

## Interview with Randall Ledford Chief Technology Officer Emerson Electric



Randall is responsible for leading the strategic technical direction of the Company, advising the Corporation and Divisions on technology acquisitions, and directing strategic investment programs for R&D and new product investments. He is also President of Emerson Ventures Inc. He serves on the board of directors of several companies and universities, as well as several CTO boards and forums both in the United States and abroad.

Before joining Emerson, he was president and general manager of several divisions at Texas Instruments. He began his career with Bell Laboratories.

Randall holds a Ph.D. in physics from Duke University. He holds over 20 patents and has published more than 80 articles in professional science, engineering and business journals. Randall can be reached at [Randall.Ledford@emrnsn.com](mailto:Randall.Ledford@emrnsn.com)

Interview conducted by Doug Berger, INNOVATE LLC. [doug@innovate1st.com](mailto:doug@innovate1st.com)

CTO Randall Ledford describes how Emerson approaches global innovation, integrates innovation with other disciplines, builds virtual networks of world-class expertise and uses venture capital to scout out new technologies.

**Doug:** Let's jump in by talking about how Emerson has been evolving and even disrupting its own innovation process over the past several years.

**Randall:** Let me give you background to set the stage. In one sense, Emerson has been typical. In another sense, we have been atypical – innovative – in our approach to innovation.

First, perhaps like most companies, we began to move some of our operations to other countries several years ago. Also, like most other companies, we started this move with our manufacturing facility. One of the first manufacturing sites that we chose outside of the United States was Mexico, followed by China.

We soon discovered that in order to generate revenues in another country, you needed to go beyond manufacturing. You needed to build infrastructure, which included sales, marketing and administration.

Once we had this infrastructure in place, we began to realize that we should also put innovation resources in these countries. We realized that we needed local designers who understood local country requirements in order to market most effectively.

The way in which we have gone about building our global organization differentiates Emerson from many if not most companies. For example, we quickly realized that there is far more to going global than simply hiring lower-cost people. Let me share a story that illustrates my point. A Fortune 100 executive told me that the total cost to his company

for an engineer in India was \$31,000 to \$32,000 a year. He had heard that Emerson's cost for that same engineer was \$15,000 a year, which he said could not be possible. To make a long story short, I soon found myself in a benchmarking session with that company.

I quickly discovered that this company assumed it had to replicate its United States engineering operation in Europe and India. So, it built a building in India to U.S. standards. It actually exported furniture to India from the United States. In addition, it used Americans as managers. In effect, this company built an American engineering center in India.

In contrast, Emerson built an Indian engineering center in India. We leased an Indian building. We bought Indian furniture and equipment. We staffed the center with locals and hired an Indian as the manager. As a result, our total cost for an engineer in India was \$15,000 a year. The substantial difference in cost resulted from our substantially different approach.

Today, there is a mad rush to go global. Unfortunately, many companies do not do their homework. The result is wasted time and lost productivity. For example, when I hear a company say that it has "hired X number of people in country X and outsourced X percent of its engineering work," I know right away that the company is pursuing an approach that will fail to maximize effectiveness over the long term.

The first thing we tell our engineering organizations is that the engineers whom we hire in other countries are part of the overall engineering team. They are not an "outsource resource." To the contrary, engineers in other countries are our people to guide, direct, and develop, as are the people who work down the hall. That means that you treat engineers in other countries in the same way that you treat the engineers down the hall. You work to maintain good lines of communication. You have regular meetings. You all understand and share the same processes. (This includes top-quality IT systems that can download engineering drawings quickly. You would be surprised by how many hours can be wasted waiting to transmit engineering drawings on second-rate equipment.) All of this requires up-front planning and work, and that up-front work is critical to optimize an organization.

In other words, we take a long-term view of all of our engineering resources, wherever they may be in the world. We have a long-term commitment to these people and their development. Emerson believes strongly in that commitment.

Finally, I am very proud of our engineering groups outside of the United States. They are focused, they are aggressive and they are productive. They regularly beat our competition.

Doug: Going global, as you describe it, has its own challenges.

Randall: Absolutely. The big challenge is creating an environment in which collaboration can be most effective. That may sound simple and obvious. However, when you get into the nitty-gritty, there are significant challenges that you have to work through in order to make your collaboration truly effective.

