ALL CHANGE

ADVANCE AGAINST THE TIDE

Take a deep breath! You are about to journey through an extraordinarily turbulent period. Raging inflation, strikes, electricity black-outs, 3- day working weeks, riots, mounting rubbish in the streets, insurrection in Ireland, Bombs in England and rising unemployment, especially amongst the young all plagued and destabilised life. Certainty faded and Britain's place in the world plummeted. There was class war in industry, developing extremism in politics and a rise in public and domestic violence. Yet stoically, if not miraculously, people struggled on and emerged at the end of the decade with more money in their pockets and a higher standard of living. They enjoyed a more frivolous life style with more gadgets and gizmos, more opportunities for amusement and holidays the like of which they would never have dreamt of. Life was all change. A roller-coaster of a ride into uncertainty.

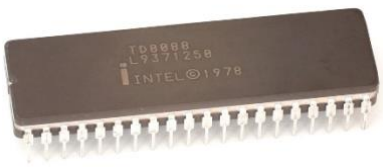
The big theatrical masterpieces of the Moon Landings and Concorde which sensationalised scientific advance in the 60's did not recur in the 70's. Instead, behind the scenes, out of the limelight the geeks were cooking up a revolution. Extraordinary progress was made in solid state physics driven by the integrated circuit and the laser. The 70's saw the birth of the modern computer and a growing understanding of its potential applications. Viewed in retrospect nothing could have been more significant.

The microchip changed everything. Microchip design evolved rapidly during the 70's opening up functionality in a wide range of devices and settings. From the Signetics NE555 Timer in 1971 to the Texas Instruments TMC0281 Speech synthesizer in 1979 the scope of change was vast. Among the most significant, however, was:

1. The MOS Technology 6502 microprocessor which emerged in 1975 to become the main brains of the first personal computer.
2. The MOSTEK MK4096 Kilobit DRAM (1973) the basis of computer memory and
3. The INTEL 8088 Microprocessor (1979) which went on to dominate the desktop computer market.

