

## **Arno Penzias: The New World of R&D**

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Ask Arno Penzias what is at the heart of the tectonic shifts that are reshaping today's corporate research and development strategies, and without hesitation, he shoots back: "Drastically falling transaction costs."

An initially puzzling comment, perhaps, but when Arno Penzias talks about R&D, it's wise to listen. A strong argument can be made that there's no one around who's in a better position than Penzias to observe and understand what is going on in research labs today.

He won the 1978 Nobel Prize for physics for his role in the discovery of radiation echoes from the Big Bang. In 1981, Penzias was appointed vice president of research at AT&T's legendary Bell Laboratories, a post he held until 1995. He became vice president and chief scientist at Bell Labs that year. He remained at that position when the organization split from AT&T and became the research arm of Lucent Technologies Inc.

Penzias officially retired last summer from Lucent, although he continues to serve as a senior technology adviser. He's since become a partner at [New Enterprise Associates](#), a venture-capital firm with offices in Menlo Park, Calif., Reston, W. Va., and Baltimore.

During the 37 years he spent at Bell Labs, he played a central role in guiding its vaunted research operation from Ma Bell's predivestiture days to today's hypercompetitive telecom world. In the process, Penzias helped reshape the model for R&D operations.

We caught up with Penzias recently to get his analysis of breaking trends in the R&D world.

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#### **Transaction costs favor new entrepreneurs**

Plunging transaction costs are reshaping R&D strategies. For one thing, he says, consider how lower transaction costs and the development of a dense web of enabling infrastructures have fueled the dreams of a new breed of businessperson, the R&D-intensive entrepreneur.

The last 20 years have seen the emergence of a sophisticated network of business services created to support fledgling, technology-heavy enterprises. These services take the place of full-time employees.

Start-ups benefit from an infrastructure that provides them with much more efficient access to venture capital and to specialized legal and accounting services. They can turn to an array of firms for help with tasks like recruiting management capable of nurturing these new ventures. They have access to consultants who can help the firms through the inevitable challenges that arise, too.

"Think about that infrastructure. In other words, these companies are awash in transactions, and, because these transactions are (now) cheap (to execute), all of the sudden, those firms can use them," said Penzias. "They do not have to have people in-house, and they can afford them part time. They rent space. Then they go out and

get some software tools. They go to a leasing company and buy some computers for 20% down. Then, when they have a product -- say it involves a computer chip -- they go to some chip foundry which produces chips."

Proliferating technology standards cut transaction fees by making new products more interoperable. Continuing with his example, Penzias says, "When this chip is produced, the folks that they are going to sell it to know how to plug it in because there are a whole bunch of other people who already have created standards. It becomes a known quantity that fits with other" products.

### **Competitors to internal R&D**

"In today's new world, most internal processes and services become subject to competition -- even, for the first time, things like research," says Penzias. "Today, you get someone like Merck or Pfizer and a lot of what used to be their research comes from buying little companies who have one drug halfway through testing and have run out of money."

This is not to suggest that organizations should simply give up on R&D and rely entirely on these "outsource acquisitions."

"By no means," says Penzias. "It is just that the internal research organization has an unexpected competitor. Every organization needs a healthy mix."

Deciding what constitutes a healthy mix should not be delegated to the R&D department, either. "The R&D organization can help with (the decision), but it should not be up to the R&D organization." That responsibility belongs to the company leadership. The R&D organization, understandably, "will put in a lot of energy into rationalizing the decision that they can do it better in-house. (But) you want the business unit to retain choice, and the business unit has got to have some fraction of its stuff from the outside."

Overall, a more structured, disciplined approach needs to be taken to managing R&D. "For the first time, managers now need to understand how to run a research portfolio," says Penzias. "In the past, it was the 'let a thousand flowers bloom' approach."

### **Turning R&D loose**

At the same time that organizations need to ramp up their efforts to look for outside sources of new ideas, they also need to allow their internal R&D operations to be able to look outward.

"You do not want a research organization that sends all of its products only inside," says Penzias. "They have got to be able to market their stuff on the outside too, because, if they do not, then you do not have a market test of how good this stuff is."

This more open approach is likely to meet with resistance at those companies that traditionally have retained the fruits of their R&D strictly for their own products and services. However, says Penzias, this reluctance should be weighed against the value of getting feedback about the functional and technical viability of R&D work.

"Today, a company like Cienna, which is a competitor of Lucent, gets a lot of its stuff from Lucent," explained Penzias. "If, all of a sudden, Cienna stops buying some of the couplers and other stuff that they buy from Lucent, that is important information. It is an important signal." It might indicate that the ideas and innovations flowing from the company's labs might not meet the needs of customers in the marketplace.

### **His role as a venture capitalist**

"I certainly am looking at a different side of the coin, but there are similarities and differences which, together, make it very interesting," says Penzias. "The difference is that, in the research job, I actually managed a portfolio by influencing what people did. Here, I manage a portfolio by selecting among proposals. In other words, I do not control the supply the way

I did on the inside, but the role is much the same: Identify needs.

"In the past, I would identify the need, then catalyze work in that area. Here, what we do is identify a need and look for companies in that area and entertain their view. That part is a little more reactive than it was in the other

case.

"A lot of it is looking at: 'Does this fit? Does the management fit?' Once having made that identification and having decided to move ahead, then it becomes more similar to what I had done before, which is to ask: 'What do you have to do to make it successful?'"

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