

PUBLISH OR PERISH: IT'S NOT JUST FOR ACADEMICS ANYMORE

The academic community has a long history of measuring the accomplishment of its members by their proclivity to publish and to base growth and advancement on the sheer quantity of those publications. "Publish or perish" has long been a way of life in academia. Engineers and their managers, on the other hand, are typically more concerned with "shipping the hardware" than writing something. The rapid rate of change in the microwave engineering community has made it more important than ever to be able to exchange information within the profession. One of the most effective ways of achieving this goal is through the publication of technical papers. This article will outline the why, where, what, how and when of publication.

WHY?

As we all know, there is no longer any such thing as "job security." There is very little corporate loyalty left and this has been matched by a similar response from employees. Even in the case of companies with good records and enlightened supervisors, the situation is frequently not under their control as mergers, acquisitions and restructuring change the culture of a company. The company that grew as a result of entrepreneurial and engineering excellence may suddenly find itself under the management of accountants and lawyers. The best that a professional engineer can hope for is "employability security." Part of this security is, of course, the actual ability to do the job, but of equal or greater importance is the outside world's perception of that ability.

This perception can be enhanced by establishing recognition and reputation in the industrial or academic community through participation in professional societies like IEEE and MTT-S. It can also be greatly accelerated by publishing technical papers. Publishing builds reputation and recognition within an author's current organization, which will provide career enhancement and can impact growth and compensation without necessarily changing jobs. Such publication is a benefit to the image of the present employer as well; many of the more enlightened companies actively encourage publication with internal recognition in company newsletters and, in some cases, with honoraria. There is also a great deal of personal satisfaction that comes from seeing one's work in print and the service to the profession, which comes with sharing information. Most engineers will acknowledge that their development was based on reading papers published by others before them.

WHERE?

A number of possible options exist for publishing. These include professional societies such as IEEE MTT-S, trade journals such as *Microwave Journal*, books, and company publications or newsletters. Each medium has its own advantages and disadvantages.

Professional societies offer several alternatives within them including transaction pa-

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HARLAN HOWE, JR.
Microwave Journal Publisher/Editor

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techniques and making them more Internet Protocol (IP)-centric. Some working standards committees are, looking at the network and its interfaces other than the air interface. The search is on to incorporate packet technologies as either asynchronous transfer mode (ATM) or IP or some combination of the two.

The question is, now that an air interface capable for a high speed data option exists, what do you do with it? It is not going to be routed over the 64 kb circuit switch pipes of traditional telephony. It is the network, not just the interface, that requires attention. There is activity toward architecting systems around packet connectivity, both ATM and IP. Some picture the backbone network, like the Internet, becoming entirely IP.

It is possible to make a phone in a nice form factor, to push a button and make a call. However, data require more than just an over-the-air protocol. The marketing brochures from any mobile carrier show what is needed to do wireless data, making it obvious why it is only one or two percent of the market. A set of cables is necessary but, when the data cable is plugged in, the phone will not sit on the table. When laid sideways, the phone does not get a very good signal, so the user may be provided a briefcase with a pocket for the phone. After all this, the user gets a blazing 9600 baud rate! It will be some time before all the pieces of a true data offering are packaged simply and conveniently.

Bolliger believes there is an over-fixation on air-interface nuances, chip rates and all the other activities around the air interface when, in fact, the far greater issue is how to build a network that supports the services envisioned. "Services requiring higher speed data almost demand a fundamentally different network — namely, more packet- than circuit-centric."

EXPECTATION AND REALITY

The problems facing a worldwide implementation of 3G will be resolved. However, there is a considerable disconnect between expectation and reality and it is related to the expected pace of technology. People — including most engineers — are used to dealing with the computer industry; Moore's Law is expected to be applica-

ble to all technology. Those of us who are part of the RF community understand that it does not apply to most of the circuits we work with. Analog, RF-type functions are on a very different (slower) development curve.

