Executive Interviews: Justin Rattner

The Link Between Standards and Innovation

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Why should consumers care whether or not a product is standardized?

Standards are a bit of an arcane topic, from a consumer perspective; people don't walk into a store and demand a particular standard. But they appreciate the quality of the experience that's associated with standards and interoperability, and they recognize the problems that are caused when products don't work together because they're not standards-based.

We've all had the experience of buying a cable and connector and not being able to connect the two—even those of us who are reasonably tech savvy. That's an unsatisfactory user experience. Maybe five or ten years ago consumers were willing to deal with that kind of problem; they might call a friend or ask a neighbor for help. Today they would likely just put the product back in the box and return it to the store. That's why standards are so important: They create a positive user experience. They help to satisfy consumers' expectations that technology products will work together easily.

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Those expectations are forcing companies to move away from proprietary technology, which used to be common in our industry. For many years, it seemed like every systems manufacturer had its own technology and interfaces, and each manufacturer believed that its product was a value add, that it was differentiated from competitors' products by virtue of a unique and powerful interface.

But when you talked to IT managers and CIOs, the reality was just the opposite: they saw this differentiation as having no value—in fact, as actually removing value. In the PC business we call this useless differentiation, and I think consumers are becoming less tolerant of it. They don't want to feel that they're beholden to one manufacturer or another. I think that's why we have been successful of late, bringing to market technologies like Intel® Centrino® processor technology, which are driving a much higher degree of standardization and driving out a lot of useless differentiation.

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What does it take to create an effective global standard?

First of all, you need to bring together many different points of view—technology, cultural, and national—to ensure that the standard will be broadly embraced. You always have to optimize for multiple variables while trying not to sacrifice any one variable, such as providing both national security and personal privacy.

There are financial considerations as well. Some innovative technologies may add desirable features but those features also might increase the cost. The relative cost of adopting a standard has to be reasonable, so that potential users across the globe can actually implement it. A standard isn't worth the paper it's printed on if it creates a non-viable business scenario.

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I also think that in most cases, for a standard to be viable, the costs of implementing the standard must be low enough to achieve high volume quickly. That drives down production costs and helps to ensure that the technology will succeed in the marketplace.

You noted that useless differentiation reduces the value of products. But what about useful differentiation? How can a business set itself apart if competitors build their products based on the same standards?

We see more than adequate evidence that companies can achieve a high degree of standards compatibility yet differentiate and innovate quite successfully. Apple is a good example. They were a very early supporter of the USB standard, which they've used in many innovative products, such as the Mac, iPod and iPhone, to allow consumers to move information between devices in a very simple way. In fact, Apple was reaping the benefits of standardization well before the rest of the computer industry.

My own experience, and I think Intel's experience, is that standards help to accelerate ecosystem innovation. While many of our innovations are proprietary, we pursue standards for innovations that require an ecosystem of interoperable technologies to develop; this enables the fastest and broadest market acceptance. USB and PCI are examples of standards that fueled the growth of broad ecosystems that benefit many companies and consumers. Another example is a new I/O standard that Intel is driving, the third generation of USB. The success of that standard will rely heavily on our ability to drive the technology to high volumes rapidly, which in turn will require an ecosystem of interoperable technologies to emerge quickly. That wouldn't happen if we were developing a proprietary technology.

More generally, we believe that standards play a key role in the virtuous cycle of innovation that drives the ICT industries forward. They allow technology investment to concentrate in a much smaller area of innovation. That enables volume to build quickly, and for profits to be funneled into rapid reductions in cost and further advancements in the technology, and the cycle repeats. If you can't make it around the cycle, you're probably not dealing with a standard that has a very strong future.

Looking back, can you give us an example of a standard that ended up having a strong future, one that stood the test of time?

