

2015 General Technology Conference

Address to Analog Device

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Introduction and Welcome

Hello and welcome, everyone, to the 2015 General Technology Conference. As ever, I'm happy to see so many of you gathered together at this event. Let me extend a special welcome to former Hittite employees to their first GTC.

In many ways, this year's GTC is similar to each one that has come before. We will share knowledge and insight... discuss opportunities... make new friends... and learn from one another.

But in *another* way, this year's GTC is also very different. It comes during Analog Devices' 50th anniversary. So it presents a unique opportunity to look back at the foundations of our company... how we

built upon those foundations through the years... and to look ahead to see how we can draw on our understanding of history to keep building, growing and innovating into the future.

Origins

Some of you know this story, many of you may not, but our very first GTC was in 1979. Analog Devices, at that time, was just 14 years old.

We knew there was an appetite to bring folks together to discuss technology, explore new ideas and learn from one another in a single, organized event. This was something that was quite unique for its time in our field, especially for a company of our size.

So we welcomed 100 participants to the first GTC, which was held at the Sheraton hotel in Boxborough, Massachusetts. One hundred engineers gathered for the main presentations on the hotel's indoor tennis courts.

Well today we have moved well beyond the tennis courts. But our appetite for mutual learning, discovery and collaboration continues stronger than ever. The 2200 engineers in attendance this year is the best evidence of our success in developing ADI's most important resource, our technical community. The 50th anniversary is cause for celebration and reflection and also a time to thank the many, many people who helped us achieve this milestone, most of all you here today and your colleagues back home.

As a company surviving, let alone thriving, for 50 years is no small feat, especially in the fast paced high technology industry. Consider this: only one-third of the Fortune 500 companies in 1965, when Analog Devices got started, still exist today, the rest were closed, acquired, merged or

broken into pieces. What about the Fortune 500 companies today like ADI? How many will still exist 50 years hence?

Some years back, Royal Dutch Shell Company initiated a study of companies who like Shell had survived for more than 100 years to see if there were any commonalities that would explain their longevity. They found 40 companies that met their criteria and analyzed 27 of them in detail. Many names you would recognize like DuPont, WR Grace, and Proctor and Gamble, in America and Mitsui and Sumitomo in Japan. The findings of the study, did in fact reveal strong commonalities among these long lived companies. These common characteristics were published in a book "The Living Company" and can be summarized as follows:

- Sensitivity to changes in the environment and ability to learn and adapt.
- Tolerance for risk, unconventional thinking and experimentation
- Strong financial results to support exploratory investments at the periphery of their core business.
- Cohesion with a strong sense of identity.

In my view, these same characteristics are key to explaining ADI's success. If history is any guide, sharing the characteristics of companies that surpassed 100 years puts us on good footing as we embark on ADI's next 50.

Sensitivity to Change/Ability to Adapt

Over our 50 year history, ADI has been confronted with the need for dramatic transformation, not once, but three times. First it was

technology and the need to transition from hand assembly of discrete components to semiconductor integrated circuits, at a time when our module business was flourishing.

We achieved performance in our modular op amps by manually matching transistor pairs and wrapping them in copper shields to minimize temperature gradients. We also manually selected resistors to reduce voltage off-set. But it was a labor-intensive, expensive process.

By 1969, ADI was a public company and I proposed to the board that ADI get into the IC business.

To put it lightly, there was much internal debate about whether this was the right direction to go. The board wanted no part of it. Why risk a successful business that was growing 80% year over year and making good profits by allocating resources to a business we knew nothing about

and where large semiconductor companies already had a compelling head start? But the more I dug into it, and the more I learned about the progress IC op amps were making – the more I concluded that, while we would continue to do well for the foreseeable future in the module business, eventually IC technology, because of its dramatically lower cost, would take over. I was not sure when or how, but for me the writing was on the wall; either we learned how to design and manufacture linear IC's, or our success would be short lived.

So, I found a way around the board by borrowing money against my ADI stock to fund a startup company, Nova Devices, at ADI's location in Wilmington. The deal was that Nova Devices would design and manufacture IC's and ADI would sell them. If Nova succeeded ADI would have the option to buy it with no gain for me. If Nova failed I would lose my money. Most people thought I was crazy.

Nova did succeed. And on November 25, 1971 ADI with sales of \$12.5M acquired Nova and never looked back. But it didn't happen overnight. It took 15 years for sales of IC's to reach 70% of total sales

Over those 15 years ADI would grow at an average rate of 27% per year. Then in the late 80's we faced another major transition this time triggered by market changes. When the Cold War ended and the Berlin wall fell, growth in our traditional low volume military and instrumentation markets slowed. Fortunately, for the first time demand for our high performance linear IC's, especially converters, began to emerge in high volume consumer and communications markets. The changes required to serve these new markets in terms of time-to-volume, on-time delivery, manufacturing cost and quality were dramatic.

