

Ann Moffatt's speech for the ACIS Conference 7th December 2007

I started my career in the Computing in 1959.

I say Computing because that's what we called it then. There was no thought, in those days that computers would be used for anything but complex, fast, accurate mathematical and logical computing.

It saddens me that today most people think computers are PCs, were invented in the early 1980s by the Americans and most probably by Bill Gates.

Many people contributed to the concept of automated computing and many prototypes were built, including steam driven computers such as those envisaged by Babbage in the 19th century and computers made from meccano sets by Zuse in Germany during World War II. However, the modern day computer is considered to date from the first stored program computer which was built in Manchester, England and first functioned fully in June 1948. Called the Small Scale Experimental Machine, SSEM, it was know to everyone as 'Baby'.

The second stored program computer was American. This computer, ENIAC, the Electronic Numerical Integrator and Calculator, had a strange history. Wikipedia lists it as the world's first modern computer thus perpetuating the myth that the Americans were first. Wikipedia does acknowledge BABY as the first stored program computer but says it was 'a very limited machine'.

ENIAC started life as a single purpose machine designed to compile tables for firing ballistic missiles. If the purpose was to be changed, the computer could not simply be reprogrammed as with a stored program computer; the hardware had to be re-engineered. It was also designed as a decimal machine rather than the binary based machines we have today.

A chance meeting between a member of the ENIAC team and John Von Neuman, the father of the atom bomb, in 1946 produced the possibility of using ENIAC to handle the calculations needed to develop the hydrogen bomb. Von Neuman joined the ENIAC design team and introduced the concept of a binary based machine which led to a much simplified design. He also introduced the stored program concept. ENIAC first functioned as a binary based, stored program computer in September 1948.

In England, Maurice Wilkes (now Sir Maurice) at Cambridge University was developing EDSAC, the Electronic Delay Storage Automatic Calculator. That machine, the world's 3rd computer, first functioned in May 1949. Australia's own Emeritus Professor John Bennett was a young PhD student working on the project.

Few Australian's and very few people outside Australia seem to know that the world's 4th computer was Australian!! It was the CSIRAC, built by CSIRO. It first functioned in November 1949. The Australian team wrote to Mother England to tell of their achievement. The return letter advised CSIRO that there was very little demand for computers and Australia should 'stick to wheat and wool'! As a result, Australia's first computer was not cannibalized for parts to make subsequent computers as were all the others 'firsts'. Australia now has the world's oldest intact computer located in Scienceworks which is part of Museum Victoria in Melbourne.

When I first started in Computing in 1959, there were about 300 computers in the world. Today there are over a billion. A monthly magazine from the USA listed the ownership, location and model of all the world's computers on the back page. We looked forward to each edition to find out where the next computer was located. In 1959, about 150 computers were listed. We judged that there were possibly the same number in 'secret locations' that were not listed.

The computer I first worked on was the Ferranti Pegasus which was a direct descendant of the Manchester Baby. One of the people who taught me to program was Conway Berners Lee whose son, Tim (now Sir Tim), the inventor of the World Wide Web, was then 4 years old.

Although Pegasus was primitive by today's standards we developed systems to automate all the production and process control for Kodak UK saving the company many £millions.

There was no job differentiation by title as there is today. Anyone who worked in computing did all the tasks needed, analysis, design, programming, operating the computer and even punching the programs and test data onto paper tape or cards.

Programs were written in machine code and I loved the work from day one. I was one of a team of 5 in the Operations Research department at Kodak UK. I feel very fortunate to have started my career in Operations Research because techniques learnt in that discipline have served me well and led to the development of Management and Life skills but more of that later.

There have been many events in my career that have marked the passing of computing history. In 1963, Operations Research techniques were demanding more and more computing power. Our programs could run for 3 weeks on the then most powerful computers without producing a result. Getting a computer to run for 3 weeks without a breakdown was an achievement in itself!!