Take, for example, the issue of language. China has proportionately fewer people who speak English than do most other countries in the world. Obviously then, you seek out people in China who speak English very well. This is difficult, particularly in the engineering community, but it is very important because so many of our ideas and innovation come from the engineering side of the organization. Effective communication is absolutely essential to optimizing our effectiveness.

The point is that we are interested in far more than lower-cost engineering. We are interested in creating an environment and a long-term process in which ideas are generated on a consistent basis. We want to create an innovation machine, so to speak.

What we have found to be most successful is to take an existing product and give the new engineering organization a clear objective for that product. Perhaps that objective is something as simple as "reduce cost by X percent." By working toward that objective and using the Emerson system, our engineers outside the United States learn the product, they learn our system and they learn the things that constitute the big levers for change.

With that base of knowledge, we start to move up the hierarchy of engineering complexity to bigger and more important value-add. Once the engineering organization has learned what makes this product tick and they have reduced its cost, we then want to understand what customers in their country and world region really want from that product, so that we can innovate and deliver that solution.

Let me give you an actual example of how this works for Emerson. We know that people in Asian cities live closer together than do people in the United States. So it should be no surprise that Asian consumers want air conditioning systems that operate more quietly. Now that we understand the customer need, let's see how we can innovate and deliver an extremely quiet system. When you do that, something interesting happens. You develop an air conditioning system that operates very quietly for the Asian market, and that innovation almost always helps you in other markets, too. For example, we can take that innovation, originally developed for Asia, and market it in the United States. Suddenly, we have the market's quietest air conditioner. We leverage that customer benefit for increased sales.

Doug: How does that collaboration work, both from an engineering point of view and from a business point of view?

Randall: We start with an understanding of the market and its customers. The understanding of what customers want leads us to the technical problems that we must solve. Equipped with that understanding, we need shared collaboration tools. These include the IT and communications capabilities that I mentioned earlier. For example, many of our divisions have regular video meetings to link their global engineering teams. In this way, people can put a face with a name. They can see the body language of their counterparts. It is more personal than a disembodied voice over a speakerphone. The point is that you want to involve people. They have to understand that their ideas are valued and important.

One of the famous stories about the pitfalls of global marketing is the General Motors introduction of the Chevrolet Nova. In Spanish-speaking countries, "Nova" literally means "no go." Well, that turned out to be a horrible name for an automobile. In Japan, the color red connotes poor quality, and so on.

The point is, when you have a global team collaborating effectively, embarrassing – and expensive – mistakes like this are identified and corrected early in the process. In the same way, we learn that Asian customers want a quiet air conditioning system. We learn that perhaps we need to change our packaging or the color of our product to make it more acceptable in some part of the world. These are the important results of effective global collaboration.

Doug: What is noteworthy about the way in which Emerson got the total business organization involved in innovation – against the backdrop of local problems, local markets and local needs?

Randall: Over the last five years, we have put together international collaboration teams that focus on these issues. Interestingly and importantly, I believe, all of the titles end with the

words “business leader.” For example, I work with top technical people throughout the corporation, and they are “technology business leaders.” In other words, even our titles remind us that our technology is inseparable from our business.

Emerson technology business leaders come from the United States, Europe, China and other parts of Asia. We examine ideas, products, services, brands, names and aesthetics, such as color and design. We focus on product life cycles from cradle to grave – from ideation to development, manufacturing, commercialization and marketing. We talk about all of these subjects and how they work together in support of a particular product.

Technology business leaders collaborate with one another, and we collaborate with our counterparts in procurement and in marketing. We do this on a global basis.

Doug: There must be some underlying principles shaping your own thinking and shaping how you lead a very far-reaching and diverse organization.

Randall: One of the most important factors in becoming more effective and increasing the success of our innovation process at Emerson is what we call ‘spiral development.’ This is how spiral development works - first, we produce a paper concept of a product. We bring the customer into the process. We share our paper concept with customers and ask, “Is this what you said you wanted?” They may say, “Well, yes, but it’s not quite right here.”

Then we may build a prototype and bring the customer into the process again. We go through several iterations of this process of spiral development. (Actually, we adopted this phrase from Dr. Robert Cooper). This is one way that we keep our finger on the pulse of a rapidly changing market.

