A Historical Perspective of the IEEE Computer Society

Six Decades of Growth with the Technology It Represents

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***Abstract*— The technology that dominated the second half of the 20th century was no doubt the digital electronic computer and its derivatives. The Computer Society of the IEEE (Institute of Electrical and Electronics Engineers) was born the same year as the world's first digital computer – the ENIAC (Electronic Numerical Integrator And Computer). As the computer became ever more important to every aspect of life in the civilized world, the Computer Society matched its phenomenal growth to become the largest technical society within IEEE and the largest computing professional society in the world. This paper traces the development of the IEEE Computer Society from its humble beginnings to its many activities today. This historical review shows that throughout its history, the Computer Society has been and continues to be responsive to the technology it represents. The Society expands its service as the discipline becomes more encompassing and multifaceted. Moreover, by effectively using the very technology it represents, the leadership of the Society not only provides its members with cost-effective services, but also leads the way in designing innovative products that become beneficial to the world at large.**

Keywords-history; Computer Society; PGEC; AIEE; IRE

I. INTRODUCTION

Electronic digital technology in general, and the digital computer in particular, is indisputably the most important technology invented in the second half of the last century. The ENIAC (Electronic Numerical Integrator And Computer) was born in Philadelphia at the Moore School of Electrical Engineering of the University of Pennsylvania in 1946, and the computer revolution was launched. The IEEE Computer Society can trace its origin to the same city in the same year with the ENIAC. Together with the growth of the industry, the Computer Society flourished and expanded its scope as the application of the computer branched to areas the pioneers never dreamt of. Today, we are the largest of the computing professional societies in the world. For the purpose of this paper, we divide the history of the Computer Society into roughly three periods of roughly twenty years each: the formative years from 1946 to the founding of the IEEE in the mid sixties; the growth period –from the mid sixties to the late eighties before the Internet changed the way people communicated with one another and information was distributed; and finally the most recent twenty years with the coming of age of the Internet.

II. THE FORMATIVE YEARS (1946-MID 1960S)

It is remarkable to note that the Computer Society can trace its origin to a committee, that was conceived in the very same year in the same city where the ENIAC first became operational. The ENIAC was the world's first digital computer and was developed at the University of Pennsylvania in Philadelphia. The AIEE (American Institute of Electrical Engineers) Large Scale Computing Devices Committee (CDC) was established under the chairmanship of Dr. Charles Concordia the same year. That committee (Table I) organized the first conference session on computers in January 1947 at the AIEE Winter Conference.

TABLE I. MEMBERS OF THE FIRST AIEE COMMITTEE ON COMPUTING DEVICES (1946) [2]

C. Concordia, Chair	E. L. Harder	G. D. McCann
J. G. Brainerd	W. C. Johnson	J. D. Tebo
S. H. Caldwell		

Charles Concordia was a very prominent electrical engineer in power engineering. However, as far as we know, he never was heavily involved in the digital computing area. Thus, it is interesting to find out how he became the chair of the CDC. From what we can gather from an interview of Charles Concordia by Rik Nebeker [1], Dr. Concordia used the differential analyzer regularly in his work in the early 1940s, and he visited the Moore School of Electrical Engineering of the University of Pennsylvania in Philadelphia quite frequently to use its differential analyzer. He also served on the Basic Science Committee of the AIEE, of which John Brainerd, the director of the Moore School, was the chair. Through those connections he had to be aware of the activities of J. Presper Eckert and John Mauchly, the designers of the ENIAC, and understood the significance of the project. But more importantly, Everett Lee, the president of AIEE then, saw that

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the new technology was potentially very important, and he encouraged Concordia to form the CDC.

In 1948, James R. Weiner formed a Technical Committee on Electronic Computers (TCEC) in IRE (Institute of Radio Engineers), the other parent of the IEEE. The main objective of the committee was to develop a glossary relating to computers. It also listed as additional duties the standardization of test methods and coordination of others in paper procurement and conference preparation. The first committee consisted of 21 members who were truly pioneers of the computer field (Table II).