The UK government funded the development of the world's first 'supercomputer', the giant Ferranti ATLAS. Atlas was to be the world's first computer with an operating system. It was to produce 240,000 arithmetic operations a second which was faster than anything built to that time. We now measure computer speeds in gigaflops, which is 10^9 Floating point operations per second!!

I was seconded by Kodak to work on the Atlas operating system with the Ferranti team in Manchester. My part was to develop the 'drum learning program' which optimized the placement of chunks of program and data in the core store or on the drum to minimize access time.

Atlas sold for about £3 million, about \$200 million in today's money. Ferranti salesmen were not on commission at that time but there was the prospect of Ferranti being taken over by ICL who did pay commission. I overheard the salesmen hypothesizing about their commission should one of them sell an Atlas. The head salesman said no one person would get all the commission because Atlas was so complex it would take a whole sales team to sell one. He went on to say that if Ferranti sold 3 Atlas computers to the Russians, the UK government had calculated that it would solve the Russian's computing needs to the year 2000. In 1963, it was the height of the cold war with computers playing a large part in nuclear weapons design and delivery and it was the start of the space race. The part played by computers in the engineering and numerical calculations associated with these activities was huge.

Atlas was much less powerful than the PC I have on my desk at home. If anyone had told me in 1963 that I would own a computer more powerful than Atlas and that it would fit on my desk rather than occupying several large air conditioned rooms, I would have thought they were nuts!

By 1964, Kodak's OR team were renting time on London University's Atlas, one of about 5 sold, the others were sold to nuclear power research organisations like Harwell. We wrote to Kodak in the USA to ask if we could buy a 10% share of the London Atlas. The reply was that Kodak had decided to standardise on the yet to be released IBM 360 computer. We asked to see the spec and quickly realized that it was not capable of doing the work we were doing. When we asked Kodak USA what we were expected to do on an IBM 360 we were told it would do 'invoicing'. Invoicing, on a computer? We had a room full of girls who did invoicing!!

I came to Australia in 1974. In 1978 I was working for AMP which was then Australia's largest company by asset value. I reported to the Deputy General Manager, Phil Grace. Amongst my duties was the responsibility for buying all the hardware for AMP. My boss asked me to keep him updated with new technology so that he could show off his knowledge to his colleagues at his club.

Computer memory was largely core storage which was sensitive to temperature variation. Even in the best air-conditioned rooms, slight fluctuations would lead to errors and engineering shutdowns. Our Univac salesman told me about a new type of very stable memory which was not affected by heat fluctuation. Called 'metal oxide on silica' memory, we now know it as 'chips'. It was \$1.5 million a megabyte.

I told the boss. He let out a low whistle and asked me what on earth we would do with a megabyte of memory, reminding me that AMP had 2 of the biggest computers in the southern hemisphere and each had half a megabyte of memory. I told him what I would do with a whole megabyte on one machine and, shaking his head, he said but it's a lot of money, if I could 'talk the salesman down to \$1 million', we should buy it. About 6 months later the price was \$1 million and we bought it. The same memory is now about 3 cents a megabyte. Nowadays, even the computers in mobile phones, cars and cameras have many megabytes of memory.

Today we complain about the slow speed of data lines. AMP had one of the first computer networks in Australia. I commissioned the first data link between Australia and NZ. It was 9 bits per second!!

One of the proudest moments in my career was when, after installing the world's first real time on line share trading system the day before the 1987 crash, the ASX system was one of the only systems in the world not to fail during that very heavy trading day. Most others, including Tokyo, Hong Kong, Singapore, London, New York, and several European exchanges, crashed before the end of trading.

Our success was due not only to good design and development but largely to the rigorous testing I insisted on much against the wishes of ASX's macho management who were used to systems that 'fell over' regularly. (The Financial Review referred to the ASX system as 'JOKEnet'.) ASX management wanted 'their' system in production as soon as possible so that they could claim a 'world's first' system before anyone else snatched the title from their grasp.

Never in my wildest dream did I imagine I would have all the facilities available to a broker to enable me to trade shares in real time on my own PC in my own home.