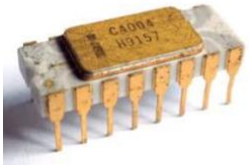
MOS Technology 6502 Processor

MOSTEK 4069 DRAM

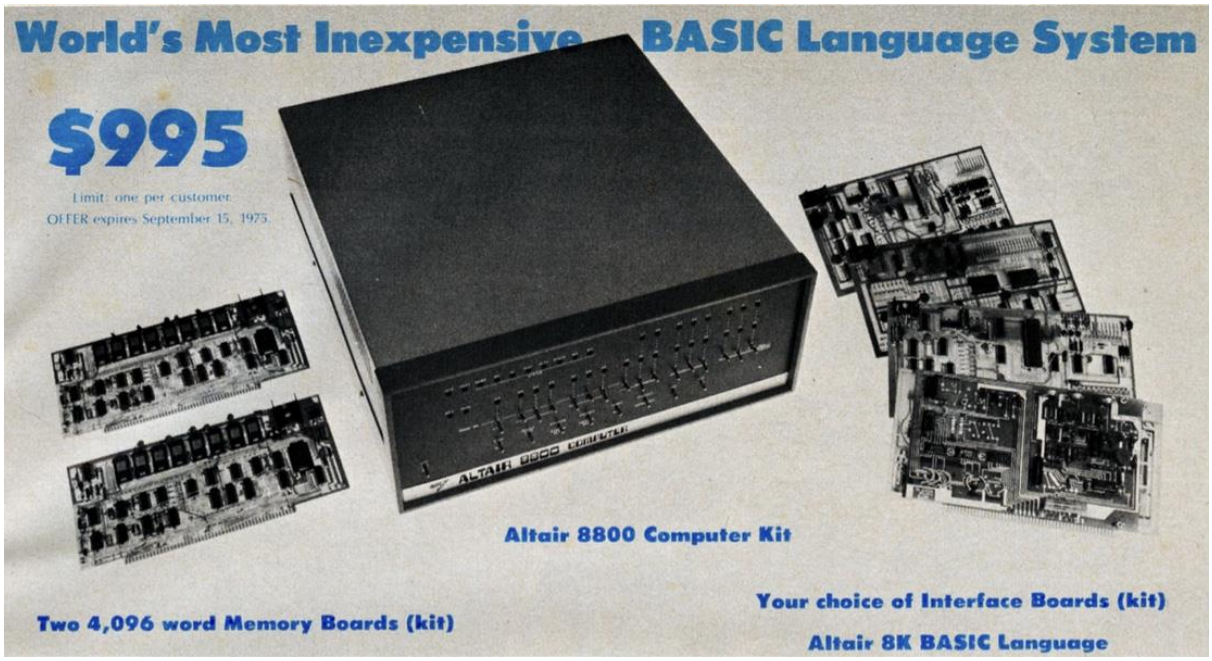


INTEL 8088 Microprocessor

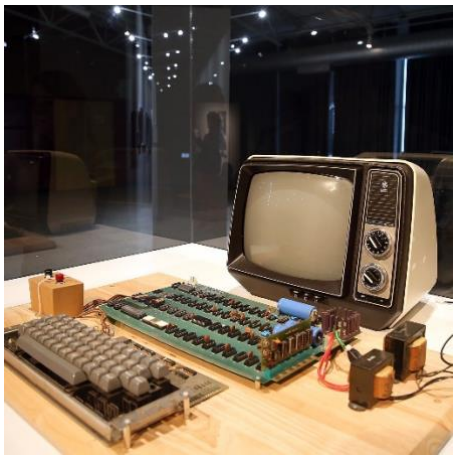
The world's first microprocessor, the Intel 404 appeared in 1971. Developed for the Japanese calculator market it had 2250 transistors and could perform 90,000 operations per second. The first advertised 'personal computer', the MITS Altair 8800 followed in 1975. It used



BASIC as it main language and had the capacity to accept expansion boards allowing the addition of peripheral components like a screen, keyboard and even a digital camera.



Then followed the Apple 11 (1977) based upon the MOS 6502 microprocessor. Sold complete with a main logic board, switching power supply, keyboard case, manual, games paddles and a cassette tape containing the game 'Breakout', it was also connectable to the TV. It sold millions.



Apple 1 1976

Apple 11 1977

This, in turn, was overtaken by the Intel 8080 in 1976; the Commodore 1530 (1977); the Tandy TRS 80 – the first Desk-top computer (1977); the Commodore PET and the Motorolla 6800 (1979) – all offering additional functionality, speed and memory.

The process of miniaturisation also transformed Main Frame Computers. In 1976 Cray Research Inc. introduced the first 'Supercomputer', the Cray 1 which could perform 230,000,000 calculations per second!

Parallel developments took place in computer language, software and connectivity. The first computer game 'Pong' hit the market in 1972. Software for Digital Drawing (Superpaint) and Animation appeared in 1972 and 1973 respectively and 'Wordstar,' a popular word processing system, was marketed in 1978. All were swiftly followed by improved versions such was the speed of development. The Atari 400 Games Consul of 1979, for example, ushered in a golden age of Video games. A similar revolution took place in the development of ARPAnet (1971) – the beginnings of E-mail.

All these developments were supported by the invention of:

1969	Led Display Calculators	1972	Floppy Discs
1970	First Dot Matrix Printer	1975	Video Display Unit
	Computer Mouse	1976	Video Cassette Player
	Sealed lead battery	1978	Laser Disk

There were also significant developments in computer controlled Robotics which opened the door to a new world of industrial production.

1974 The Silver Arm – robot for small parts assembly

1976 Soft Gripper Robot (Shigeo Hirose)

The world of communication was likewise revolutionised by the creation in 1970 of a glass fibre so clear that it could be used to communicate pulses of light, sound and image data. Fibre Optics lit up another constellation of potential development.