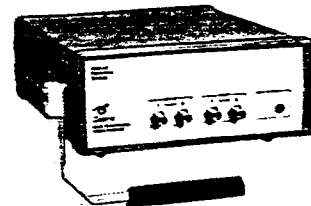
There are fundamental functionality limitations that do not exist with digital circuits. The power amplifier is a prime example. Because it must deliver a certain amount of power, power consumption cannot be brought down to zero. There are other areas, which are power-constrained in function, that people outside RF do not appreciate. This constraint relates to circuits like low noise amplifiers that, to achieve a certain intercept point and, hence, a certain linearity and dynamic range, must be biased and consume large amounts of power. Oscillators are another example: If a specific signal-to-noise ratio is desired, the signal must be brought up to a certain level above the noise floor.

For RF, it is architectural changes that yield the most significant improvements, for example, eliminating an oscillator rather than trying to design it for low power. Eliminating a filter by changing receiver architecture reduces size and cost more quickly than advancing the technology in which the filter is implemented.

However, all this having been said, anyone (in or out of RF) who doubts the potential applications for the high bandwidth channel 3G can deliver to users is mistaken. Historically, as the capacity of a communications system increases, people find unanticipated ways to use it. Telephone modems are a good example. The growth of the Internet was dependent on the enhanced data rate that could be delivered over a twisted pair. In the days of 1200-baud modems, the Internet would not have been practical. From this perspective, it is difficult to question the utility of the higher capabilities that the new 3G hardware and protocols will deliver. ■

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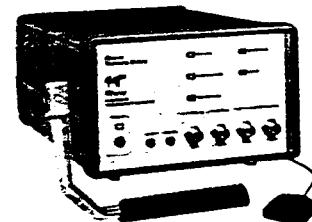
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pers, magazine articles, newsletter items and presentation of papers at technical meetings, which includes published digests of the presented papers. Presenting a paper at a technical meeting is perhaps the easiest and fastest way to get published. The acceptance and production cycle is generally short and the amount of actual printed material is usually a short summary of no more than four pages.

Publication in some vehicle of a professional society carries the most personal prestige for the author since the papers are peer reviewed and the criteria for acceptance tend to be fairly stringent. Such papers are also considered to be archival and will be referenced for years to come. One of the disadvantages, however, is the long production cycle, which for transactions can be nine months to a year or more. Letter publications are somewhat faster but tend to be restricted to a shorter format. Neither provides the capability for color, which in many cases is needed to fully present the material. Another disadvantage of transactions is relatively low readership. Most society publications, such as the *MTT-S Transactions*, have a circulation of only about 12,000 and it has been estimated that fewer than 1000 copies actually are read in a given month. The total print run for symposium digests is even smaller. The number of digests printed for the recent MTT-S International Microwave Symposium was approximately 2500 plus a similar number of the CD-ROM version, which is gaining in popularity. These venues are important and essential for a well-rounded résumé, but they don't provide wide exposure.

Another option is to publish in one or more of the trade journals such as *Microwave Journal*, *Microwaves & RF*, *Applied Microwave and Wireless* or *RF Design*. Each journal has its own editorial style, but all of them share some common advantages. The circulation of these publications is between 35,000 and 58,000 (*Microwave Journal's* circulation is 54,500 in more than 22 countries), offering a much larger audience than a society publication can deliver. The audience is also more diverse. Society transactions are read primarily by other design engineers and researchers, while trade journal subscribers also include

corporate and engineering management as well as basic research, support services, marketing and sales personnel and educators. *Microwave Journal* has nearly 20,000 subscribers who fall into the category of engineering management in addition to more than 28,000 engineers. There are additional practical advantages to trade publications, which include a much shorter production cycle, editorial and art department support and, in most cases, the availability of color to help clarify and enhance the presentation of material.

A minor drawback to trade publication is that it can carry less prestige for the author than publication in a professional society transaction. This is a factor that varies from publication to publication. *Microwave Journal* is the only one of the trade publications that provides peer review of technical papers, which increases the author's credibility and prestige. However, not everyone considers this to be essential. The tabloid publications tend to provide the lowest level of author prestige since their editorial content leans toward product presentations with a heavy emphasis on sales.