In the early 1960s, I attended a lecture given by Donald Davies at the National Physics Laboratory in England about transmitting data across telephone lines. This resulted in the concept of packet switching.

I had worked on programming language standards committees for the British Standards Institute but the thought of the power created with the combination of computers and communications really fired my imagination so I switched to data communications standards committees until 1984 when the basic reference model for the 7 layer system was ratified. Then the world turned to the much simpler TCP/IP. Although we had data transmission from the 1970s, it was not until the birth of the World Wide Web in 1994 that the power of that combination was fully realized.

It's been a really exciting journey. I feel as if I have been paid, and often paid very well, for having fun. Working in the ICT industries, has given me the opportunity to bring up my children and indulge my love of travel. ICT is an excellent profession for women and it saddens me that less and less women are choosing our industry every year.

It also saddens me that more and more of the rigorous engineering side of our industry is being done off shore and that few people in Australia understand that there is a rigorous engineering side to our industry. Most Australians seem to think a 'computer expert' knows how to plug in all the peripherals on a PC and get it working and know how to use a spreadsheet package!! There is very little understanding of the rigor, intellect and effort required to develop and maintain the large compute facilities and complex networks that are the engine rooms of our largest enterprises, or that the ubiquitous Microsoft Operating System is very poorly built.

So how can women make a satisfying career in the ICT industry in Australia today?

I am often asked about prejudice against women and how to overcome 'the glass ceiling'. In my experience, there is no more prejudice against women than there is against men. Research has shown there is no 'glass ceiling' except where women make one. I can, however, give you 3 stories of prejudice against women from my own experience.

When I got my job as the only woman executive at AMP, I was about 30 people down from the top of Australia's largest company. Stories circulated that I had slept with 3 of the top men in AMP to get the job. I was very upset and even considered going back to England where I thought people were more civilized. One of the men was my boss, the deputy General Manager. I discussed the rumor with him.

He told me that he knew it wasn't true and I knew it wasn't true and that was all that really mattered. Also, if that was the only thing people could think of saying about me it demonstrated that I was very good at my job.

The second man was a good family friend who was also head of the naval reserve. He winked and said 'let them go on thinking'.

The third man was the dour, very Christian Chief Accountant. Early one morning I gingerly knocked on the door of his enormous office. When I asked to close his door as the matter I wanted to discuss was 'personal', he seemed to shrink behind his ornate desk. I told him I was very upset, as he must be, about the rumors. Looking startled, he asked 'what rumors'? When I explained, his face softened. "Oh those rumors. Don't stop those rumors. Everyone used to think I was a dry old stick now people even come and sit next to me at lunch in the executive dining room. Oh no, don't stop those rumors!"

My boss used to hold morning teas for his executive team on every opportunity possible, birthdays, new babies born to his staff etc. At that time I was a single mum with 2 children. The conversation at these events would often get round to 'who can we marry Ann off to'?

Whenever the wives of senior executives died, the comment would be 'wait a couple of months, then we'll have a dinner party & see what happens'. They even tried to marry me off to homosexual executives because, as the boss said, 'you've got 2 lovely children so you don't need any more of that 'silly stuff''.

One day, I asked the boss why they had never mentioned a man at AMP who was my age, taller than me, was handsome and 'sporty' & had never married. "Oh, you can't marry him", said my boss. "He's not an Executive". I told him that was a case of prejudice. Had I been a young male executive, he would have been trying to marry me off to a pretty young secretary.

When 'Equal opportunity for women' was introduced in 1984, interview panels for public service jobs had to include a woman, an outsider, and someone who earned more than the salary of the position for which the interview was being held. As part of their 'good corporate citizen' role, AMP would often allow me to serve on these panels as I usually conveniently fulfilled all 3 criteria.

I was a member of a panel of 3 interviewing for senior IT positions at the ABC. All positions were declared vacant and incumbents had to reapply for their own jobs if they wanted to continue in the service.