For scientists these were truly exciting times. From small beginnings possibilities mushroomed. The public, however, were largely unaware of the brewing revolution. Most had great difficulty in comprehending the science. It took films like Star Wars and other futuristic epics to illuminate the potential of developments and even then few could believe what was possible. It was not until the 1980's that the public were truly seduced and the floodgates opened on a new chapter in personal endeavour.

Fortunately, computers were not the only recipients of the evolving technologies. Much overflowed into products that were to change the lives of ordinary folk at home. Home entertainment systems were at the forefront and developed rapidly. Colour television became widely available at the beginning of the decade along with Music Centres combining radio, records and cassette tapes offering stereo and even quadrophonic sound. Eight-track tape recorders capable of recording from other devices also became available – a fore-runner to the Video Cassette Recorder which appeared in the mid-70's. Both stimulated markets for pre-recorded cassettes making music and films available on demand. This gave a unknown flexibility to home entertainment allowing freedom to record, listen and watch programmes at will. As with transistor radios in the 60's new levels of portability were achieved with the Sony 'Walkman' – a pocket sized radio and cassette player which became a must-have item in the early 80's.

In the kitchen the 70's saw a widespread introduction of Freezers. By 1974 1 in 10 households had purchased one. With the capacity to store food almost indefinitely they greatly enhanced convenience and revolutionised shopping. By the end of the decade dedicated Freezer Shops were appearing offering bulk-buying opportunities for meat and vegetables as well as the first tentative steps into ready cooked products like pies and fish-fingers – the forerunners to frozen meals. Micro-wave Ovens also finally reached the domestic market with a microprocessor controlled panel in 1975. Low-cost countertop models from many manufacturers gathered in popularity late in the decade. Washing Machines also benefitted from electronic control. As a result the Twin Tub machines of the 50 and 60's were edged aside by front-loading automatic machines in the 70's. The Food Processor also made an appearance with the Robot-Coupe's 'Magimix' in 1974 and the Kenwood 'Processor De-luxe' in 1979.

In 1970 the word 'Digital' entered popular language with the arrival of the Pocket Calculator. This rattled the foundations of traditional Maths teaching in schools and joined the list of must-have gadgets. It was the first main-stream item to utilise LED display. It was quickly followed by the world's first commercial digital wristwatch in 1972. This retailed for the pricey sum of $2100 (£840) which equates to about $12000 (£9500) today, but under the weight of demand and the miracles of mass production was selling for under $10 (£4.71) by 1979 and could be found as giveaways in cereal packets in the mid 1980's!

Digitalisation also overtook the telephone. The 'Trim' phone was offered as an alternative to the 'dial' phone in 1976. More significantly, the appliance of science also gave birth to the mobile phone. The first prototype was demonstrated by Martin Cooper of Motorola in 1973.

It was a brick-shaped object weighing 2 kilograms. It was not until 1979, however, that the first commercial automated cellular network was launched by Nippon Telegraph and Telephone in Japan, and later still in 1983 that the first hand-held mobile phone, the DynaTAC 8000X, became available.

The Medical world was also quick to grasp the opportunities of the new technologies. The