At some point in their careers, most professionals have considered the idea of writing a book. A book carries perhaps the most prestige. It is certainly satisfying to the author and can be profitable both in terms of direct remuneration as well as compensation due to career growth. A book has a very long lifetime. If it includes basic information, it can outlive the changes in technology that might otherwise make it obsolete. The *Microwave Engineers' Handbook* by Ted Saad was published in 1971 and is still in print. Similarly, *Microwave Filters, Impedance-matching Networks and Couplers* by Mattheai, Young and Jones was published in 1964 and continues to sell well.

Writing a book, however, is not for the faint of heart. It takes a lot of work and requires a lengthy production cycle. Word processors have made the job much easier than it was 25 years ago, but it is still likely to take at least a year of concentrated effort before the publisher even can begin the production process. An additional and serious consideration when contemplating a book is that publishers

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must make a profit. While the editor of a journal or transaction will accept a good paper, even if it has a limited audience, the acquisition editor of a book publishing house must consider the market for the book and whether it will sell well enough to justify the expense of printing, marketing and stocking it. Thus, even though the author may be the world's leading authority on a given topic, if there aren't enough people working in the field to provide an adequate sales return, the book will be rejected. It is also important to match the goals of the book with an appropriate publisher. McGraw-Hill and John Wiley, for example, address the college textbook market. Specialty publishers like Artech House focus on the market for working professionals rather than schools. As a result, a perfectly good manuscript may be rejected by one publisher because it doesn't fit its market, while another publisher will be happy to publish it. To avoid the disaster of writing a book that no one wants, it is imperative to create a proposal first and come to an agreement with a publisher before the final manuscript is completed.

Company publications are a mixed bag: some are very good while some are very bad. Company publications like the *Hewlett-Packard Journal* and the old *Microwave Associates Micronotes* have been very well received and actually have archival value. Present-day international companies like

IBM and some European communications companies (such as Nokia) publish very slick, polished magazines, which help the reputation of the company as well as the author. Unfortunately, the bulk of company publications are sales-oriented newsletters or tabloids that do not help the individual author. If the content is principally written by the technical staff, a company publication can be useful. However, if it is created by the sales department or, worse yet, an outside PR agency, it is likely to be full of puffery and an embarrassment to the author.

There are some advantages to a good company publication. Publication is quick and easy. There is no fear of rejection and the publication cycle is generally very quick. In the final analysis, however, the author who is asked to write for the company publication has no choice.

WHAT?

There are six basic material categories that are appropriate for technical publication. This list does not include social commentary, interviews, market projections, surveys and the like, but rather confines itself to technical material.

The first area (and the most difficult) is new theory. This category requires extremely innovative thinking, a deep insight into the existing theory and the ability to convey new ideas in a convincing and thorough manner.

This type of paper is best suited to professional society publications. In most cases it requires mathematical proofs and derivations, which trade journals are reluctant to print in their entirety. The contribution that such papers bring to the engineering community is significant, lasting and essential for the long-term growth of the profession.

An easier and more universal type of paper is one that presents a novel approach to an established or new problem. This type of paper has appeal to society publications as well as trade journals although trade journals will react more quickly since this is the major style of paper preferred.

Some papers grow out of a successful project and are a description of the project and its results. This type of paper tends to be newsworthy and is well suited for conference presentation where new and improved results or achievements are showcased. Except for the special symposium issue of the conference, this type of paper rarely is published in society transactions. However, an expanded version with additional up-to-date data is very attractive to trade journals. If the author expends a little effort, this type of paper can be parlayed into two publications.

Application notes are always of interest to trade journals. A new way to solve a problem, make a measurement or use an established technique

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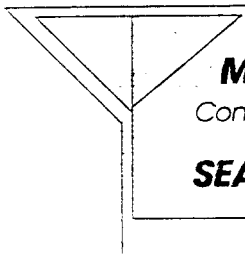
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for a previously unknown application makes a good short paper. Caution is needed to be sure that the paper does not turn out to be a "commercial" for a specific product but rather provides sufficient general information for the reader.

Tutorials are becoming more important than ever as a new generation of engineers who are used to "computer everything" need basic background technology, which is increasingly hard to find. *Microwave Journal* publishes an ongoing tutorial series. We'd like to hear from you if you have an idea for a tutorial.

