



From the Editor's Desk

Barriers to Technical Communication in Consumer Technology

■ Madhu S. Gupta

Once upon a time, microwave products were produced solely for one customer—the government—and were used almost exclusively for military and defense applications. Most microwave engineers then worked either directly for that customer or for the contractors and subcontractors of the customer. The resulting culture had the following two traits:

- the customer paid for the research and development costs (often on a cost-plus-fixed-fee basis), therefore encouraging its contractors to share technical information, which was mostly generated at customer expense
- the customer, being sophisticated in technology, understood and was willing to assume the risk to users resulting from the new technology.

In the second generation, the microwave industry added industrial and institutional customers by producing navigation and direction finding products for aircrafts, vessels, and ports; telecommunications products for terrestrial and satellite links; scanning and imaging products for medical use;

and measurement, sensing, drying, or processing equipment for industry. Such customers did not significantly alter the two aforementioned traits of the culture in microwave industry, partly because they accounted for only a fraction of the total industry volume and partly due to business arrangements, including virtual monopolies, vertical integration, long-term allegiances, cost insensitivity of the market, and the use of the microwave products being confined to trained professionals.

The third generation of microwave industry resulted from a confluence of the “peace dividend” (a downturn in aerospace and defense business) and the “radio frequency (RF) renaissance” (emergence of civilian and commercial market opportunities) that has been widely discussed in the press. The RF and microwave industry began producing a plethora of consumer products, including microwave ovens, wireless communication and networking equipment, GPS receivers, mobile handsets, automotive radars, and RFIDs, representing a paradigm shift in microwave industry. Of the numerous ramifications of such a shift, we examine here only the changes in the two industry traits mentioned earlier. First, as a result of marketplace competitiveness, lower cost and shorter time-to-market became

an overwhelming concern and essential for product survival. Second, because the products were meant to be used by technologically unsophisticated consumers and due to greater uncertainty about the operator environment (lying down, in a bath tub, in the presence of petroleum fumes, and in the vicinity of other RF and microwave products), the product risk became an issue. Unfortunately, both the competitiveness and the concern about consumer safety and user risk assumption negatively impact the dissemination and sharing of technical information, which is the mission of an engineering publication such as *IEEE Microwave Magazine*.

When Francis Bacon declared “knowledge is power,” he could have been predicting the mantra of the high-tech industry where technical knowledge endows competitive edge, both in cost and in time-to-market, that can make the difference between success and failure for a commercial product. The reluctance in sharing technical knowledge in a competitive field is understandable, but it appears to reach epic proportions when authors decline invitations to write (or withdraw) papers citing company clearance policies, conference attendees arrive with eyes and ears open but mouths shut, and manuscripts become sterile as the

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details are stripped away. Even universities can no longer be assumed to be centers of free exchange of information. Derek Bok, the past president of Harvard University, in his recent book titled *Universities in the Marketplace*, warns about the ability of corporate research sponsors to suppress and delay technical information resulting from university research for a very long time. The vitality of technological journals is thereby jeopardized.

The use of any engineering product, including those that employ electromagnetic energy in the RF and microwave frequency range, involves a variety of risks: the risk to the user when the product is in normal use, the risk if the product fails to function at all, the risk if the product fails to function as intended, the risk caused by a malfunctioning product or one functioning in a faulty mode, and risk due to its interaction or interference with another product. Since an utmost regard for human safety is part of an engineer's code of ethics, one would expect that the possible problems and risks associated with a particular tech-

nological product will be carefully studied; if there is uncertainty about the risks, further research will be conducted to ascertain them more definitively; if potential risks have been identified, a cost-benefit analysis of modifying the product to mitigate the risks will be carried out; and if there is a causal or statistical evidence of injury, the product will be restricted or withdrawn; moreover, these studies, conjectures, analyses, and results will be presented to the expert community through the technical literature, to benefit from the collective wisdom and effort of that community through discussion, evaluation, and further study. For this process to succeed, the scientific and technical community typically expects a candid discussion of the subject in the open literature.

The standards of open-mindedness and proof in the technical community are, however, different from those applicable in a civilian court of law. A seemingly harmless phrase like "problem with the product" published by an employee of the manufacturer can become evidence in a product liability

lawsuit. This drawback is not confined to the open literature; internal reports, documents, correspondence, and even e-mails can be subpoenaed in the court to bolster the claim that a manufacturer has been irresponsible. Even studying the potential risks of a product can be risky. In countries with a jury system (as in the United States), a clever attorney can present the existence of such studies as an ipso facto proof that the product is dangerous, that the manufacturer was aware of the risks (otherwise why would they study them), and was therefore irresponsible in producing and distributing a product known to be risky. It is almost as if it is better to be unaware of the risks than to study them! A cost-benefit analysis, or any attempt to balance the risks against the costs, can be presented as a cold-hearted willingness to sacrifice customer safety for profit. The norm of open discussion expected in the scientific community can become a liability in such an environment. The scope of the technical literature, and the role it plays in the process of scientific advancement, can thus be diminished.



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