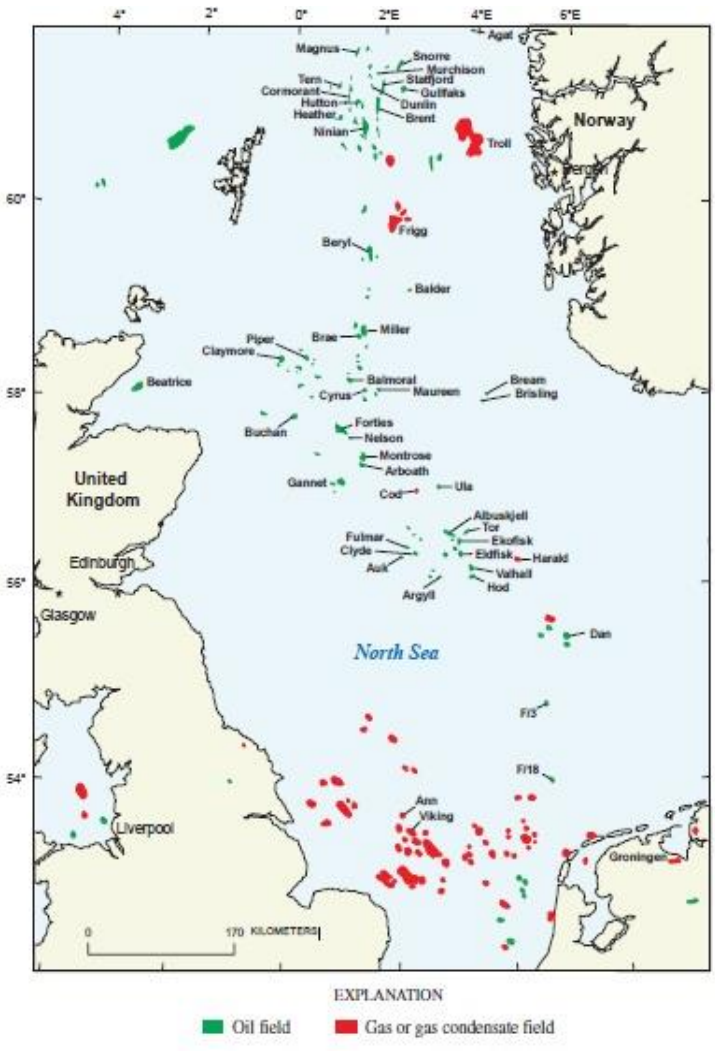
70's saw the introduction of the CT Scanner, the MRI Scanner, Laser Eye Surgery and the Insulin Pump along with developments in immunotherapy, especially MMR Vaccine, Skin Cell Therapy, Liposuction and the beginnings of Genetic Engineering.

Meanwhile space science continued to expand. Whilst the Space Race had all but ended and the Apollo missions were coming to an end, exploration continued, though somewhat less frenetically. Developments were on 3 major fronts.

1. Space Stations. In 1971 the Soviet Union launched the world's first Space Station – Salyut 1. This was of monolithic design and was launched in one piece with life limited to on-board supplies. It was followed by a series – Salyut 2, 3 and 5 (Almaz Stations) all designed for military reconnaissance. They were all largely unsuccessful. Skylab, launched by the Americans in 1973 was equipped with docking ports which allowed re-provisioning and thus stayed in use until 1979 successfully supporting solar studies and biomedical experiments in the effects of weightlessness. Salyut 4 and 6 launched in 1977 with docking facilities for a Soyuz spacecraft, were more specifically civilian scientific missions. Salyut 6 even hosted a series of international visitors.
2. The Voyager Programme. An ambitious probe into the outer solar system was launched in 1977. With a mission length of over 43 years it flew by Jupiter in 1979 and Saturn in 1980 before progressing on an inter-stellar mission into outer space.
3. The Global Positioning System. (GPS) is a satellite based radio-navigation system developed by the U.S. Government. It provided critical positioning capabilities to military and civilian users around the world. The first satellite was launched in 1978 and had since been joined by a further 75 satellites.

The rapid advance of new science and technology into almost every area of human endeavour began to feel unsettling as its potential became ever more evident. Humanity, it seemed, had reached the point where extinction was possible at the press of a button, and where machines, which few people understood, could vastly outperform the human brain. Even the term 'artificial intelligence' was openly discussed. Where was it all going? Where did mankind stand between science and nature? Fears for the future were balanced against the certainties of the past and something of a 'back to nature' counterculture began to develop swayed, in part, by the ethic of the Hippy Movement. In Britain there was a trend towards 'grow your own food' and self-sufficiency and a sharpening concern for the environment and the natural world. The divorce of an ever burgeoning urban population from its source of food was becoming ever more evident. More significantly, however, was the increasing global awareness that natural resources were finite and that the frenetic pace of industrialisation and urbanisation together with the quickening emergence of the world's underdeveloped countries were stimulating a systematic rape of scarce fuels and ores and an accelerating degradation of the natural environment. The need for conservation and the more efficient use of resources rose sharply up the political agenda as fears for the future grew.