This may sound simple. One of the toughest – and most essential – principles of spiral development, however, is killing products during development if the technology changes or the market changes. This can be hard to do because you almost always have champions who really believe in a product. Nevertheless, it is necessary to kill a product when the facts tell you it needs to be done.

To demonstrate why this makes sense, let’s draw an analogy with venture capital. A venture capitalist will tell you that if he makes 10 investments, he expects six to seven to fail, and two or three to have okay returns. He hopes to get one blockbuster out of 10. This covers his losses and pays a terrific return. So, with that in mind, why should Emerson assume that 10 out of 10 projects are going to succeed in the market? It just is not realistic. We believe that you have to have the courage to reprioritize resources and put resources behind the project with a larger return. Spiral development helps us to do this.

Doug: How do you stay nimble with the rapid turns in technology?

Randall: Emerson follows two guiding principles. First, our products and our services – including our marketing campaigns – must create value for the end customer. Secondly, we believe that it is our right to capture our fair share of the customer value that we create. I’m not saying we are greedy. I’m just talking about a fair share.

Here is an example that makes my point. We all would agree that the PC industry has created enormous value for everyone who uses PCs. However, the PC equipment companies have largely failed to capture almost any of that enormous value that they have created.

Now, let’s tie this back to nimbleness – nimbleness in electronics, in particular. I use electronics as an example, because the world of electronics is one of the most competitive

industries in history. This is partly because prices of electronic components come down faster and faster as their value goes up and up.

One of our electronics companies receives a Request for a Quote (RFQ) from a customer. The RFQ states a price target and performance objectives that we must hit. We have built an organization that can build up a block diagram of electronics from library components so that you don't have to stop and design circuit by circuit. For example, you can pull a memory block out of the library and know that it will work. You can pull out a CPU block and know that it will work.

Now, as that design process is happening, there are automatic computer triggers notifying Emerson procurement people that they must almost instantaneously get new quotes from suppliers for these key components. Our designers work very closely and quickly with procurement people to identify key parts and key areas where they need cost reductions. Therefore, they can go to a memory supplier and find that the 16-megabit chip costing \$3 two months ago, now can be purchased for \$2. It depends on the size of the project, but we can put together a current quote and get back to a customer within 24 to 48 hours.

I consider this world-class nimbleness. We have the ability to respond to a customer with a new design and a new price at a manufacturing cost that allows us to capture our fair share of the value that we have created. If we cannot do that, we will not bid the project. However, if we choose to make a bid, we will usually beat our competitors in responding first to the customer, and we usually will capture our fair share.

Doug: You have just illustrated one place in particular where you have integrated engineering and procurement so tightly that you really are remarkably nimble in your ability to respond to a customer. Is there anything else to add in this area of Emerson's nimbleness?

Randall: I'll give you an example. It surprises me that so many companies who want to build a new product get their design team together and start with a clean sheet of paper. It might be a terrific product, but the problem is that it takes so long when you start with a clean sheet of paper. For example, Emerson is the world's leader in electric motors. If we started with a clean piece of paper to design a new electric motor for an appliance manufacturer, the process could take one and a half to two years.

We cannot afford an innovation process that moves slowly because today's marketplace changes too quickly. So, one of our guiding principles – and an important way in which we have changed our product road maps – is to identify products as platforms and derivatives. (Our product road maps are color-coded to identify platforms and derivatives.) When we develop a derivative, we leverage the platform and we choose building-block components and put them together very quickly. You can get some dynamite products – very quickly – from this process. And that speed is vital in today's marketplace.

Doug: What are some of the other things that Emerson has done to ensure that it is being platform-driven and nimble in growth outside of the core?

Randall: Diverse companies like Emerson have so many different products and so many different technologies that there is no way we can have all of the technical expertise in-house to answer every question. Therefore, what Emerson has done – and I believe this is an important differentiator for us – is to create an extremely broad virtual network of technical resources. In that virtual network, which now numbers more than 100 sources worldwide, we have universities, national laboratories and special research centers. We call on these resources to help us solve unusual technical problems.