Ethernet is a great example. It's a very old standard, first published in 1980. It was driven by Xerox, Intel, and Digital Equipment at a time when the concept of a local area network was something of a mystery to most people. Ethernet has driven an extraordinarily broad set of innovations that have advanced LAN technology. Even the Internet owes its existence in part to the Ethernet, in that the existence of disconnected Ethernets motivated people to create networks to link them. That in turn gave rise to companies like Cisco, which emerged to help people connect, manage and expand these networks in an orderly fashion. In fact, an entire industry came into existence to build out that early vision of a local area network, just because the Ethernet standard existed.

Another strong global standard that's been around for more than a decade is USB, which was introduced in 1996 and has greatly simplified how we connect technology devices. Life before USB was filled with a number of single purpose I/O interface standards, such as the PS2 bus, the classic serial RS32 interface, Apple's ADB, and Centronix printer ports with their gigantic connectors. Over time it became increasingly apparent that this proliferation of connectors and cables and adaptors was not cost-effective or consumer-friendly.

After USB was introduced, the legacy I/O interfaces began to disappear, and we started to see USB used in printers and eventually in a whole range of consumer devices, such as digital cameras and camcorders, handheld devices, and DVRs. When the second generation of USB was introduced, people began to connect hard drives and flash storage using USB. And because USB2 cables could draw power directly from a computer, in many cases that eliminated the need to carry a power cord.

So USB unleashed a flood of innovation that was not foreseen when the standard was developed. And it illustrates why driving global standards is so important.

Why must standards be global? Why shouldn't a country develop its own standards so it can retain a competitive advantage?

For a country like China, which has a very large domestic market, that's not necessarily an unreasonable position to take in some cases. The Chinese manufacture practically all of the world's DVD players, for instance, but the cost of building those DVD players barely exceeds the selling price, in large part because China has to pay license fees to the IP holders. So a national standard might be more appealing to them, since it's more likely to result in local intellectual property being a key component of the standard.

On the other hand, I think that countries like China understand that they must be a part of the global economy in order to thrive. I think that increasingly, people around the world recognize that they there's more benefit in being part of the international standards process than there is in driving their own national or domestic standards.

Who is responsible for developing global standards?

Besides the three UN sanctioned standards organizations, the ITU (International Telecommunication Union), ISO (International Organization for Standardization) and IEC (International Electrotechnical Commission), there are other global standards development organizations that have developed important global standards, especially in the ICT industries. That includes the two standards we just talked about; Ethernet was created by the IEEE, and USB was developed by the USB Forum. Also, many Web standards, such as html, were published by W3C (World Wide Web Consortium). We believe that standards such as these, which have been widely adopted throughout the world, should have the same stature as specifications published by the ITU, ISO and IEC.

What standards is Intel helping to drive today? What are the most important emerging standards?

Green technology is one of the most important areas we're involved in today, at both the national and international level. Intel has a long history of involvement and leadership in industry standards that improve energy efficiency and minimize the environmental impact of IT products and technologies.

Today Intel is involved in a wide variety of environmental standards and organizations. We have been actively working to promote US ENERGY STAR specifications for making PCs and servers more energy efficient. We are also driving international design standards such as IEC TC 111, which will minimize the eco impacts of IT products. And we are involved in creating global standards to define carbon footprint calculations and reporting, through our work with the WRI (World Resource Institute) and the EICC (Electronic Industry Citizenship Coalition).

In the wireless arena, Intel is very much committed to driving ubiquitous access to broadband communications technology. That's one of the reasons we've spent an enormous amount of time and money driving WiMAX, which is another important emerging standard that will enable wireless communications across a much broader area than Wi-FI. WiMAX is the first global standard that is driven by the need for wide-area wireless access to the Internet and the World Wide Web. We believe deeply that the advancement of many technologies, and the delivery of high quality user experiences, will be enabled by standards such as WiMAX.

At what point in the Research and Development process does Intel get involved with standards bodies?

That depends on the technology. Intel has become fairly sophisticated in recognizing when in the development of a particular technology it makes the most sense to present it to one of the formal international standards bodies or to bring the industry together and drive an industry standard.