TABLE II. MEMBERS OF THE FIRST IRE TECHNICAL COMMITTEE OF ELECTRONIC COMPUTERS (1948)[2]

J. R. Weiner, Chair	J. P. Eckert, Jr.	C. H. Page
G. R. Stibitz, Vice Chair	J. W. Forrester	J. A. Rajchman
S. N. Alexander	N. Goldstine	N. Rochester
J. V. Atanasoff	E. L. Harder	R. Serrell
J. H. Begelow	B. L. Havens	T. K. Sharpless
P. Crawford	E. Lakatos	R. Snyder
C. S. Draper	G. D. McCann	C. F. West

Even those who have only a casual interest in the history of computing would recognize many of these names. It may seem odd today that a technical committee on electronic computers defined its scope of work so narrowly. But in those early days when many research centers were developing similar devices simultaneously but each invented new names for the same object, it became very difficult to communicate with one another without a commonly agreed upon language. For example, logic design was one of the most important activities in those days, and one of the hotly debated issues of the committee was the standardization of logic symbols. [4] There was also the anecdote on what to call a "milli-microsecond." As the speed of the switching circuit got faster, this awkward term was used very frequently. A proposal was made to call it a "Babbage." After some stormy debate and voting, the committee finally decided to use the metric system and called the unit a nanosecond. The TCEC continued to work on standards until the merging of AIEE and IRE to form IEEE in 1984. It provided the Computer Society with a strong tradition in standards activities ever since.

In 1951, the chair of the Technical Committee on Electronic Computers of IRE (TCEC), Nathaniel Rochester, encouraged a young colleague of his to form a membership group, the Professional Group on Electronic Computers (PGEC). The IRE bylaws had recently changed to allow the formation of membership-based groups to work on particular areas under the umbrella of IRE. It was done partly to discourage groups from forming separate societies. The young colleague, Dr. Morton M. Astrahan, took up the challenge and established the group. He was also elected the first chair of the administrative committee of the group (Table III). The first act of the administrative committee was to organize a symposium at the IRE National Convention the next year. It is interesting to note that even before the PGEC was formally approved by the national IRE Board, an IRE section in Los Angeles had already formed a local chapter there. The chair of the local chapter, Dr. Harry D. Huskey, was of course invited to join the initial administrative committee of PGEC. The group grew rapidly, and by December 1952, PGEC had already established 1,100 paid members and 400 unpaid members. PGEC quickly assumed the role of a conference organizer. The most important of the conferences was the Joint Computer Conference in cooperation with its counterpart in AIEE.

TABLE III. MEMBERS OF THE FIRST BOARD OF DIRECTORS OF THE PROFESSIONAL GROUP ON ELECTRONIC COMPUTERS (1951)[2]

M. M. Astrahan, Chair	W. D. Caldwell
H. D. Huskey, Vice Chair	G. W. Downs, Jr.
J. H. Howard, Secretary-Treasurer	W. F. Gunning
S. N. Alexander	J. H. Pomerene
E. G. Andrew	T. A. Rogers
H. H. Arkissian	J. R. Weiner

At the urging of the PGEC and with the support of the Medical Electronic Group, the IRE approved the admission of affiliate members in 1957. It allowed members of certain sister professional societies to join a group without being a member of IRE. Many of the practitioners of logic design at that time were physicists who normally would not participate in IRE publications. The affiliate membership provided a way to accommodate these practitioners to belong to the organization without changing its regular membership qualifications. This regulation was preserved after the merger and provided a significant base for Computer Society membership in later decades. Today, the majority of affiliates in the Computer Society are also members of the ACM who typically do not have an engineering background and whose primary interests are in the computing subdisciplines. At the end of the 1950s, the PGEC was the largest professional group in the IRE. It had 19 chapters across the U. S. and 8,874 members, including 8,129 full members, 679 student members, and 66 affiliate members. [2]

IRE and AIEE merged to form the Institute of Electrical and Electronics Engineers (IEEE) at the headquarters level in 1963 (Figure 1).