The scare of scarcity hit home in 1973. The Oil producing states (OPEC) decided to control supplies and raise the world's oil prices. Reacting to the Yom Kappur War and political instability in the Middle East they also decided to place an embargo on oil supplies to countries supporting Israel. The result was a 4-fold increase in oil prices and a world-wide economic crisis. It was followed by a yet another crisis in 1979 causing a further tripling of price! High prices incentivised the production of oil from newly discovered fields in the North Sea. (The Montrose Field (1969); the Forties Field (1970); the Brent Field (1971); the Frigg Oil Field (1971); and the Piper Oil Field (1973)). In response to the crisis rapid efforts were made extract and land supplies and the flow began from the Forties Field in 1975. Thus began a new era which proved to be a saviour to the British economy. Further discoveries were made in the ensuing years with oil output

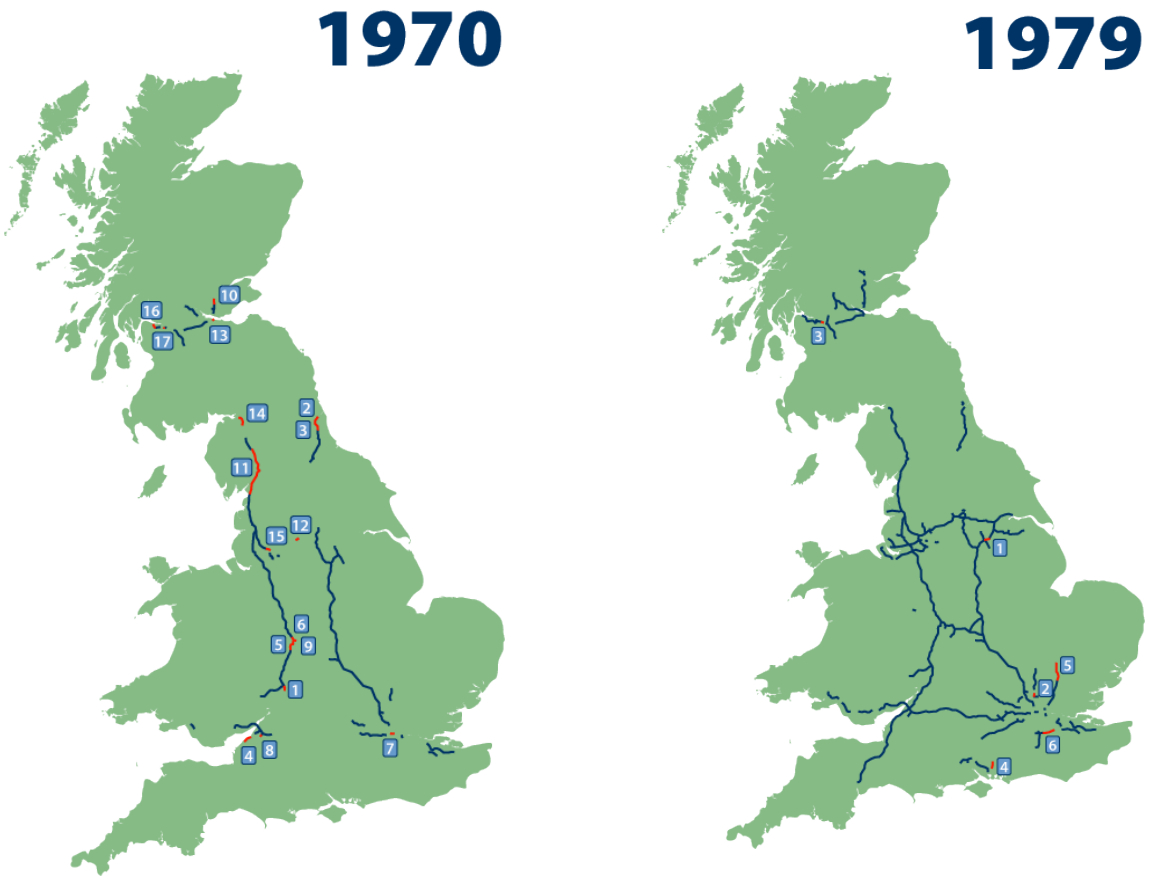


reaching ½ million barrels per day – 25% of the country's needs.