Clearly it's important to work with standards organizations early in the case of communications technology, which requires that many different components come together to connect, exchange information efficiently, and provide a unified set of services. For instance, Intel is working on a design for a new USB 3 connector that will accommodate the presence of optical fibers in the future, which will drive signaling speeds to tens of gigabits per second. So we approached the USB 3 technical team about including this capability in the USB 3 connector specification, so that we won't have to design a new connector when fiberoptics or photonics capability is introduced at some point in the future. That way, users will be able to buy a USB 3 cable that is somewhat future proof.

When you're developing new communications technology, especially wireless communications, it's also important to get involved early on with the people who legislate and enforce regulations, to educate them about the technology and why a new standard is required. For instance, Intel spent a great deal of time and effort persuading the ITU to allow WiMAX into the IMT 2000 family of standards. We had to overcome a lot of resistance, which was not surprising; wherever standards touch policy, there will be politics.

How did you overcome the resistance to WiMAX?

We took a global approach. Our policy and standards team is global, so we worked with policymakers and senior technology leaders around the world to promote WiMAX as a future standard. We also worked very closely with ITU management to convince them that including WiMAX as an ITU standard would produce global benefits and introduce new and healthy competition. And I think that combination of working to inform and educate the ITU as well as working with the key thought leaders around the world helped drive acceptance.

That's not to say that we're always successful. Certainly the particular standards that Intel advocates do not always win out in the end, but failure is important. We learn more from failure than success. For instance, Intel was advocating the HomeRF standard at the time when 802.11 or Wi-Fi was also being promoted. Ultimately Wi-Fi won out, and we learned from that. Looking back, HomeRF was too narrowly focused on the home, whereas Wi-Fi was a more encompassing technology that made sense in the home, in the office, and in the enterprise; it had good range and reliability. Subsequently we incorporated Wi-Fi in our notebook platform Intel® Centrino® processor technolgy, which contributed to its success.

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Looking ahead, what are the key challenges that standards bodies face today?

International standardization continues to be a challenge, particularly in areas such as content protection and encryption, where you need innovative solutions to improve both personal privacy and national security. It's a struggle to balance the competing interests of users and policymakers.

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It's also challenging to educate policymakers, to help them understand that technology is advancing at an accelerating rate, and to grasp the implications of that. Some experts project that the next 100 years of innovation will equal the last 20,000 years of innovation; that's how compressed the innovation cycle is becoming. So, government must be careful not to mandate standards that might otherwise be adopted voluntarily, because some fundamental technology advance could completely change the landscape overnight, and if rigid regulations are in place, that could stall innovation. The good news is that, at least in my experience, policymakers are quite willing to be educated, because most of them are not technologists themselves.

Finally, there's the challenge of inclusiveness. Innovation is not limited to a particular country or group. Innovations can come from many different sources with different business objectives. Useful innovation should be considered from all sources. However, when considering innovations for inclusion in standards, there is a responsibility to assure reasonable access to the potential IP in such innovation. That means that reasonable consideration be given to access by businesses in all countries. It is important to include innovations from global sources and utilize global resources when developing standards. So inclusion is important, particularly in terms of IP, and my personal opinion is that being inclusive is just a healthier way to run global standards efforts. At the same time, it's a challenge to educate countries that are relatively new to standards development about the need to incorporate the best technology into the standard, not just to promote inclusiveness for its own sake. The key to success is to have a fair and open process under which all parties are heard and all technology is fairly examined. It's a global economy; we're all in this together.

About Justin Rattner

Justin Rattner is vice president and chief technology officer (CTO) of Intel Corporation. He also is an Intel Senior Fellow and head of the Corporate Technology Group. In the latter role, he directs Intel's global research efforts in microprocessors, systems, and communications including the company's disruptive research activity. Rattner joined Intel in 1973, was named the company's first Principal Engineer in 1979 and became its fourth Intel Fellow in 1988. Among the many industry awards he has received, Rattner was named Scientist of the Year by R&D Magazine in 1989, and in 1997 was honored as one of the Computing 200, the 200 individuals having the greatest impact on the U.S. computer industry.