

Actuaries and Computing The Next Ten Years

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1. Introduction

This paper sets out my forecasts of the general computing trends that will affect actuaries and the effects of those trends on actuaries. The time scale I have chosen is the next ten years.

Nothing in this report is certain, but I have left out phrases such as "almost certainly" and stated the forecasts I feel most confident about as facts. Those forecasts that I feel less certain about include the odd "may" or "might".

This report reflects my background in the pension industry, and lacks detail in other fields.

2. Computing trends that will affect actuaries

2.1 Hardware

Hardware will continue to get cheaper (or become more powerful for the same price). I do not foresee any major step changes, except parallel architectures might become important if actuaries use stochastic methods more.

Hardware will improve from an ergonomic point of view. It will get smaller, quieter and produce less heat. The user interface will improve with large flat screens, mice for skilled users and perhaps touch screens for unskilled users. Voice input and output will become important, but the accurate translation of voice into text is unlikely to be economic in ten years time.

Paper will still be used to work on and for the storage of information.

Combined printers and photocopiers will become available.

Documentation will be stored on line as it will be too voluminous to be printed.

Office workers will have "workstations" on their desks, at home and in their briefcases. These will be combined personal computers and terminals and be connected to a network including computers, telephones, printers and gateways to other networks.

The price of storage media (memory, discs, video discs, tape etc) will drop but there will never be enough capacity to store everything that people want to store, at an economic cost.

2.2 Software

The current forms of generally available software that we use will gradually improve and become more intuitive to use. They will also need more powerful hardware to run on. Such forms of software include computer languages, word processing packages, databases and financial modelling packages.

At the moment computers deal largely with data. A significant development over the next few years is that computers will also hold and manipulate knowledge. For example

databases may include details of legislation and there will be intelligent retrieval systems to find the legislation relevant to a particular case. So called "expert systems" will mimic experts. The user can input a problem into an expert system program which will then ask relevant questions and produce a solution, together with a summary of how the solution was arrived at.

Expert systems are part of the studies into "Artificial Intelligence". Another part is "Knowledge Engineering", which is a rapidly developing field.

Expert systems will become very important. I expect standard shell packages (programs that enable expert systems to be written easily) to improve and become best sellers. Expert systems will reduce the skill and experience needed to perform many technical actuarial tasks. They will also remove the more mundane parts of some jobs, including those of experts, making these jobs more interesting.

2.3 Telecoms

Telecoms and networks will improve. It will be possible for an individual's workstation to communicate with many other workstations, terminals, computers, databases and so on.

Networks will handle data, images (graphs, fax etc), voice and TV pictures. Improvements in all these media will have a large effect on our working practices. For instance:

- (1) Some, if not most, mail will be transmitted electronically, and be available at the recipient's printer or workstation almost instantly.
- (2) As soon as a letter is typed into a machine it will be available for checking at someone else's workstation or for printing (any number of copies) at your or the recipient's printer/photocopier.
- (3) Fax quality will improve. It will be operated by feeding a document into your photocopier and the copy being output at the recipient's printer/photocopier, or viewed on his workstation.
- (4) Telephone systems will be able to store messages and forward them on request. This facility will allow recorded messages to be left if the recipient is out or engaged. It will also enable the same message to be passed to several people and enable messages to be passed without long conversations.

As with storage media, the price of communication links will drop but not enough to satisfy all users at an economic cost.

2.4 Public and commercial databanks

Data and knowledge will become much more widely available in databases. Access will sometimes be very expensive.

Valued Added Networks ("VAN"s) will be very important. These are set up by different suppliers of information pooling their databases. An example is the airline timetable and reservation system. One potential VAN would consist of all life insurance rates, general insurance premium tables and so on.

Expert systems will be set up to give members of the public advice on many subjects now dealt with by solicitors, insurance brokers, and consulting actuaries. How such systems compare with advice from humans on quality of service or price will be an interesting subject. The expert systems will be good at detail and rigor but will lack imagination and be bad at very wide ranging problems.

The user interface of databases will standardize and so will the "computer interface" enabling other computers to ask databases what they contain.

2.5 Standards

Everything to do with computing will become more standardized. This will enable software to be circulated widely, data to be interchanged and users to change machines with less training. A minor drawback of users insisting on standards will be to reduce innovation.