Preceding the oil discoveries, reserves of Natural Gas in the Southern North Sea were also discovered as far back as 1965. First supplies reached the shore in 1967. This marked the start of a 10-year government programme to convert every gas appliance in the UK to use natural gas instead of 'coal gas' and the closure of Gas Works in every town and city.

The surge in energy costs sent a tsunami through the economy. Price inflation took off bringing many changes in its wake. Among the many there developed a purge on energy efficiency with initiatives to insulate homes and minimise fuel usage. It was the final nail in the coffin for open coal fires. Gas and electric heating became the norm with a growing take-up of central heating widely included in the design of new-build houses. Architectural fashion changed in the latter part of the 60's and the 70's. The availability of toughened, shatter-proof glass and the design preference for light open spaces saw the development of glass-faced office and tower blocks and the inclusion of much larger windows in houses. Seen as one of the major areas of heat-loss in the home it was not long before 'double glazing' appeared on the scene, not the vacuum units of modern times, but initially aluminium-framed sliding windows fitted against the inside of the window. They were sold against advertisements proclaiming X% savings on heating costs. With glass-fibre loft insulation and the uptake of cavity wall insulation there is no doubt that efficiencies were achieved. However, economic circumstances did not favour the building industry, House building collapsed in the 70's from 300,000 per year in 1970 to 150,000 in 1980. At the same time house prices soared from an average of £4975 in 1970 to £19273 in 1980. Against average wages of £1664 in 1970 to £6000 in 1980, however, houses were still very cheap by today's standards.

Fuel efficiency was also the objective of the motor industry though, over the years, little progress had been made in raising the mileage per gallon. The 1930 Austin 7 achieved 48 mpg; the 1970 Mini was attaining about 51 mpg on the open road! Nevertheless, the industry turned away from heavy and large vehicles towards lightweight, fuel efficient and environmentally conscious vehicles. The Lotus Esprit was an example of a 1970's super-car providing high performance with a small engine. The real problem in 1973 -74 was petrol supply. Filling stations ran dry and where petrol was available long queues developed and customers were often limited to 2 gallons each. The situation was not helped rising demand. The number of cars on Britain's roads grew rapidly from 13.5 million in 1970 to 19.5 million in 1980. It far outpaced the ability to provide an adequate road network. The result, apart from congestion, was an increasing number of road accidents. The death rate was high. 7500 people were killed on the roads in 1970. (1,713 in 2013). Not surprisingly attention turned to safety. Seat Belts were made mandatory during the 70's, MOT Tests were tightened, vehicles were made safer with 'Crumple Zones' to cushion the impact of collisions on occupants, and speed limits were introduced to limit speed to 70 mph on motorways. The economic climate of the times did not support much investment in road super-structure but some advance was achieved in the expansion of the motorway network.



Perhaps the most notable change in the 70's was in freight transport. With world trade expanding quickly containerisation became accepted as a more efficient and convenient way of moving goods. After international agreement on container size was reached in 1968 Container ports were quickly developed, most notably at Felixstowe and Southampton. Standardised handling equipment was installed to speed the turn-round times of specialised Container Ships. The first 'TEU' container ship, the Japanese 'de:Hakone Masu', capable of carrying 752 containers, it came into service in 1968. During the 70's container trade expanded rapidly.