Take the Wilmington Fab for example. In 1986 our estimated outgoing failure rate was over 10,000 parts per million. Within ten years it dropped to hundreds of parts per million and today it is less than 1ppm.

The new things we needed to learn and the areas of our business that needed to adapt were so pervasive throughout the company that we symbolized this second major transition as “Creating the New Analog”.

Today the high volume markets represent a large portion of our sales, however the lower volume industrial and instrumentation markets still today account for more than 40% of sales.

And now as we speak we are in the midst a third major transition from components to silicon systems. This transition is not really from here to there. The challenge is to build and sustain leadership in both

components and systems, what we are calling an ambidextrous organization

Our friend and former CEO Jerry Fishman once said, “In technology companies, it’s all about transitions – transitions in leadership, transitions in technology, and transitions in markets. It’s how you *manage* through these transitions that, more than anything, separates the companies that will last from those that won’t.”

These fundamental transitions take a decade or more to have a significant impact on business. The process of transition is disruptive and frustrating, because it is hard to do. Many companies are able to sense and even understand the necessity for change, but they lack the courage or the will to act. ADI has consistently demonstrated an ability to sense, learn, and adapt, to reinvent itself. This is one of our greatest strengths.

Tolerance for Risk

Another characteristic which explains ADI's success is what the Shell study called tolerance for risk, unconventional thinking and experimentation. Each of ADI's transitions involved enormous risk as we reallocated resources and talent to new and unproven businesses.

Our entry into the chip business was not a singular event in terms of risk. Other bold moves mark our history, for example our moves into DSP and MEMS. Both were unpopular and it took much longer and more investment than we ever imagined. But we persevered since we believed there was long-term potential that would open new market opportunities and it turns out we were right.

For example, MEMS accelerometers opened the door to ADI's penetration into the automotive industry, which is now one of our fastest growing businesses.

But it doesn't always work. For example our investments in baseband and radio products for cellphones and more recently MEMS microphones did not fit in our strategy. So we sold them.

It takes constant vigilance, particularly as a larger and – as we turn 50 – older company to assure that everything doesn't have to be perfect and guaranteed before taking action. That's what risk means. And that hesitancy, natural as it may be, has never stopped us. *Can* never stop us.

Financial Strength

The 100 year old companies also achieved strong financial results to support exploratory investments at the periphery of their core business. When we started Analog Devices, venture capital was just emerging. To fund the company we struck what today would be an unheard of deal with the First National Bank Boston. For every dollar of profit ADI earned, the bank agreed to loan us a dollar. That resulted in a one-to-one debt to equity ratio.

This highly leveraged position meant that we had to kill to eat everyday.

The risks were high. We had a lot on the line, including the livelihood of our employees. But this arrangement created financial discipline and a standard for profitable growth that has continued over decades and has proved to be a key factor to our longevity.

Cohesion – A Strong Sense of Identity

What the Shell study called cohesion and a strong sense of identity is another characteristic which explains ADI's success. Without fully understanding the implications, we were fortunate to have started our business with a focus on operational amplifiers. Although we didn't think of it this way in the beginning, op amps are the most universal and ubiquitous analog signal processing functions. So in a few short years we became known to thousands of customers around the world, across a wide range of applications. To expand our product portfolio we built on

our success and recognition in op amps to discover what other functions our op amp customers needed. With the emergence of minicomputer based instrumentation the answer was loud and clear – converters. 50 years later these two products categories are still growing and demanding innovation and are still a significant fraction of our sales.

But beyond that, our leadership position in amplifiers and converters opened the door to many other related products like – multipliers, sensors, RF and with a stretch of imagination for an analog company, even DSP.

With such a diverse collection of products we were challenged to define our position in the semiconductor industry until we recognized that our products taken together were the essential elements in the design of our customers signal processing chain, both analog and digital. Thus we

coined the term real world signal processing as a new product category – a category now well accepted in the industry. From the beginning we had stuck to our knitting and had focused exclusively on real world signal processing applications as we expanded our product portfolio. This focused business strategy provided the company with cohesion and a strong sense of identity.

Innovation

Another cornerstone of ADI's core beliefs and sense of identity has been our belief that innovation drives business success. Innovation is about our commitment to excellence in whatever is important to our customers and to business success. It is about having the best products, the best quality, the best customer service, the best value.

