered to be maturing since standards have been in place for many years, and multiple vendors have developed to the standard in each functional area.

Process - Dynamic VOD is in its early process development stage since traditional vendors and operators have begun integrating the technology into traditional business and operations.

### How to Speed Market Adoption?

In order to accelerate market adoption, a bridge needs to be extended between the new capabilities and current business and operations. This can be accomplished by reducing the business and operational impact.

Vendors - The more seamless the implementation process with existing business and operations, the easier and faster the wide-scale adoption process will be.

For example:

- Design and publish interface specifications. Even though the SCTE-130 specification defines interfaces between components, the specification leaves out many of the necessary implementation details.
- Pre-integrate with third-party systems. Not only is it important to integrate with corresponding SCTE-130 components, but it is also equally important to integrate with traditional advertising technology vendors.
- Design your product so that operators don't have to require their customers to change the way they do business. The product should support traditional advertising business models (pricing and packaging), with the flexibility to enhance or migrate to new models over time. It will take some time for the market to adjust or evolve to new business models. Ad agencies and advertisers will need proof that new models provide better results and will want to compare models side by side prior to making large-scale changes. Designing products to complement existing practices will allow the product to be deployed faster and allow the market to adjust alternative models within their timeframe.
- Consolidated operations between new and existing technology reduces overhead, simplifies operations and can increase speed to market.

Operators – Service operators need to provide direction to the vendor community. This can be done by communication business roadmaps and timing for innovative technology with vendors. In addition, encouraging vendors to integrate and to publically support the technology helps provide momentum.

Industry consortiums like CableLabs are valuable in establishing cross-operator initiatives. CableLabs has been conducting SCTE-130 interoperability events for the past several years to encourage vendors to integrate and to demonstrate compatibility. Also, CableLabs has developed an SCTE-130 Emulator tool that allows vendors to test and validate their products against service operators' specific implementations of the standard. Given the modular nature and flexibility of the SCTE-130 standard, CableLabs interoperability events and Emulator tool provide a significant catalyst for the accelerated adoption of the standard.

## Summary

Implementing innovative technology is difficult and counterintuitive to traditional business operations. New technology can be disruptive to groups that are traditionally compensated and evaluated based on reliability and efficiency of the business. Their support can often be the biggest hurdle in scaling innovative technology. By examining historical patterns, companies can adjust their focus and direction in order to achieve desired future results.

In order to accelerate the wide-scale deployment, vendors and operators need to work together to minimize the impact to the existing business. Dedicated efforts and direction are needed from operators in order to define market opportunities and implementation timelines. Vendors need to examine current business models and operations to design their products to integrate and support established practices and help justify changes. Through careful planning and execution, innovative technology can become a widely deployed technology faster and with less disruption.

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