Increasing standardization will be an enormous influence on computing in the future.

3. The effects on actuaries

3.1 Actuarial techniques

Stochastic methods may become more widely used to determine the variability in actuarial estimates.

An actuarial notation that is capable of interpretation by computers would enable actuaries to use computers much more productively, but progress in this area is very disappointing at the moment.

Most of the numerical techniques that are currently used by actuaries were developed to be evaluated manually by clerks. This is no longer a constraint and there is scope for changing techniques so that the notation and techniques are more easily understood by the actuary.

Techniques for checking complicated calculations will be required. In particular packages will become available to enable companies to value their own pension funds. Consulting Actuaries will find themselves merely auditing such valuations instead of performing the entire valuation for some clients, and will have to develop suitable auditing procedures.

Nearly all actuaries will have a workstation on their desk, and they will tend to do more jobs on that workstation, rather than specify the work for others to do as at present.

Graphs will be used more for the presentation and scrutiny of results.

3.2 Actuarial professionalism

I think legislation, regulation and our relations with the accounting profession will have a much bigger influence on our professionalism than computers.

I do not consider expert systems a threat to our profession. They are a tool we will have to learn to use.

3.3 Actuarial training

I feel the current actuarial training is inefficient and there is too much concentration on the "trees" and too little on the "wood". It is possible that trying to put actuarial knowledge into expert systems will reveal some of the "wood". In any case I hope a vast effort will be put into thinking how we should train future actuaries.

Computing is becoming so important in the work of the actuary that it should form part of the training of new actuaries and current actuaries.

3.4 The employment environment of actuaries

I do not think that the number of actuaries doing their current jobs is likely to change over the next ten years as a result of computer developments.

The availability of actuarial software packages will be an interesting influence. Accountants might start doing actuarial valuations (and perhaps employ actuaries to interpret the results). Software houses may employ actuaries to write actuarial packages although it is more likely that such packages would be developed inside existing actuarial firms.

3.5 Changes in the insurance, pensions and investment industries.

3.5.1 The market and environment

I do not expect that the type of organisation using actuarial services will change significantly, except that expert systems may enable actuarial services to be purchased by individuals who could not otherwise afford them.

Successful investment in computing will make some offices more competitive than others.

The market in pensions products is being opened up but this is not due to computing.

3.5.2 The products sold

Increasingly sophisticated use of computers will enable more complicated products to be sold.

3.5.3 Sales and sales methods

Brokers will be able to access a database containing details of all contracts and premiums. Software would select all suitable policies. The public would also be able to access such databases at home.

3.5.4 Administration

More and more data will be held on computers. Maintaining data about individuals will remain a difficult and time consuming task relying on humans and their common sense (which is very hard to incorporate in a computer program). Tools for extracting, summarizing and presenting data will improve. This will aid, for example, the financial control of organisations.

Typically data will be held on central

databases and copied to workstations for analysis. Controls on subsequent updating of data will be required.

3.6 Actuarial productivity

The objectives of expenditure on computers and telecommunication equipment in offices is to raise productivity. It is extremely difficult to measure the productivity of office workers but it is generally accepted that it has increased far less than that of manual workers over the last hundred years.

In very general terms I would say the productivity of actuaries doing technical work, such as valuations, has increased enormously over the last ten years and that of actuaries doing less technical work has hardly changed over the same period. A challenge for the next ten years is to raise the productivity of all actuaries.

4. The effect of the actuarial profession on the computing industry

Unfortunately this will not be significant. Most of the hardware facilities we require are

included in the computer industry's concept of "commercial users", and our needs will be looked after as the computer industry develops its products. The current exception to this is the processing power we would like, which the computer industry thinks is only required by "technical" users. I hope the computer industry realises as soon as possible that technical users also need commercial products and combine their technical and commercial product ranges.

Actuaries do have special software needs. The widely available database and financial modelling packages are not adequate for our needs and languages like Fortran and APL are only suitable for a minority of actuarial users. An increasing number of software packages will become available to meet the specific needs of actuaries.

5. Summary

I believe computers will have an increasing influence on actuarial work and that, apart from expert systems, any changes will be evolutionary, and not revolutionary.

Computers are tools that enable us to do our work better. We must take advantage of them.