

Computers and Commerce: A Study of Technology and Management at Eckert-Mauchly Computer Company, Engineering Research Associates, and Remington Rand, 1946–1957. By Arthur L. Norberg. Cambridge: MIT Press, 2005. x + 347 pp. Illustrations, figures, tables, bibliography, notes, index. Cloth, \$40.00. ISBN: 0-262-14090-X.

Reviewed by Thomas Haigh

Computers and Commerce gives a highly focused account of an important aspect of the history of the computer industry: the short and troubled lives of two early startup companies, Engineering Research Associates and the Eckert-Mauchly Computer Company, and their eventual merger in 1955 to become the Univac division of Sperry Rand. The undertaking never achieved spectacular success, but Univac managed over the decades to endure and sometimes even to prosper in the rather small section of the mainframe computer market not controlled by IBM.

Arthur L. Norberg, who recently retired as director of the Charles Babbage Institute of the University of Minnesota, explains in the foreword that he began *Computers and Commerce* as an attempt to document the story of Engineering Research Associates (ERA), an early, little-known Twin Cities computer pioneer. ERA, the topic of the first and third chapters, was formed in 1946, after many of its founders had spent the war engaged in code-breaking work for the U.S. Navy. They, and the navy, saw the new firm as a vehicle with which to continue their high-technology research and development work on a contract basis. ERA eventually worked on projects as diverse as a design for an airport service truck and a parachute-landing shock reducer. However, its main source of business continued to be naval intelligence. Code-breaking required repeated comparison of strings of enciphered text, and the navy was prepared to fund work in digital electronic recording in order to ensure the achievement of the most rapid automated process. Norberg documents a series of contracts through which ERA was paid to investigate the new field of digital electronic computing and to experiment with magnetic-storage technologies. He describes in great detail the process by which ERA in 1948 created the first successful magnetic-drum memory unit (a precursor of today's hard-disk drives). The firm eventually won a contract to design and build a complete

computer system based on the technology. It delivered the first of two Atlas systems in 1950 and then tried to find customers for a commercial version, the ERA 1101, while working on an improved Atlas II for the navy. ERA's leaders realized that they lacked the capital necessary to succeed in the computer product business. In 1952 the firm was sold to Remington Rand.

Prior to the publication of this book, primary and secondary sources on ERA were limited to a few autobiographical fragments. Norberg's work is detailed and drawn from primary sources and oral histories that have been made available to scholars only as a result of his two decades of work on the topic. Though the role of the U.S. government in shaping early computer technology has been well publicized, for example in Kenneth Flann's *Creating the Computer* (1988), Norberg documents in rich detail a decidedly chummy relationship between ERA's entrepreneurial principals and their former colleagues in the navy, who fed the firm contracts. Indeed, this relationship provides a striking parallel with a theme of Norberg's previous book *Transforming Computer Technology* (with Judy O'Neill, 1996), a study of the celebrated but incestuous work of DARPA in supporting computer-science research during a later period.

The parallel story of the Eckert-Mauchly computer company fills chapters two and four. EMCC was founded in 1946 by the eponymous duo, who had led the production of ENIAC, the first useful general-purpose digital electronic computer, at the University of Pennsylvania. EMCC created the market for powerful computer systems in the United States, promoting its Univac system several years before IBM announced its competing system. While ERA has languished in historical obscurity, EMCC and its Univac occupy a hallowed place in every overview of the history of the computer business. EMCC distinguished itself through its bold commitment to unproven technologies, its eagerness to document and support the requirements of administrative users, and its attention to programming tools and other software (under the command of Grace Hopper, who eventually became a mascot for women in computer science). However, it was woefully undercapitalized and hopelessly optimistic, trapping its leaders in a destructive spiral as they pushed to bring in new development funds by signing contracts that could never cover their own direct costs. Despite winning contracts from the Census Bureau, Prudential Insurance, and several other customers, EMCC was forced

to sell out to Remington Rand in 1950 without having delivered a single Univac computer. Though the outline of this story is already well known, this is a readable and reliable telling based on careful primary research. Norberg adds new layers to the story through his exploration of managerial decisions made by the firm's leaders, his use of archival sources in describing both sides of the interactions between EMCC and its customers, and his documentation of the firm's early commitment to applications and programming research. His analysis of the unanticipated difficulties EMCC encountered in trying to assemble existing technologies into a workable product gives a vivid sense of the often overlooked role of engineering skill and tacit knowledge in the commercialization of computer technology.

The parallel stories of ERA and EMCC come together in the fifth chapter, which follows the efforts of Remington Rand, a large but loosely managed collection of office-equipment companies, to parlay its acquisitions into leadership of the emerging computer market. At first, the two businesses remained largely separate from each other and from the rest of Rand. While enough money was forthcoming to keep each in operation for the next few years, both struggled to deliver products on time and to devise workable strategies. Following the 1955 merger of Remington Rand with Sperry Gyroscope, EMCC and ERA were combined to form a new Univac division. Norberg lowers the curtain on his story in 1957, at which point members of the former ERA had decisively lost an internal struggle to set Univac's direction. Several, including gifted young computer designer Seymour Cray and division head William Norris, struck out to form Control Data Corporation, which distinguished itself as the leading supplier of high-performance scientific computers during the 1960s. This chapter breaks new ground by documenting Rand's internal rivalries and discussing some of its less well-known early computer products.

Norberg's narrative is readable throughout, but the book suffers from pervasive editing problems. A surprising number of typographical and grammatical errors have eluded the MIT Press copy editors, as have some organizational issues. In attempting to tie the two strands of the story together, Norberg sometimes refers to events that have not yet been mentioned. Even within chapters, the flow is sometimes confusing, as the material is not presented chronologically. As if to compensate, other material is

occasionally presented twice. For example, the extended discussion of a performance problem afflicting ENIAC and various possible engineering remedies given on page 112 is very similar to coverage of the problem on page 99. Likewise, the analysis of ERA's attempts to sell its machines commercially, presented on pages 158–59, covers the same ground on pages 231–32.

Because it provides the most rigorous treatment to date of the early history of Univac and its precursors, *Computers and Commerce* is essential reading for anyone with an interest in the business history of the computer industry. Although Norberg confines his own historiographical framing to issues raised in the specialized literature on the history of computing technology and the computer industry, this story is potentially relevant to a broader audience. It might give much to ponder to those interested in the evolution of twentieth-century corporate research and development groups, the emergence of high-tech government contractors in the early cold-war period, or the role of engineering practice in product development.

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