



## National Institute for Science, Law & Public Policy

### Thoughts on 5G and IEEE by Tim Schoechle, PhD

#### The 5G wireless bandwagon

##### 5G Rhetoric



In public discussions on the topic of communications and media technology—e.g., the mention of “smart cities” and of the future of everything from smart phones, and autonomous vehicles to electric power grids—we frequently see an emphasis on 5G wireless (fifth generation) and a neglect of the trends toward municipal fiber networks and even of 4G wireless technology (also known as “LTE” for “long term evolution”). In spite of the heavy promotional rhetoric from certain elements of the telecommunications and semiconductor industries, 5G is still undefined and burdened with many problematic aspects—both technical and non-technical. Nevertheless, the 5G bandwagon seems to move forward.

##### Political pressure for 5G

Industry lobbyists, including trade associations like TIA, CTIA, and cellular wireless manufacturers and carriers are all over congress and state legislatures to pass legislation preempting local regulation of wireless cell sites. They clearly are afraid of localized opposition and want to head it off, particularly because 5G has a serious and threatening vulnerabilities—mainly its limited range and the signal propagation difficulties with the millimeter wavelengths that it proposes to use—and the fact that 5G would require a vastly greater proliferation of “small cells” compared with conventional 3G or 4G LTE wireless.

##### The IEEE

On the technical side, one of the strongest 5G promoters is the *Institute of Electrical and Electronic Engineers* (IEEE)—a highly respected national and international professional society that sponsors many conferences, and publishes technical and non technical publications including many technical standards related to communications. The IEEE’s vigorous advocacy of 5G seems to fly in the face of the fact that the relevance, scope, and economic viability of 5G is still very much in question, and that 4G LTE is not fully deployed and is still actively expanding and evolving.

##### Why does the IEEE promote 5G so heavily?

As a 25-year IEEE member and a member of the *IEEE Communications Society* (ComSoc), myself, I have been increasingly puzzled by this question. I found part of the answer recently in an editorial, appearing in the June 2018 issue of *IEEE Communications Magazine* on the “President’s Page” titled “The Challenge of Industry Engagement” by VPs Khaled Letaief and Stefano Galli.

It seems that the problem that IEEE wants to solve with 5G may indicate a fundamental structural problem with how corporate concentration, financialization, and globalization have changed the basic nature of research and development and of technical innovation in modern society—and with it, the career paths for science and engineering—and not in a good way. The following excerpts tell the story.

1. **Corporate R&D has changed.** There are many more incentives and pressure for delivering short term results rather than investing in long term R&D. For example, the financial industry demands quarterly estimates, contracts to executives have short-medium duration with incentives on short term stock appreciation, etc. The actual research being done in industry today has dramatically diminished since the golden years of a couple of generations ago when research conducted in certain corporations was not that different from research conducted in academia. Growing competitive pressure and the resort to the use of trade secrets rather than patenting, has greatly affected the possibility of industry researchers and practitioners contributing to conferences and publications.

2. **Incentive for industry people are lacking.** While academics are incentivized to produce scholarly output and to participate in scholarly activities as part of their job, industry people find it increasingly difficult to do so as companies no longer set incentives for — and might sometimes actively discourage — participating in IEEE activities or even seeking recognition as, for example, Fellow elevation. Today, it is very much the case that industry people work breathlessly from deadline to deadline, often supporting obsolete or legacy products, and all this makes it difficult for them to submit papers or even merely contribute their time as volunteers. And this difficulty often becomes an impossibility when activity in IEEE (from publishing to volunteering) is neither recognized nor encouraged by management.

### “Engaging” industry

As economic (and political) influence becomes more concentrated in fewer and larger corporations, trade associations and standards bodies find members and participants harder to come by and their activities become harder to pay for. Smaller innovative ventures must struggle to survive and the standards bodies and technical conferences are left to consultants and to a few large corporate players. Such trends become reflected in the nature of the technical literature of the field.

These considerations are supported by a 2006 study edited by Robert Lucky and Jon Eisenberg for the U.S. National Academy of Engineering which is

very relevant for ComSoc. The study showed a sharp change in publication trends in telecom research between 1970 and 2005. In 1970, about 80 percent of papers published in *IEEE Transactions on Communications* were authored by industry people, but in 2004 that number declined to 15 percent (U.S. industry alone decreased from 70 percent to 7 percent). Similar trends hold also for conference papers (e.g., ICC and Globecom). The reduced contributions from industry have been partially offset by an increase in the number of academic papers, from both U.S. and foreign universities.

To some extent, the decrease in industry participation in IEEE activities is basically “physiological,” driven by externalities and, unfortunately, there is little we can do about it. Given the strong role of these externalities, it is difficult to adequately address the chronic decrease in industry membership and engagement, and what is needed is to reformulate the problem statement...

ComSoc’s approach in 2018-2019 will be to maintain and nurture the excellence in its Technical Activities (to which industry and academia should contribute together with sometimes different but legitimate points of view and priorities) and augment those with other activities and services that are more suitable for an audience that is not interested in the scientific details of a technology but rather in its applications, standardization, place in the ecosystem, product-oriented design, etc. In engaging this new type of audience that is not interested in the deep technical and scientific analysis typical of scholarly research, then the challenge is to work toward differentiating our products and services while coupling them with a stronger membership value proposition.

Out of all this came the current IEEE focus on 5G as something the local chapters could get behind that would hopefully engage industry and save their jobs and careers. For example, in May of 2016 I attended a technical meeting of the IEEE Communications Society held at the University of Colorado, Boulder, when a distinguished expert and IEEE fellow, Professor Dr. H. Anthony Chan of Huawei Technologies, Plano, Texas, presented an in-depth technical lecture on *5G and Future Wireless Internet: Challenges and Emerging Technologies*. Prof. Chan noted that a new generation of wireless has been introduced each decade, and that 5G is intended to supplement or supersede 4G LTE by around 2020. He described the existing and planned architecture for wireless access and supporting wired core networks and stated that the intention was to support “ever higher speed” wireless access to the Internet.

In spite of the highly technical nature of Professor Chan’s presentation, when asked about the basic motivation driving 5G, he had a surprisingly concise and non-technical answer: “...if technology does not change, the company will die...it is about more jobs...engineering and manufacturing.” Chan added, “people must buy a new phone.”

## **The take-away**

So 5G is not really about higher speed Internet access, lower latency, IoT, smart cities, smart grids, transportation, or any societal need. It is not about market demand or needs. It is about jobs and careers. It is about compensating for an industrial structure that has become derelict and not “engaged” in anything except increasing stockholder value and executive compensation.

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[Return to Homepage](#)