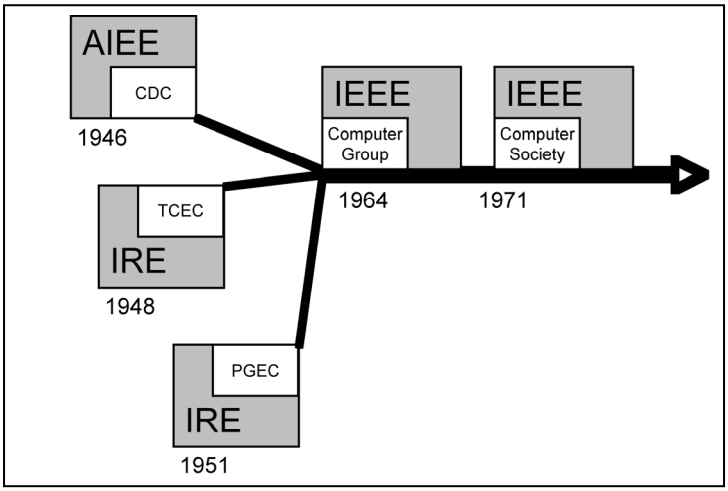

Figure 1. The Genealogy of the IEEE Computer Society

At that time, there was not much concern regarding the reorganization of lower levels of committees and technical groups. Computing was the only area with large active units in both parent societies, and it was logical for these units (CDC of AIEE and PGEC and TCEC of IRE) to merge as well. As the organizational structures and traditions of the two parent societies were quite different, merging required careful planning to avoid unnecessary conflicts. Fortunately, many engineers were members of both organizations, and they helped to keep both sides well informed of the pending merger of the parent organizations. These individuals took it upon themselves to negotiate the merger without much guidance from the parent organizations. One of the major concerns was at the leadership level. The AIEE committee members were appointed and involved a small, select group. The leaders typically served the offices in progression. The officers of the IRE group were elected by dues-paying group members, even though most of them ran uncontested. It was due to the statesmanship and diplomatic skills of the leadership at that time, Wally Anderson, Garry Hollander, Ed Harder and Keith Uncapher, among others, that made the transition smooth and uncontroversial. [4] The merger was finalized in April 1964. The merged group became known as the Professional Technical Group on Electronic Computers, and very shortly thereafter, the Computer Group. The total membership was about 10,000.

III. The Growth Period (mid 1960s-late 1980s)

Perhaps the most consequential step taken by the new group was the publication of the bimonthly *Computer Group News* in July 1966. The first issue contained 16 pages of Computer Group and industry news, applied and tutorial articles, a guide to computer literature, and a repository of computer articles. This was the first "magazine" published by a technical group and freely distributed to the entire membership of the group. This modest beginning proved to be most significant in the development of the Computer Society as well as the IEEE itself. The Computer Society group employed John Kirkley as the editor of the publication. He in turn hired and managed a small full-time staff in the Los Angeles area to support the publication and other administrative activities. The office was literally in the garage of Kirkley's residence in Northridge, CA. The *Computer Group News* was the first magazine published by any operational unit within the IEEE, and it set the precedent for many subsequent magazines published not only by the Computer Society itself but also by many other IEEE societies. The Computer Group was also the first IEEE group to employ its own staff, and this was a major factor in the growth of the Society.

The IEEE underwent a major reorganization in the late sixties to give the Technical Activities Board greater influence by allowing its larger and stronger groups to have direct representation on the Board of Directors. It also authorized the establishment of societies to give those groups more autonomy. In 1971, the Computer Group became the Computer Society. It was designated Division V within the IEEE Technical Activities Board and had its own division director on the IEEE Board of Directors.

The reorganization came just in time to give the Computer Society the independence and flexibility to meet the rapidly changing world of computing. The coming of age of the Large Scale Integration (LSI) circuit technology lowered the cost of computing drastically. Lower cost led to the broadening of applications and the building of ever more complicated and larger systems. Both the designers and the users demanded better programming languages and more reliable software systems. The Computer Society acted quickly to meet the needs of the practitioners by providing the necessary forum for professionals to exchange information and ideas. It expanded the number of publications and conferences and enhanced local chapter activities. For the Computer Society it was a period of significant growth in both the depth and breadth of its services.