For example, one of our customers, an appliance manufacturer, had a capacitor problem it could not solve. The president of the Emerson division who sold to this manufacturer

called me and said, "Randall, these guys are struggling. They can't manufacture product." That also meant they could not buy Emerson product until they got their problem solved and their line running. So, as soon as that conversation ended, I called a capacitor expert. He literally solved the problem over the telephone. Now, to make certain he was right, he flew out the next day ... and he was right.

So, what is it worth to a company to have an expert on hand who can solve a serious problem in less than 24 hours, versus having a line shut down and generating zero revenue perhaps for weeks? This is exactly what we mean in our advertising when we say, "Emerson – Consider it solved."

Not only do our experts in Emerson's virtual network solve problems, they help us prevent problems and optimize our product design. For example, if we are designing a product that uses an unfamiliar technology, we bring in outside experts to conduct what we call an outside design review. In about two weeks, an outside design review by world-class experts can teach us a great deal about optimizing a product. Incidentally, these reviews are extremely stimulating and a lot of fun.

This virtual network of experts gives Emerson a tremendous competitive advantage. As in the case of the appliance manufacturer I mentioned, not only do experts help us, they also help us build relationships with our customers based on problem-solving. Customers appreciate this. In fact, I've helped some customers build their own virtual networks.

Doug: You also are doing some very interesting collaboration with venture capital.

Randall: The reality is that much of the innovation in the world today comes from start-ups. So, how does a large company take advantage of all these new commercial ideas – and avoid being caught by surprise by so-called disruptive technology?

Something that has worked successfully for Emerson is having someone else do the work. This may sound a bit strange, but what I am referring to are venture funds that have the experts and professionals to screen new companies for us.

Emerson finds venture funds that are looking not just for financial investors but also for strategic investors who have both a financial interest and a business interest. We look at venture funds as a kind of radar to go and find these companies. We look for new-to-Emerson or new-to-the-world technology that we can embed into our existing product lines. In other words, we look for opportunities that offer an immediate technology transfer. In addition, venture funds that Emerson invests in have companies that can become a vendor to or customer of Emerson. This is another way that is important in keeping an eye on new technologies from start-ups.

Doug: How do you short-circuit the 'not invented here' syndrome within Emerson?

Randall: The technologies that we buy and embed in our products are typically not where we see our unique value add. For example, we make uninterruptible power supplies – UPS. A UPS has an alternate energy source. Applications range from keeping the power up for quite a while, i.e. in a hospital operating room, to keeping the power up for only 60 seconds, so that a computer can shut down without creating problems. One way to create this alternate power is through flywheels that spin around to produce electricity. Through our venture program, we found the world's best flywheel company. At the time, we were buying flywheels from another company, so we substituted the better technology, but we never had an interest in making flywheels ourselves. Our value added is the UPS electronics.

We use the same approach to give our core products a new layer of application – and value – for customers, as in wireless communication. And, we leapfrog our competitors by bringing this new technology application to the market in advance of anybody else.

The other thing I would say about the 'not invented here' syndrome at Emerson is that we have a long history of having a highly disciplined focus. Our organization is extremely result-oriented. That is nothing new. What is new is that we have significantly stepped up our pace of innovation. We have done that (with the help of Dr. Cooper) by refining and strengthening our innovation or new product design process, which has no place in it for the 'not invented here' attitude.

### **Velcro Points**

1. Build a global organization with long-term performance in mind ... how people will collaborate ... how new customer needs will be addressed ... how new locations will become fully integrated ... and how you can apply local culture and customs to gain performance advantages.
2. Know your company's distinctive technical competency ... make sure you receive your fair share of financial value.
3. Organize your product development around platforms and derivatives.
4. Use venture capital investments to hunt for technologies and products which enhance your derivatives and to spot potential disruptors.
5. The power of virtual networks for solving customer problems and open innovation.

INNOVATE is a management consulting firm specializing in new-to-the-company innovation, game-changing growth and breakthrough approaches. INNOVATE publishes **The Innovators** ezine and hosts **Innovate Speaks**, a speaker referral service. For further information visit our website [www.innovate1st.com](http://www.innovate1st.com) or contact Jaymie Berger, [Jaymie@innovate1st.com](mailto:Jaymie@innovate1st.com), or +1.732.564.9145