There was similar change in overland freight services. Road transport now vastly out-performed rail and the pressure for larger and larger lorries grew. In the early 60's the maximum permitted weight of cargo per vehicle was 24 tons, the maximum length 33 feet, and the maximum speed 40 mph. Drawbar trailers were permitted raising the weight limits to 32 tons over 60 feet, but the speed restriction was only 30 mph. By the 70's the parameters were lifted largely to match the size and weight of containers to 32 tons on 4 axle articulated vehicles with a length of up to 49 feet. Speed was also adjusted to the improving road network to 60 mph on motorways and 40 mph on other main roads.

The need for international standardization in an ever more global environment also became an agent for change. Countries sought to reduce barriers to commerce by aligning bureaucratic processes. One such barrier was Britain's idiosyncratic monetary system and preparations began in the 60's to move to a decimal system to fall in line with the majority of

western countries. Decimal Day was declared on 15th February 1971 when the system on pounds, shillings and pence was consigned to history. To help the public come to terms with the change conversion charts appeared everywhere. Shop tills, and meters for petrol, parking etc. all had to be adapted to the new system in preparation for the day. It was a major event!

NEW HALFPENNY CONVERSION TABLE (SHOPPERS' TABLE)

Old £sd	New £p	Old £sd	New £p	Old £sd	New £p	Old £sd	New £p	Old £sd	New £p	Old £sd	New £p	Old £sd	New £p	Old £sd	New £p	Old £sd	New £p
		2/–	10	4/–	20	6/–	30	8/–	40	10/–	50	12/–	60	14/–	70	16/–	80	18/–	90
1	½	2/1	10½	4/1	20½	6/1	30½	8/1	40½	10/1	50½	12/1	60½	14/1	70½	16/1	80½	18/1	90½
2	1	2/2	11	4/2	21	6/2	31	8/2	41	10/2	51	12/2	61	14/2	71	16/2	81	18/2	91
3	1	2/3	11	4/3	21	6/3	31	8/3	41	10/3	51	12/3	61	14/3	71	16/3	81	18/3	91
4	1½	2/4	11½	4/4	21½	6/4	31½	8/4	41½	10/4	51½	12/4	61½	14/4	71½	16/4	81½	18/4	91½
5	2	2/5	12	4/5	22	6/5	32	8/5	42	10/5	52	12/5	62	14/5	72	16/5	82	18/5	92
6	2½	2/6	12½	4/6	22½	6/6	32½	8/6	42½	10/6	52½	12/6	62½	14/6	72½	16/6	82½	18/6	92½
7	3	2/7	13	4/7	23	6/7	33	8/7	43	10/7	53	12/7	63	14/7	73	16/7	83	18/7	93
8	3½	2/8	13½	4/8	23½	6/8	33½	8/8	43½	10/8	53½	12/8	63½	14/8	73½	16/8	83½	18/8	93½
9	4	2/9	14	4/9	24	6/9	34	8/9	44	10/9	54	12/9	64	14/9	74	16/9	84	18/9	94
10	4	2/10	14	4/10	24	6/10	34	8/10	44	10/10	54	12/10	64	14/10	74	16/10	84	18/10	94
11	4½	2/11	14½	4/11	24½	6/11	34½	8/11	44½	10/11	54½	12/11	64½	14/11	74½	16/11	84½	18/11	94½
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1/2	6	3/2	16	5/2	26	7/2	36	9/2	46	11/2	56	13/2	66	15/2	76	17/2	86	19/2	96
1/3	6	3/3	16	5/3	26	7/3	36	9/3	46	11/3	56	13/3	66	15/3	76	17/3	86	19/3	96
1/4	6½	3/4	16½	5/4	26½	7/4	36½	9/4	46½	11/4	56½	13/4	66½	15/4	76½	17/4	86½	19/4	96½
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1/6	7½	3/6	17½	5/6	27½	7/6	37½	9/6	47½	11/6	57½	13/6	67½	15/6	77½	17/6	87½	19/6	97½
1/7	8	3/7	18	5/7	28	7/7	38	9/7	48	11/7	58	13/7	68	15/7	78	17/7	88	19/7	98
1/8	8½	3/8	18½	5/8	28½	7/8	38½	9/8	48½	11/8	58½	13/8	68½	15/8	78½	17/8	88½	19/8	98½
1/9	9	3/9	19	5/9	29	7/9	39	9/9	49	11/9	59	13/9	69	15/9	79	17/9	89	19/9	99
1/10	9	3/10	19	5/10	29	7/10	39	9/10	49	11/10	59	13/10	69	15/10	79	17/10	89	19/10	99
1/11	9½	3/11	19½	5/11	29½	7/11	39½	9/11	49½	11/11	59½	13/11	69½	15/11	79½	17/11	89½	19/11	99½