Innovation leads to market leadership with the goal of achieving the largest share in whatever business we pursued.

We believed in the beginning as we do now that Market leadership through Technical Innovation and Superior Customer Service is not only the best path to financial success, but also being recognized as the market leaders is a source of pride, satisfaction and motivation for employees. And it is also key in recruiting and retaining the best engineers.

Certainly ADI has a long and distinguished record of introducing many, many industry firsts, of breaking performance records and creating industry standards, of solving complex problems, of developing game changing manufacturing processes and CAD tools for precise analog and mixed signal products. We have a well-earned reputation for innovation and leadership in real world signal processing.

You can't have great innovations without having great innovators – innovators like you. So the number one goal for ADI has always been to attract and retain the best and brightest engineers, to encourage and support their development and to recognize and celebrate the value they create.

We have more than our share of industry superstars, who not only develop breakthrough products themselves but who also inspire and mentor the next generation of innovators.

Through our parallel ladder, we created an environment where those who choose to continue their technical careers can achieve recognition, rewards and influence that is commensurate with that of managers at ascending levels of achievement and responsibility, culminating with the position of Fellows as the top rung of the technical ladder. Barrie Gilbert and Paul Brokaw were appointed our first two Fellows in 1978. They set

a high bar for the 34 Fellows that were appointed over the next 36 years.

Innovation occurs at the intersection of technology seeds and market needs. We create technology seeds sometimes out of the blue or by anticipating future trends. We understand market needs by listening carefully to what customers say and don't say. Design engineers are the best listeners for truly innovative products since they are able to imagine solutions that customers would have never thought possible. We have always believed that the best way to spark innovation is to connect our best engineers with our customers' best engineers.

Ahead of What's Possible

"Ahead of What's Possible" is a clear, memorable, and inspirational expression of our commitment to innovation. It is a way of telling our

customers what they can expect from ADI. If it is already possible then it is not innovation. Being ahead of what's possible has always been our goal and must continue to be.

HR Philosophy

The philosophy that guides how we treat employees is another way we have sustained a strong sense of identity even as Analog has been transformed so dramatically in other ways. ADI has always embraced a Theory Y style of management which was first articulated by Douglas McGregor in his seminal book "The Human Side of Enterprise" and which I first saw in practice when I worked at HP. Theory Y takes a positive view of human nature and assumes that people are honest and trustworthy. And for their own self-esteem, people are motivated to do the best job possible and to develop to their full potential. People value

the freedom to do it their way and to sometimes make mistakes, and they want to be recognized and rewarded for their achievements.

And it is okay for people to have goals and ambitions of their own. The responsibility of management is to achieve alignment between company goals and employee goals and to create a challenging work environment with opportunities for personal growth. And it is management's responsibility to build trust and confidence that employees' wellbeing is always in focus.

Because of our value system and our success, many employees came and stayed for the long-term. This includes ADI's three CEO's who grew up with the company and essentially spent their entire careers here.

Long service employees at every level of the company are a great strength. By their words and deeds they perpetuate ADI's value system and make ADI a great place to work.

I have always said "Hire great people and get out of their way." While this is still true today, systems thinking has taught us that there is more to it than just focusing on the individual.

Conclusion

As we look to the next 50 years we have entered the age of systems thinking. Russell Ackoff, a pioneer in systems thinking said "The performance of a system, whether an organization or product, depends much more on how well the parts work together than on how they work separately. If you optimize the performance of the parts you systemically sub-optimize the performance of the whole." ADI has

historically had a propensity to optimize the performance of the parts.

One of our biggest challenges is to learn how to organizationally optimize the performance of the whole while maintaining the excellence of the parts. By the same token we need to think about our products more holistically in how the parts work together to address a larger scope of our customers' problems.

Over the longer-term I believe our continued success comes down to how well we adhere to the basic values that have driven our success to date; responsiveness to change, commitment to innovation and excellence, , tolerance for risk, cohesive business strategy, and a human resource philosophy that motivates employees to achieve their full potential. It is harder for a larger, more complex organization to sustain these qualities. But the Shell study shows that it can be done.

It takes leadership at every level to sustain an awareness of and agreement on what it takes to win and it takes commitment at every level to sustain a system of beliefs and work environment which we are all happy and proud to be a part of.

Vince has a deep understanding of what has made ADI successful and he is exercising leadership to sustain Analog's winning formula even as we grow larger and adapt to a system orientation. But it is also important that you, our technical community, preserve our capacity to take risks, to innovate and to be the best in whatever we pursue. I ask you today to reflect on what has made ADI a successful company and great place to work and to make sure we keep it that way.