At his interview, the then Director of IT told the panel in no uncertain terms and using all the f and b words he could muster how stupid the process was and how demeaning it was to have to reapply for his own job. He then stormed out of the room. The 2 ABC men on the panel asked me what I thought. I answered that it was totally inappropriate behavior and I had no way to judge his suitability for the job.

His deputy was next. He used his time to tell us what an F wit the director was and that he should take the Director's job. He too stormed out. The men asked me what I thought and I gave the same answer that I gave for the Director's performance.

We interviewed about 8 non ABC applicants. At the end of the process it was obvious to me that Jane, the only woman, was the best applicant by far. When I gave my opinion, the 2 ABC men said Jane couldn't possibly be appointed because she wouldn't be able to handle the politics at the ABC. I said I didn't see 'politics' in the job description. Maybe if the politics were bad a good manager would sort that out.

After a few days interviewing for lower rank jobs I persuaded the panel to appoint Jane. Years later I was told that the department worked better than it had ever done. Productivity and staff retention had increased significantly and the politics were almost non existent. Had I not been on the panel, Jane would never have been considered for the job.

I'm often told that women are not good at the company 'politics'. I tried my hardest not to get involved in company 'politics' as I felt I only had enough energy to do my job as well as I possibly could and get home to raise my children. My job was never '9 to 5' but often involved working overnight if there was a deadline to meet or flying overseas at short notice or attending meetings outside 'normal' office hours. I was often advised by male colleagues that I would never really 'get on' unless I got involved with the politics.

However, when I established my own company, many of my ex colleagues contacted me to see if they could get involved in many of the interesting projects we worked on. Over a coffee or lunch, that was the usual way I interviewed, many would tell me how much they admired the way I never got involved with company politics. When I told them they didn't have to get involved either they seemed to think they had no choice.

Women are now getting into top jobs but it seems to me that once there, whilst they are willing to mentor more junior women in other organisations, they are not willing to help their female colleagues in the same organisation 'climb the ladder'. When challenged, they infer that being supported by a team of male subordinates makes them look more powerful.

Now I'm nearly 70. I have been 'retired' for 7 years. Having always worked, 3 months off with my first babe and 10 days off with my second, at which time I was managing 250 people, I have at long last been able to put my 40+ years of experience in the ICT industry in perspective. What can I tell you about what I have learned about how to be successful in our industry?

Firstly, you must understand your own values and what is important to you. These may change with life experience but you need always to know what they are. How do you find out what your values are? You spend time in a quiet place and listen to yourself. Only you can know what your own values are.

I mentioned that I was fortunate to start my career in Computing in Operations Research. Many Operations Research techniques are very useful in just living life. In fact I'd like to see OR taught in secondary schools.

One technique I learned very early in my career was to plan. By this I mean to develop a plan with not only goals but the activities that are necessary to achieve those goals plus dependencies and resource and time estimates. Life does not always go as planned but it sure helps to know where you are heading when faced with unplanned events, opportunities and choices.

I make a plan every 10 years. For the years from 20 to 30 my goals were to be married and living in my own house as soon as possible after my 21st birthday, to have given up work and to have my first baby by the time I was 26 and to have my second baby 2 years after my first. I did not plan that I would still be working and in fact managing 250 people at the time I had my second baby or that on my 30th birthday my husband would announce that that he no longer wanted to be married but wanted to go and live in America as a bachelor!

For the years from 50 to 60, amongst my goals were to get a PhD by the time I was 60 and to travel round China for a month using public transport. I had been told at school that I was one of 2 girls who would go to uni and get a PhD but a fractured skull at the age of 19 cut short my university career. By the time I was 50, I was working for UNSW and thought it high time I completed my studies but not even having a first degree presented a challenge. My colleagues at UNSW suggested that I start at Masters level at MQ Uni and I was allowed to move to a PhD program before I completed my masters.

Half way through my PhD I decided that I had different priorities so did not complete it. To travel round China, I had to learn Mandarin which I found very difficult but I was able to take 5 weeks off from managing my company to travel extensively in China.

