

Building Community: Innovation through Consensus

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Abstract

Every field has its own definition of innovation. As tools for defining technical knowledge and validating new technology, standards play an important role in implementing new ways to solve a problem or improve a process. This paper will touch on ideas of innovation and examples of impact through technology standards, and explore how the consensus building and standardization process benefits all levels and participants—in a measured sense by defining quality and influencing markets, and in a broad sense by forming community and promoting research. Examples from the personal protective equipment and health and safety industries are provided.

Introduction

Many studies discuss the economic influence of standards, suggesting a quantitative link between standardization practices and market growth, as well as qualitative impacts on job quality and value-added manufacturing and services (ISO, 2015). In a very fundamental definition, standards can be thought of as facilitating specialization, in trade, manufacture, or design. Standards have been considered alongside patents as formalized mechanisms which promote the diffusion of technological knowledge and as essential strategic tools in corporate and governmental practices (Ernst, 2013). The ways in which intellectual property and

standards interact brings standards into the discussion as importantly in the research lab as in the executive boardroom. Beyond technical specifications, standards can also address conceptual and societal issues indirectly or outright—such as corporate governance standards or management principles which aim to alter corporate operations and culture.

Consensus standards take many forms but share the process in which they are developed, which includes the involvement of all interested parties, openness, public review, and an appeals process (American National Standards Institute, 2007). Standards can further be classified in many different ways, such as by functions they provide. Tasse (2000) lists four functions for technology standards and gives examples of the innovation impact each can have: 1) Quality and performance specifications can provide a departure point for competition in industry; 2) Informational documents and standard operating procedures help verify claims and increase efficiency; 3) Compatibility and interoperability standards reduce costs and operating issues for users; and 4) Variety reduction helps achieve economies of scale. In the above examples, innovation involves surpassing a competitor or giving customers new options. Defining the proper test methods and boundaries of such standards can prove complicated for complex products and services and in competitive marketplace or high-stakes applications. Finding the sweet spot when pushing the envelope to encourage innovation or validate new solutions often means hitting a “moving target” which is continually adjusting to technological development (Ernst, 2013). Sometimes, just defining a status quo inspires others to move beyond it.

Consensus through Community

In the way in which they form and focus a community, consensus standards have been integral in guiding innovation in many areas of scientific research and market development. The textiles industry has long relied on consensus standards to define quality and direct improvements. The American Association of Textile Chemists and Colorists (AATCC) was founded in 1921 in response to the growth of American dye manufacturing following the “dye crisis”—the shortage of dye resulting from World War I, when German companies supplied the majority of the world’s production. The AATCC’s first test methods, published in 1923 to define colorfastness

testing, were in part to address the poor quality of many American dyes produced domestically during this time. AATCC's founder, Louis A. Olney, sought to create a culture of systematic research and open exchange of knowledge, which he felt would also improve America's global competitive advantage (Clark, 2001). To Olney, innovation meant using science to build a community. The AATCC established a consensus mechanism to develop standards, and today publishes a handbook of 150 test methods and provides testing supplies and educational services that have helped guide a century of improvement in textiles.

The standards organization ASTM International has grown by similarly applying the consensus principle across all aspects of materials testing. Their foundation started with research on the composition of steels used in the railroad industry and has expanded to over 13,000 methods and procedures, often formed in response to public safety concerns. Over the years, these types of standards have helped to protect consumers and companies alike by ensuring quality through all steps of the supply chain. ASTM has put an emphasis on international cooperation, noting that incompatibility can cause barriers to global trade (ASTM International, 2014). It is easy to see how defining terms and classifying goods aids in communication across industries.

Innovation in Protective Equipment Standards

Such an approach to conformance and consensus seems especially important in the areas of health and safety and protective equipment because of the implications for public safety and the required balance between end-user needs, technological capabilities, and standards' reliability. The National Fire Protection Association (NFPA) is a prominent example of a consensus standards organization which publishes standards and codes in all areas related to fire and chemical safety. Through standards work and outreach, they have helped increase awareness of many issues related to fire safety, such as the use of fire sprinkler systems. As a trusted representative of public and first-responder interests and a meeting ground for technical expertise in the field, NFPA has been called on directly by regulators to draft standards addressing issues of industrial safety. NFPA notes that the involvement of all the stakeholders in a committee provides the market with insight for future development (National Fire Protection Association, 2014).

For personal protective equipment (PPE), innovation means guarding users from the physical dangers of the environment without inhibiting comfort and faculty. This means identifying the right equipment for the job. Here at the Textile Protection and Comfort Center (TPACC)—located within the North Carolina State University College of Textiles—test methods for comfort, ergonomics, and protective properties against multiple hazards for textile products are performed and studied. As part of my graduate studies here, I have had the chance to work directly with end-users, manufacturers, the standards organization, and certifying bodies, with NFPA standards shared as a mutual interest for research and discussion.

An essential partner to consensus standards is consensus-supported research. Research provides a middle ground for collaboration, production, and validation of knowledge. The Fire Protection Research Foundation (FPRF), an affiliate of the NFPA, was established to coordinate and communicate research related to the standards. They recently funded a small project in TPACC to explore new test methods to evaluate chemical protective clothing (CPC) closures, which are addressed in other tests but do not have a dedicated test method. This is potentially another addition to the knowledge on the decontamination and useable lifetime of firefighter turnout clothing.

Research on turnout gear is an example of how continuous standards work is needed for such depended upon products. The basic performance standards of firefighter turnout gear have been in place for many years now, yet there is still room for improvement. Companies have had to innovate and adapt their products to distinguish themselves, leading to a gradual but consistent improvement in the quality of firefighter apparel. The standards actively evolve to introduce change, as well. The latest NFPA standard revision for structural firefighting, for example, included a stored energy test as a result of a large amount of research indicating that burns can occur in certain areas of a suit from low-level radiative heat which can be stored in the layers of an ensemble. A test method was developed to address this problem, and manufacturers have incorporated new design elements into their clothing and have brought these improvements to other occupations.

In the chemical lab at TPACC, we have been studying whether the standards defining chemical protective clothing (CPC) capture a complete picture of the performance needs of end users. For the closure study we experimented with a test that may be capable of distinguishing between the closure types, but it was difficult to then identify the significance of that difference for the overall ensemble. Pursuing these questions has many potential benefits. Finding a property that correlates to performance can simplify the task of screening materials for use in ensembles and reduce the time and cost of designing new PPE while also improving their safety.

A great challenge in these pursuits is understanding and defining the end user and their needs to begin with. The next step is figuring out how a standard can help ensure those needs are met. Many questions are faced in the field of personal protective equipment: What components can be standardized to increase interoperability? Can a standard platform for incorporation sensors and smart textiles be developed? Do test methods need to be altered to evaluate new materials? Are standards evolving to meet new operational challenges in military and emergency services? The ingenuity and collaboration that go into solving such problems is supported by standards organizations, which help in defining a problem and forming a framework for innovation to build from—and potentially providing a pathway to get these solutions to end users more quickly.

There's a Standard for That

A recurring theme of my education in chemistry and textiles is stumbling across a standard that, whether for its specificity or breadth, I am surprised to find exists. The standard is usually helpful—standards are meant to answer practical questions. But many times they can also lead to more questions. On an individual basis, a standard can serve as a useful entry point for a technical field, and can lead to tackling bigger issues in research and innovation. Looking at the fields of protective clothing and health and safety standards, it is clear that standards play a role at all levels of innovation, from providing guidance to an industry and serving economic purposes, to forming a space for the involvement of a community and helping researchers approach design and performance problems.

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