The Society's publication program expanded rapidly. The *Computer Group News* was published bimonthly starting in 1966. It was renamed *Computer* in 1972, became a monthly publication in 1973, and significantly increased its tutorial-oriented content. The tradition of sending this free publication to every member of the Society has been maintained ever since. The *IRE Transactions on Electronic Computers*, launched in 1951 (Werner Buchholz, founding editor), was renamed IEEE *Transactions on Computers* and became a monthly publication in January 1968. In addition to the *IEEE Transactions on Computers*, which was unbundled from *Computer* in 1972 to allow non-member subscriptions, the Society introduced the *IEEE Transactions on Software Engineering* in 1975 (Raymond Yeh, founding editor) and the *IEEE Transactions on Pattern Analysis and Machine Intelligence* in January 1979 (K. S. Fu, founding editor).

With the introduction of desktop computers and embedded systems, computers became truly ubiquitous. The computer revolution was in full swing. New applications, from word processing used by practically everyone with a personal computer to huge software systems that managed databases for commercial enterprises, nuclear power plants, and transportation systems, were being developed daily. Every user demanded that the systems be user friendly, reliable, and extensible. The launch of the government sponsored "fifth generation" project in Japan added another dimension of excitement in international competition in artificial intelligence and robotics. The Computer Society responded by adding a number of application and tutorial-oriented magazines in the decade of the eighties. They included *Computer Graphics and Applications*, *Micro*, *Design and Test*, *Software*, and *Experts*. The Society also introduced many special topic-oriented conferences and symposia. Associated with each conference, several sessions of tutorials were conducted to help members keep up with the latest developments in the industry. Also during this time, the Society formalized its non-periodical publications into the Computer Society Press. The operation mainly produced conference proceedings, tutorial texts, and reprints in the seventies.

New technical committees continued to be formed in response to new technical developments. By the end of this growth period there were 33 of them in total. The committees contributed significantly to growth in the number of specialty conferences and meetings. One that requires special mention was the formation of the Technical Committee on Software

Engineering in 1974. This was a key decision of the Society to embrace the nascent professional group of software engineers. Under the leadership of Steve Yau, Raymond Yeh, and Dick Simmons, among others, the Society published the *Transactions on Software Engineering* in 1975, launched the *International Conference on Software Engineering* in 1975 (Steve Yau, Chair) and *Computer Software of Applications (COMPSAC)* in 1977. These were the important initial steps that transformed the character of the Computer Society. Today, the majority of the members of the Society identify themselves as software engineers.

The Growth Period was also the time that the Society made significant contributions in standards activities. The IEEE 754 floating-point working group was created in 1977, and eight years later the Microprocessor Standards Committee completed the IEEE 754-1985 binary floating-point arithmetic for computer microprocessors. This was in fact one of the key components that helped make microprocessors dominant in the computer field within a short time. The Computer Program Test Methods conference in 1972 articulated the need for software engineering standards. The Software Engineering Technical Committee started the Software Quality Assurance standards working group in 1976, and this work resulted in the final draft published in *Computer* magazine in August 1979. Formal approval and publication of Standards concluded two years later. At the end of this period, more than 56 standards had been approved, and 125 working groups were under way. These projects involved well over 5,000 people. Major standards established during this time included LAN (Local Area Network), VHDL (VHSIC (Very-High-Speed Integrated Circuits) Hardware Description Language), and POSIX (Portable Operating System Interface for Unix) supporting application portability in the Unix environment. The expansion of computer hardware standards and the software engineering standards resulted in the Society's decision for an organizational change to promote the standards committee to a board – the Standards Activities Board (SAB) - in 1985.

Organizing technical conferences was considered one of the most important activities of both the CDC and the PGEC, the forefathers of the Society. As early as 1951, John Brainerd, the second chair of the CDC, proposed the Joint Computer Conference (JCC) and invited both the PGEC and ACM to cosponsor. ACM agreed only to be a "cooperating" society. As a result, CDC and PGEC ran the JCC for several years together and through this cooperation established a friendly relationship, which was essential to make the merger possible later on. In 1967, the first computer conference organized solely by the Society was held in Chicago. In order to distinguish itself from the JCC, the conference selected a few popular topics and explored them in depth. After trying the model a couple more times, the society decided to institutionalize it by forming a standing committee to supervise the organization of this annual event. It became known as COMPCON and was held every February in San Francisco. A fall season COMPCON was added on later in Washington, DC every October. The smaller, more narrowly focused conference run by a standing committee soon became the norm for organizing conferences. So we had, for example, the *International Symposium on Computer Architecture* (1973), the *International Conference on Software Engineering* (1975), *COMPSAC* (1977), and the *International Conference on Distributed Computing Systems* (1979). All of them are still running strong today. Towards the end of this period, the Computer Society was sponsoring or cosponsoring more than 50 technical conferences, meetings, and symposia annually, many with ACM.