The last category is the new product description. This item is of no interest to the professional society publications and is handled differently by different trade publications. The trade journals print a lot of this material but, in the case of *Microwave Journal*, the article is staff-written based on material supplied by the company and does not carry an author byline. Company publications encourage this type of presentation and generally give the author credit, but it is not considered a career builder.

Seven basic elements must be addressed in any good paper:

1. An introduction or abstract, which gives the reader a summary of what he or she is about to read.
2. A statement of the problem. Why was the work performed and what was intended to be accomplished?
3. The theory behind the approach to the problem. Why was this approach taken and on what prior work was it based?
4. How was the problem solved? (This should be the major portion of the paper.)
5. What were the results? Measured data are very important. Unless the paper is pure theory, real data (not just computer simulations) are needed.
6. The conclusions drawn from the work. Was it as successful as hoped? Is more work needed? If so, what is the next step?
7. Proper references to previous work.

If these steps are followed, the likelihood of publication is very good.

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HOW?

If the paper has already been written, it should be submitted to the intended publication. It is very important to remember that a paper should *never* be sent to more than one publication at a time. "Shotgunning" a paper to multiple publications is unethical and counterproductive. If minor revisions or additions are required, the editors will typically work with the author to make improvements to the paper. If the paper doesn't meet the editorial needs of a given publication, most editors will suggest an alternative publication.

All publishers require an exclusive copyright on the material before publication. The agreement will also include language that the paper has not been accepted elsewhere and that the author has obtained any needed permission to publish it. Once a publication has accepted and scheduled the paper, production moves quickly. If the author is employed by a large company with a legal department that must justify its existence by rejecting everything the first time, then it is important to obtain permission in advance. This is also true for government employees. Trade journals have deadlines and will not wait, and many of the professional societies are now requiring such statements at the time of submission. All of the publications will grant the right to reprint the material with an appropriate reference to the original source or to use the basic information in company literature or other papers, so the publication agreement is not as restrictive as it may sound. In addition, all publishers make reprints available at a very modest cost. In the case of trade journals, these can be in color and include additional material, which makes them useful as handouts at shows and for supporting proposals.

If the intended publication is a trade journal and the paper has not yet been written, then it is very useful to first submit a proposal with an abstract and outline to the publication. Most editors will provide guidance so that the paper will meet the necessary requirements, thus speeding up the process. Most publications have author guidelines, which they will be happy to provide. This approach does not apply to the professional societies, which will want a finished manuscript.

Authors need to recognize that all publications will do some editing, either to improve the clarity of presentation or to suit the style of that particular publication. In some cases, repetitive material may be reduced or removed. In most cases, the author will have a chance to see the final version before printing. Unless the editors have inadvertently introduced an error, it is not productive to argue over the edits.

WHEN?

It is best to start publishing as soon as possible. This may mean starting as a co-author with a more experienced colleague. After that, one should look at the work he or she is doing with an eye toward publishing on a regular basis, preferably every year or two. It is good to set a realistic frequency goal and try to meet it. It is also important to balance efforts among the many publishing options.

CONCLUSION

Writing and publishing one's work is an important part of a successful professional career. There are many alternatives and, once the ice is broken with the first paper, it becomes easier and easier. Most people can find someone in their organization who can offer helpful advice and encouragement. The main point is to recognize that writing, like attending advanced classes, should not be neglected or forgotten due to the daily pressures of the job.

A PERSONAL NOTE

During the 33 years that I worked in engineering prior to taking the helm of *Microwave Journal*, I followed the advice that I have just presented. I have published in every media I have mentioned, and it worked for me. I was fortunate to have two mentors in this respect. When I was just starting as an engineer, Bert Aaron urged me to become active in the IRE/PCMTT (now called IEEE/MTT-S) and told me to "Go write something." Some years later, Ted Saad gave me the encouragement and self-confidence to embark on the daunting project of writing a book. In thanking them both, I hope this article may give someone else enough of a push toward writing in the hopes of successfully enhancing his or her career. ■

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