Increasing globalisation changed perspectives. It widened trade and increased interdependence. It also caused a re-evaluation of Britain's place in the world and honed the balance of power between competing cultures. By the 1970's Britain was in a parlous state. The economy was teetering on the edge and prospects for improvement were far from clear. The ability of the country to stand alone in a viciously competitive global market was blatantly questionable and, in the absence of a Commonwealth, it began to seek mutually beneficial trade partners. Joining the newly formed European Economic Community offered some solution and, as early as 1963, application was made for admittance. Rebuffed by the French President, Charles De Gaulle, approaches were made again in 1967 but it was not until 1970 that prospects for acceptance became positive when Prime Minister Edward Heath managed to persuade the new French President, Georges Pompido, to lift the veto. Britain joined the Community on the 1st January, 1973 along with Denmark and the Republic of Ireland. It was not until 1975, however, after some re-negotiation of terms, that the decision was ratified by

the British Electorate in a Referendum. As with most changes in the 70's, however, there was no glorious and dramatic salvation to the country's economic woes. There was some fluctuation of prices, which was commonplace at the time, and news of developing 'butter mountains' and 'wine lakes' and other disturbances to farmers as the Common Agriculture Policy bedded down, but otherwise there were few discernible differences to the man in the street.

Throughout the 70's change was tempered by economic restraint. Evolution was slower. In retrospect, however, small, hardly noticeable Incremental steps added up to considerable advance in some areas. Most significant was the permeation of solid state electronics across a wide spectrum of products. Vehicles and household appliances in particular benefitted from much advanced functionality and reliability. There was, for example, unprecedented improvements in the quality and reliability of cars brought about by the integration of computer and robot on assembly lines. Pioneered in Japan by Honda and Toyota in the manufacture of the 'Civic and Corolla' models, they made major inroads into the western market outperforming and edging aside British manufacturers in particular. Across the board, however, there were other noticeable differences to motor vehicles. On the dashboard electronic sensors were installed to monitor performance; electric and demisting windows appeared; windscreen wipers gained speed control; electric cigarette lighters appeared along with cassette players and vastly improved radios. At home similar enhancements were noticeable in washing machines and cookers with digital timers and rudimentary programmes. New products like portable hair dryers and Hostess Trolleys became fashionable but there was a host of others that changed people's lives.

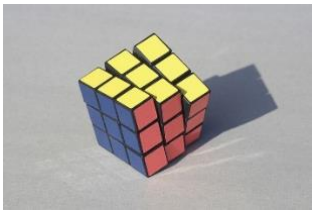
NEW ON THE MARKET

1970s

Credit Card

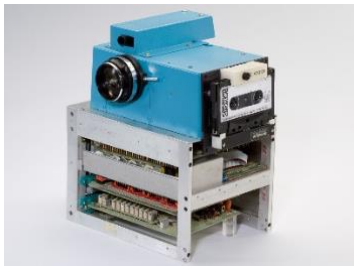
Canon F1 Camera

Blender



Hostess Trolley

Automatic Washer / Dryer



Digital Camera

Video Cassette Recorder

Laser Disc Player

Oven

Sony Walkman

Post-it-note

These, with a host of other innovations from aeroplane parts to chocolate bars, contributed towards convenience and an improvement in the quality of life. They changed routines and opened up opportunities. Why then was life so ‘turbulent’ in the 70’s? What shadow was cast over such positive developments? Let’s find out !