The Society initiated the Education Committee in 1970, and under the leadership of C. V. Ramamoorthy, it produced the first model curriculum in 1976. The Education Committee was elevated to the status of a board headed by a vice president in 1982. It quickly extended its activities to include computing sciences accreditation, in addition to the design of model curricula. Together with ACM, it founded CSAB (Computing Sciences Accreditation Board) in 1986, and it accredited the first Computer Science programs in the U. S. in 1987. The combination of model curricula and accreditation helped to improve the quality of many of the then newly-formed computer science degree programs.

As mentioned above, the Computer Society had its first local chapter at the same time when the Computer Group was formed in IRE in 1951. By the time of the merger in 1963, there were already 25 chapters. This number grew almost 10 times to nearly 250 chapters by the end of the eighties. To help the technical activities of the local chapters, Steve Yau initiated the Distinguished Visitor Program to provide national speakers to the chapters in 1971. He also pushed to build Computer Society Student chapters in 1974 as an experiment. This led to the change of the IEEE bylaws to allow student branch chapters as a regular structure.

The number of staff members supporting the Society's operations also grew. Harry Hayman, who was the first secretary of the Computer Group and had his office in his basement in the sixties, became the first executive secretary when the position was created in 1971. In 1973, True Seaborn joined to succeed John Kirkley as the publisher of the Computer Society. By the end of the 1970s the Computer Society staff numbered 16 permanent employees: two in the executive secretary's home office in Silver Spring, Maryland, and 14 in the publishing group's rented space in Long Beach, California, plus several temporary part-time people in both locations. The needs and viability of the publishing organization grew to the extent that, late in the decade, the Society started the process of acquiring its own building in Los Alamitos, California.

In 1983 the Society established the position of executive director, and Michael Elliott was hired to fill the position. The amount and complexity of the Society's activities required greater staff support. Within the next five years, the staff was expanded from 16 to 94 members. The Society purchased some office space in the Los Angeles area at the beginning of the eighties. That space was doubled by 1985. Also in the same year, a building in Washington, DC was purchased to serve as the headquarters of the Society. Then in 1987 and 1988, branch offices in Brussels and Tokyo respectively were established.

During the 1980s, the Computer Society began to provide member services using products based on digital technology in a major way. The Computer Society had always tried to use the latest computer technology to operate its offices efficiently, but

it was not visible to the outside world. At the dawn of desktop computers and the Internet, the Society provided our volunteers with an e-mail service (COMPMail+) as early as 1982, and the benefit was extended to all members in 1986 on a subscription basis.

At the time of the merger of CDC and PGEC, the Society had approximately 10,000 members. By 1982, it had grown to over 62,000 members, three times as large as the next society within the IEEE. As a result, it was rewarded a second division director position as well as representation on the IEEE executive committee. By the end of this growth period, in 1988, the Society had surpassed 100,000 members for the first time. It had about a third of the total IEEE membership.

IV. The Dawning of the Internet Age (1990-Present)

The beginning of the 1990s saw the dawning of the Internet age and electronic publication. The Society was either the first or among the first to make use of the new technology. The digital library was first introduced in early 1996 in the form of a set of CD's of 1995 periodicals. Soon afterwards, these periodicals were made available on the World Wide Web, and the IEEE Computer Society Digital Library (CSDL) was formally launched as a product in 1997.

The last decade of the century also saw a number of accomplishments by the Computer Society in the Standards Activities. The IEEE 802.11 (wireless networking standards) became perhaps the most popular and well-known protocol of the industry. It had its origin in the late seventies when it was proposed by a group of Computer Society volunteers working on the Ethernet standards, IEEE 802.3. Over many years of hard work starting in 1990, the wireless standards working group made it an official international standard in 1997.

At the turn of the century, the Society published a total of 24 journals and periodicals. In 1999 the total number of editorial pages published was 70,661, including 6,408 in transactions and 4,529 in magazines, and 57,880 in conference proceedings and 1,844 in books by the Computer Society Press.

