EDITORIAL AND ANNOUNCEMENTS

GUEST EDITORIAL

Actuaries and computers: a partnership

The actuary has evolved into the scientist within the insurance structure. He plays a major role in the development of new forms of coverage and establishment of investment policy. He is also concerned with the application of electronic data-processing machines to these operations and it is that with which this article is concerned.

Actuaries have always utilized what technology was available to them in their derivation of calculations. Pen and paper gave way to the first adding machines followed by the advent of the punched card by Herman Hollerith in 1886. This card could be used with electrical rather than mechanical equipment and still remains a common input carrier. Punched cards provide only binary information, are bulky and slow to process. Thus new forms emerged and the evolution continued.

In 1953 IBM entered the computer industry with its model 701. These first-generation machines used vacuum tubes as their primary elements. They dealt only with machine language, were very large, expensive to operate and generated a tremendous amount of heat, but they could make calculations a thousand times faster than existing electromechanical devices. The second generation of computers developed from the incorporation of transistors to replace the cumbersome vacuum tubes. Symbolic language was developed, magnetic core was used for main memory and magnetic tape and disk were common as auxiliary storage devices. At this period computers became more of a serious business tool and were used to perform a variety of clerical functions. With the announcement of the IBM 360 series of computers a third generation was born. These computers used integrated circuits which, because of their smaller size, allowed for faster processing and greater storage capacity in the same physical area. These computers were designed to replace all of IBM's previous computers and to fulfil the requirements of business and science, a new set of criteria evolved: standardization, timesharing, multiprogramming, expanded input/output, operating systems, procedure-oriented language and minicomputers. As the generations of computer technology continue, further advances have been made in the areas of advanced circuitry, increased multiprogramming, virtual memory, microprogramming and increased information storage.

Coupled with the great mechanical advances came also an evolution of computer language. The users went from having to be trained personnel with a great deal of knowledge to persons who need little knowledge in order to operate a computer. This language evolution working in conjunction with Personal Computers has brought the computer age to the desktop of anyone who has the desire to use them.

When the first computers were developed, machine language (the language that

the computer understands) was the only computer language which existed. Machine language is binary and thus the commands must be written in a string of binary numbers. The disadvantages associated with machine language led to the development of symbolic language in the early 1950's. Symbolic language allowed the programmer to substitute a symbol in place of part of the binary string. Symbolic language was improved upon when micro instructions were introduced. This led to the development of procedure-oriented languages. These languages are oriented to a particular procedure, or type of problem, rather than to the logic of the machine in the way that symbolic language is. Also, procedure-oriented languages are designed to run on many different computers. Although symbolic language is still in use today, procedure-oriented languages dominate. Some of the common procedure-oriented languages are:

COBOL: (COmmon Business Oriented Language) was introduced in 1960 and was designed to serve the business community and help users achieve program compatibility.

FORTRAN: (FORmula TRANslation) was developed in 1954 as a scientific–mathematic language. In appearance FORTRAN more closely resembles mathematical formulas than English sentences.

BASIC: (Beginner's All-purpose Symbolic Instruction Code) was developed for college students in the mid 1960's as a teaching language to be run on small computers. BASIC has become very popular because of its simplicity. It allows someone with little or no background in computers to write simple problem-solving programs.

PL/I: (Programming Language I) was introduced in the mid 60's as a general all-purpose language which would fulfil the functions of both COBOL and FORTRAN.

APL: (A Programming Language) is a general language with complex notations and unusual but powerful operations. It is used especially for complex mathematical problem solving.

PASCAL: was developed for use in universities as an aid to computer science students. It is very structured and shows algorithms very clearly.

C: was developed as the definition language for UNIX (operating system) by Bell Laboratories. It replaced the macro-assembly languages as a flexible, high-level language in defining operating systems, device drivers and general applications.

The latest developments in computer language are object-oriented languages such as PROLOG and LISP (5th-generation languages), which are used mainly for expert systems. The 5th-generation languages define to the computer the task it has to perform instead of defining all the steps contained within the task, and represent the emergence of the AI (Artificial Intelligence) systems. For the actuary who decides to learn this new technology there will be significant changes in the way he works, as the systems will be able to incorporate the hundreds or even thousands of slight alterations of data within a specific formula. Thus the end result will be achieved quickly and efficiently.

In order to solve the more complicated equations and calculations involved in medico-actuarial science and research the actuary must be able to write programs

tailored to his needs. The results of his efforts will depend upon his expertise; but if complicated comparisons and research are not the actuaries' intention there are many other computer means available to assist him in his daily responsibilities, without him having to learn a computer language.

The many over-the-counter software packages available in the market today, such as formula translators, statistical graphic packages or one of the many various spreadsheet programs e.g. LOTUS 1-2-3, make the life of the actuary much simpler. These software packages which run on micro-computers may be integrated with databases from mainframe computers. This integration has replaced and improved upon the EDP department printouts. The actuary can retrieve from his desktop all the records and necessary information needed for use in formulas and statistical analysis, enabling him to work independently.

The possibilities for an actuary using his science with computer aid is unlimited. Everyday tasks can be done quickly and simply while more scientific work would be almost impossible without the computer. Because both computer and actuarial sciences have their base in mathematics the actuary must become involved in defining the direction of his EDP departments. The advent of the 5th-generation languages and software engineering will free the actuary to work independently, enhance his techniques, research new options and make more timely decisions.

As Hans Buhlmann stated in his Editorial of the November 1987 edition of the ASTIN BULLETIN a new actuary is emerging. A professional who is using his skills for investment and banking applications within and outside of the insurance industry. Furthermore, this "Actuary of the Third Kind" should also implement computer techniques to help assist him through this transition. As stated, there are simple and complex computer applications available and each actuarial candidate should be required to know enough about these applications to use computers wisely. A basic understanding of programming is essential to allow the forthcoming actuaries to be able to make sensible operating decisions and utilize the computer for their own and their science's advancement.

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