I find that as I get older it is even more important to plan what I will do with the rest of my life as I have less and less time left to achieve my goals.

Another OR technique that served me well was the Theory of Games. Here the aim is to conceptualize all the things that can stop you achieving your goals and develop strategies to overcome them. The technique was developed by John Forbes Nash who was the subject of the film 'A Beautiful Mind'.

Take time to observe. Often a solution to a problem is simple but counter intuitive as it was when Kodak was faced with the issue of buying 200 more expensive stainless steel vats to contain emulsion. My then boss in OR observed the processes being used then suggested the solution was to hide away 200 existing vats. He had noticed that when vats became scarce operators made an effort to clean out dirty vats and throw away unusable small amounts of emulsion. I left Kodak about 5 years after that decision and in that time, although throughput increased, rather than needing to purchase 200 new vats, the 200 hidden vats had never had to be used.

In my experience, it is often the most junior staff, who have time to ask why, that can suggest the most successful solutions.

Something I learnt fairly late in my career was to put my own needs first. We women are often taught to put the needs of others before our own. It seems very selfish, but I have found that you are better able to help others if you meet your own needs first. It makes sense when the flight attendant on an aeroplane announces that you should put your own oxygen mask on first before helping others and it works in life. Always putting others first leads to resentment.

Take good care of your physical and mental wellbeing. We each only have one body. It is important that we treat it well and maintain and exercise it regularly so that it will be fit to support us in all we want to achieve in life.

Promise less and deliver more. In providing estimates for ICT projects I have always slightly overestimated. This not only provides a margin for error but it delights clients when projects are brought in under budget and ahead of time. In my masters program I was horrified that one mature age student said he always underestimated ICT projects otherwise, if the management knew the real cost, they would never get the go-ahead. He said once a project was part way through more budget and time would always be allocated. I consider this attitude to be dishonest. It has been the scourge of the ICT industry. The ICT industry is a service industry. Professionals must learn to provide accurate estimates.

Value difference. Life is very comfortable when you are surrounded by a group of 'minimes' but we need to be with people who constructively challenge our ideas and recommend alternatives so that in a culture of mutual respect other people's views are heard and the outcome is best and strongest solution.

Appoint a competent deputy. In this way things can continue successfully if you are ever away from work through sickness or on holiday. It also means you have the choice to take on interesting opportunities as they arise.

Reward yourself when you achieve something you are proud of. I hate public speaking. The first time I made a presentation to a group of 500+ and received a standing ovation, I bought myself a very expensive hand knitted jacket. Whenever I wear it I recall the event that led to the purchase and feel a million dollars. Something as simple as a nice bookmark, a significant book or small piece of jewelry will serve the same purpose

Make time to pursue activities you enjoy outside your career.

Have fun. If you do not look forward to going to work each day you are probably in the wrong job. Have the courage to get out of a situation you are not enjoying.

After I retired and came to live in Queensland I thought I would be forgotten by our industry but was delighted to be called to Sydney to be inducted into the Australian ICT Hall of Fame. I didn't even know the industry had a Hall of Fame.

It didn't, until 2002. In 2002, from 145 nominees identified by our industry, 3 people were selected by a panel from our industry and became the inaugural inductees. In a very male dominated industry, it was a great honour to be the second person and first woman to be inducted. One of the award sponsors was Air New Zealand who gave the 3 inductees 2 round the world tickets each. It was a very pleasant reward for a most enjoyable career.

I would like to leave you with a quotation from the 16th century essayist, scientist and philosopher, Francis Bacon. He said "Let no man a debtor to his profession be." I have certainly enjoyed the fruits of our industry and enjoyed making a contribution to our profession.

I am currently a Director of the Australian Computer Society Foundation. The Foundation takes donations from the industry and gives money to ICT students to help them complete their university studies. In the past 5 years we have raised over \$12 million and supported over 650 ICT students. If you know of any students who might benefit from these scholarships, please do not hesitate to contact me.

Here endeth the commercial. Thank you.