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The Age of Dependability

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Thirty years after the invention of the first computer system, technological advances have made computers available to the public at large.

The computer of today bears no physical resemblance to its original forbear. Micro-electronics has produced the matchbox sized processor and software has harnessed the computing power for productive use. The long years of development saw different aspects of computer performance and usage scrutinised and improved. In motor car terms, we are now entering the pnuematic tyre and closed cab phase.

The first phase of computer development had been concerned with functionality - making it work as a piece of electronic equipment. The second phase was to make it function usefully so that benefit could be derived from its existence. This was the beginning of software. The third phase was to make it reasonably reliable so that people could be persuaded to buy duplicates. This was the start of the computer industry.

In the early years, users bought computers for prestige, for performance and sometimes for profit. Marketing strategies focussed attention on price/performance characteristics and computers were bought for their terminal velocity over the measured mile. The measurement of performance allied to the arts of course building added new dimensions to the mystique of computers and gave birth to a pseudo-science of computer evaluation.

Price/performance was a useful comparative yardstick as long as people costs in the computer department were low and user aspirations for applications were minimal. At the same time, the primitive operating systems available gave most of the I/O power to the user. During this phase computers became a necessity for anyone with volumes of data to process.

The price/performance era did not last long. The excess of processor power over I/O throughput brought forward the development of multi-programming techniques which devoured the processor power and multiplied the people costs. Analysts, programmers and operators were hired to provide work for the computer to do. Work expanded to fill the capacity available. The bottleneck area of data preparation was attacked by the new technology products of key-to-tape and key-to-disk. Price/ performance disappeared in favour of cost/benefit.

Cost/benefit recognised that the costs of running a computer were the sum multiple of the cost of buying one. Cost justification therefore had to encompass the potential applications benefits of the new systems to be compared with the high overall cost of running the system. Costs were still excalating rapidly but users began to analyse and understand their expenditure and return.

Analysis showed that total mainframe installation costs were rising rapidly, and that the larger systems were becoming increasingly difficult to manage. Cost evaluation of one large computer against another was impossible. There were too many ill-defined areas. The availability of third party software could transform the economics of the most mundane system. Separation of hardware and software pricing offered the user viable alternatives. The market changed from seller dominated to buyer orientated.

Into this changed environment, the makers of large computers launched a pre-emptive market strike in the form of database management concepts to provide corporate Management Information Systems. Based on man's undeniable thirst for knowledge, these new systems were to provide a daily or real-time encyclopaedia of corporate activity. The pre-requisite of very large and very expensive computers for MIS was not lost on the more astute users.

The MIS succeeded in over-shadowing the advent of the mini-computer and its rapid commercial exploitation. The mini-computer took computing out of the sanctity of the EDP suite and placed it in the corner of the sales office. As such it was seen as a threat to the EDP institution. The threat was contained for some time by emasculating the mini-computer, allowing it to fulfil the roles of dumb RJE terminal or card punch replacement. The key-to-disk market thrived handsomely.

Improved mini-computer software finally undermined the rationale for increasing mainframe usage. Economics showed that totally centralised systems were the most expensive forms of computer-isation. Mathematics proved that a number of mini-computers were more reliable than single or duplexed mainframes. Common sense contributed the notion that computers were probably more useful in the hands of people making money than in the hands of people counting it. The mini-computer revolution was upon us.

The exodus of computing power from the EDP bunker into the office and factory was a significant sociological event. Computer designers realised that the man/machine interface was the critical factor for widespread acceptability of computer products. Stated simply, as computers became less complex to use, potential markets multiplied. Thus simplicity of use became a major design goal and the use of tutorial software began.

The entry of the computer into the working environment posed many problems. The computer had to be physically acceptable requiring no special environmental facilities. The constituent parts had to be organically designed for office use with office cosmetics. Above all, the computer was to do very sophisticated jobs - data communications, transaction processing, data management - and yet it was not to be operated by computer experts. A fundamentally new approach to operation was needed.

In the home can be found many intrinsically complex devices - television, hi-fi, programmed washing machines. These devices are used every day without a thought being given to the sophistication of manufacture. The complexity is transparent to the user.

Similarly with the contemporary mini-computer located in the office, there are minimal controls and no flashing lights. The system is switched on/off by an ignition key. The memory is non-volatile and the system warm-starts immediately. The disk is in a sealed unit and is untouched. A message appears on the terminal screen to indicate readiness to proceed. The entire process takes around 30 seconds. At the end of the day the system is switched off and the key removed.

There are a number of interesting facets to this revolution. The fact that the man/machine interface is simple builds confidence in the operatives. In prior days, office workers had often asked for re-grading as computer operators when a system was installed that was difficult to use. The terminal on the desk is now just as accepted as the typewriter. But two problems remain.

Firstly, the computer is now in a revenue supporting or revenue producing role. If the system fails, the business fails. Modern office economics do not allow for anything but the most rudimentary back-up. Secondly, however transparent, the computer is doing complex jobs and can go wrong. We are now entering the age of dependability which will characterise the computer industry for some years.

The previous computer industry phases of price/performance, multi-programming, cost/benefit, data management and good product reliability are taken for granted. Dependability highlights the critical role of the computer at the operational level in today's organisations. Dependability is not concerned just with MTBF and MTTR, but with built-in hardware resilience and above all crash-proof software. Degraded performance is

acceptable to a degree, down-time is not.

With large computers, dependability can be built-in with an appropriate price tag. With mini and micro-computers innovation is as important as design, especially at component and sub-assembly level. Elastic tolerances, fail-safe circuitry and rigid manufacturing quality control with hot stage testing prior to shipment ensures dependability of hardware. Dependability of software is gated by design and test concepts. Innovative testing philosophies together with fail-safe functions ensures resilience and often full crash-proofing.

Dependability takes the worrying out of computers. Operatives are trained to use them as much from the exception situation as the normal operation. Dependability means that exceptions are exceptional in a classical distributed processing network where computers are connected together over telephone lines, making the connections using the appropriate protocols is routine, much the same as making a phone call. In the exceptional case, where the connection cannot be made, the operator has documentation and prior training to ensure that the problem is notified to the appropriate authority and that an alternative course of action is initiated.

Dependability requires organised back-up resources. For problems requiring outside resolution the Customer Engineer or Systems Support Technician must be at hand and fully equipped to provide immediate resolution. The computer manufacturer must be committed to dependability.

New technology is not always the best friend of dependability. Reduction in component count and cabling reduces the number of items to potentially fail but change brings risks. The current pace of hardware development could obsolete most products in five years. In practice technology will be assimilated, slowly, carefully, to a plan. Product cost considerations are less important than dependability goals.

The computer is now a high profile product contributing to the productivity of people and the profitability and even survival of enterprises. The move from centralised to dispersed computing is a worldwide phenomenum as more lower cost, easier to use products become available.

The inter-connection of these dispersed computers through telecommunication links and the use of these computers in recording and controlling the business transaction requires a high level of confidence by the user. The specific cost justification is still sometimes worked out in cost/benefit terms but the truth perhaps is that in a post-industrial society, society itself is computer-dependent for its standard of living.

The mini-computer and micro-computer have opened the door to computer power for the public at large. Personal computers will soon be as common as pocket calculators. For these and key systems in the high profile applications, dependability will be the yardstick of success and acceptability.