The new century brought new opportunities and challenges for the Computer Society. Our executive director, who had served us well for seventeen years, took early retirement in a dispute with the upper administration of the IEEE. For almost three years that followed (2000-2002), the volunteer leadership had to fill in to assist the management of the offices. We were lucky that our staff had the strength and depth to take up any slack. The situation was complicated by the burst of the "dot com" bubble. The collapse of the industry did not have a direct immediate impact on our membership and publication subscriptions. However, the collapse of the stock market deeply injured IEEE financially and consequently also severely constrained the operation of the Computer Society. In spite of these adversities, the Society continued to innovate and improve its services, especially the on-line resources provided for members and the general public (Table IV).

Recognizing the revolutionary nature of the Internet, the Society accelerated its conversion to electronic publishing. It was the first society to publish a totally electronic magazine, the DS-online (Distributed Systems). The magazine also supports a de facto virtual community for the readers. The Computer Society was also the first professional society to provide free distance learning to its members (2002) and as an additional benefit allowed members to subscribe to electronic technical books on line at greatly reduced costs (2003).

TABLE IV. Major Activities of the CS Today

- Publishes 25 periodicals, including 17 of the top 20 in the field
- Sponsors or co-sponsors 300+ conferences annually with over 100,000 attendees
- Supports 700 groups in standards development and manages almost 900 active industrial standards
- Provides professional development in the form of web-based courses and certification programs
- Supports 45 technical committees and councils to facilitate international networking for professionals with common interests
- Develops model curricula in computing and information sciences and supports degree program accreditation
- Provides 14 major awards to recognize contributions in innovation, education and standards

The majority of our members identify themselves as software engineers, and the Society has a history of providing them with strong professional support. The Society first published the *Transactions on Software Engineering* in the 1970s and the *Software Magazine and IT-Pro* in the 1980s. In the 1990s it produced the *Software Engineer Body of Knowledge (SWEBOK)* together with ACM. Its Standards Board established a number of Software Engineering Standards, which were instrumental in advancing the art of building large software systems. In 2002, it produced, as part of the model curricula project, a model curriculum for software engineering. It also became the sponsoring society, through CSAB, for ABET (Accreditation Board for Engineering and Technology) accreditation in software engineering. Finally, it launched a certification program for mid-level software professionals: Certified Software Development Professional (CSDP) in 2002. A certification program for entry level professionals, Certified Software Development Associate (CSDA) was added in 2006.

The Society has also been mindful of streamlining its internal operations by taking advantage of the technology it represents. It was the first to use SGML (Standard Generalized Markup Language) and soon afterwards XML (Extensible Markup Language) in the production of its publications. XML facilitates searching and information retrieval and also makes our product flexible to be produced in any digital platforms. We have been using a database system to keep track of the papers submitted for review and publication. We allow

electronic voting for the election of our officers. Finally we extensively use the Internet to communicate with our members.

V. Future Directions

Ironically, the very technology the Society has helped to promote also makes our members much less dependent on the Society. People can now access information practically from anywhere. With the recent economic downturn, the Computer Society has lost both membership and revenue to a degree perhaps even more severe than many of our sister societies. Together with the rest of the world we must evolve to flourish. However, while the technology and format of information delivery may change, the Computer Society is in a unique position to anticipate its development and uses it to provide better services to our members. We firmly believe that the value of the core services we provide will remain. The professionals in this dynamic and ever expanding field of ours will always need a reliable source for timely and accurate information contained in our many publications. Researchers and inventors will need an impartial and noncommercial forum to discuss their latest discoveries. These are exactly the conferences and workshops we sponsor each year. All practitioners need the continuing education that keeps them up to date throughout their professional lives. Our distance learning campus gives them the convenience and flexibility in their busy lives at a reasonable cost. These have been our missions since the founding and we have established an exemplary record in delivering our services with integrity and efficiency. We look forward to a bright future in the next 60 years.

Acknowledgment

We relied on the references [2,3,4,5] for the early history of the Society. We would also like to thank many of our staff and members of the 2009 Computer Society History Committee for checking the accuracy of many dates mentioned in the paper.

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