The Unseen and the Seen

Our progress is measured by the accumulated effects of all the ideas, seen and unseen, that appear, only to vanish and then perhaps return at the proper time.

A presidential transition represents that moment when the invisible and the visible switch places. A new president steps from the wings to head the organization. The outgoing leader takes a bow for work well done and returns to serve the Society in other ways.

The event tells us more about the organization than about any one individual who holds the office of president. It points to the constant renewal of the Society by its members, as they look to new tasks and new opportunities. Yet it is still useful to consider how the seen and the unseen switch places, how the organization’s accomplishments slide into the background and new problems take their place.

LOOKING BACK

In preparing for my 2013 presidential term, I’ve been reading the messages of the individuals who held the presidency during the past four decades. I’ve seen how they celebrated the accomplishments of the group and prepared it for an unknown future. I recently read the message of Sam Levine, who served as chair of the Computer Working Group in 1966 and 1967 and was one of the individuals who helped transform that working group into the modern IEEE Computer Society.

From our perspective, the switch that occurred at the end of Levine’s term is almost obvious. In the mid-1960s, the members of the Computer Working Group were devoting a lot of attention to the reliability of computing components. Their accomplishments in this field were substantial.

In Levine’s time, computing hardware was not sufficiently reliable. Many manufacturers admitted that their machines would run for only a couple dozen hours without failure and would need preventive maintenance weekly. None had the reliability that we currently demand from smartphones, tablets, and cloud systems.

Yet, within three or four years of Levine’s chairmanship, reliability began to slip into the background. Although it once had dominated the pages of the Computer Working Group News, Computer’s predecessor, reliability slowly faded into the background. At the same time, another issue gradually became prominent: large software systems and software engineering.

The year that followed Levine’s presidency would see the two events that inaugurated the software age: the Garmish NATO Conference on Software Engineering, and IBM’s decision to separate software from hardware and allow other firms to create software for its machines. In 1970, when the Computer Working Group became the IEEE Computer Society, the software industry was already beginning to grow, and software engineering began to be a subject for academic study.

The growth of software was invisible to the Working Group leaders of the late 1960s, not because they couldn’t see it but because they couldn’t identify the most important issues among the many they faced. Software was just one topic on a list that included computer architectures, computer communication systems, solid-state circuits, memory and storage systems, analog computers, and simulation. However, Levine did indeed identify software as one of the many subjects that might be of interest to a new Computer Society.

“The close relationship of software to hardware in the design of modern computer systems is evident,” he wrote.
In looking at Levine’s plans for the Society, it’s evident that the leadership intended to create an organization that would catch the important trends of the future when those trends were identified as visible entities. Levine wrote about technical committees and conferences, the need for new publications, and the value of standards. He argued for broadening the membership of the working group beyond “electrical engineers and physicists.”

In planning for the future, Levine argued for one activity that seems a little quaint in this age of the Internet and social media. He wanted to see a distinguished visitors program for universities. These visitors would be the ambassadors for the avant garde. They would spread the unseen ideas around the country.

A NEW ERA

We live in a different era than Sam Levine and his peers. Our field is strong and mature. We’ve offered contributions to the world for more than 60 years and have seen our ideas move into fields quite far from our own. Indeed, we’ve pushed many IEEE entities toward engineering practices that more closely resemble those of software engineering than those that are used to develop circuits and power supplies.

Yet, at this point, we probably still need an avant garde of the unseen. We still need something to help us identify the ideas and problems that are not well understood but are about to become important. In a stable organization, it’s too easy to believe that something is of value because it supports our function or gives us status.

Time and again over the past six months, I’ve seen a new idea struggle toward visibility, temporarily blinding those who were witnessing its birth. A paper on market mechanisms in algorithms caused one computer scientist to ask if this idea marked the end of traditional space/time complexity analysis. It seemed to the questioner that the research results implied that we need to worry about efficiency.

A second paper, closely following the first, claimed that we need to be concerned not only with space and time complexity but also with energy complexity. If energy eventually becomes the scarce item on the planet, do we need to make sure that our programs produce the most calculations per watt?

In some cases, new ideas pass by without generating much real interest. In others, they produce real emotion. For example, at one point, I listened to a truly emotional speech by an older computer scientist who said he felt that computer science, the field to which he had devoted his life, was slipping away.

The world turns upon its axis and, to some extent, so does our field. New ideas appear, only to vanish and then return at the proper time. Our progress is measured by the accumulated effects of all these ideas, currently seen and unseen.

LEADERSHIP TASKS

As I look forward to this year, I see three principle tasks for the IEEE-CS leadership.

The first task is to look into the future and grasp the ideas that are struggling to move into the light. Of course, the leadership isn’t always in the best position to identify new ideas. However, we can help the members understand the concepts that will dominate the field in the next decade in the way that software development dominated computer science in the decade that followed Levine’s presidency in 1966 and 1967.

Next, we need to understand our current position, the ideas we’ve mastered, and the tools we bring to the field. As I have begun to see more of the IEEE-CS, I have acquired a new appreciation of the depth of our expertise and the extent to which we dominate fields such as computer security. If we don’t fully understand our own strengths, we won’t be able to apply those ideas to the next generation of problems.

Finally, we need to ensure that our accomplishments are well understood by those outside the Society, including other IEEE members, the people who work in the technical community, and the world at large. Our task is to make the unseen visible, so that those ideas can be well used.

In recognizing that societies such as ours involve a dialog between the accomplishments of the past and the hopes of the future, I need to thank the leaders who are rotating out of their current IEEE-CS positions. In particular, I thank John Walz, who served as 2012 president, and Sorel Reisman, who’s finishing his term as past president. I also thank the vice presidents, who’ve served nobly, as well as the members of the Board of Governors.  

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