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BT exact TECHNOLOGIES

Technology timeline

Contents

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Technology timeline

The future looks ever more exciting each year. Technology development is still accelerating and an increasing number of new fields are being created and exploding new ideas onto the market.

The future is a hard to predict but here at BTexact we have always believed that inventing the future is the best way to create it. One thing is certain in the distant future - the world will be a very different place. One tool we produce to help alleviate uncertainty about the future is our BTexact technology timeline. Paul McIlroy produced the first timeline in 1991 and it has been updated about once every two or three years. This is the 5th edition, and the biggest yet. A new editor Ian Neild has joined me on this edition and brought a welcome freshness to the timeline.

The timeline is produced mainly to give BT researchers and managers a view of what the operating environment is likely to contain at any future date, so that our products and services can be better targeted to the needs of the customer. But we have also found that many people outside the company find it useful too, so we always try to make it as free of technical jargon as possible. What must be remembered by anyone preparing for the future is that technology change isn't very important in itself. What matters is what this change enables or destroys.

Timeline targets include our business customers, government, media and many private individuals. Extracts of previous versions have appeared in numerous books.

Several sources of information are used for the timeline. The largest single source is the previous edition, where most of the entries are still in the future and still valid. We have only had to change a few of the dates, which we hope is an indication that we were guessing well. Many items from our last edition have happened on cue, and have therefore been removed, but many more new developments have come into view that weren't so obvious last time round. We obtain these new entries from industry journals and bulletins, scouring the Internet, chatting to experts, and some just by relaxing and thinking about the future. The arguments that the timeline has produced in the past have often proved to be useful to us and we hope that this will have the same affect on you.

Experience has shown us that telecomms and computing industry companies see the future in quite different terms, so this time we are grateful to Jeff Harrow, formerly of Compaq, whose newsletters have provide us with a view from the computing industry and a number of the new entries.

We have also modified and extended the 'wildcard' section, based on John Petersen's excellent work in his book 'Out of the Blue'. Although wildcards are defined as events that can happen at almost any time, for most there is a date before which they couldn't happen, since their mechanisms do not yet exist. We have estimated the dates at which each wildcard becomes feasible. We have also changed the focus of this to illustrate the acceleration of the downside of the technology development. Each new technology brings many benefits but also has a price. It is clear from this section that we are rapidly inventing new ways of destroying ourselves, and that the risk to mankind is increasing exponentially. Of course, the far future is much harder to imagine than the near future, so the number of dangerous technologies listed actually drops off in our list after a couple of decades, but we could reasonably assume that by the time we get there, we will be able to see many more potential dangers. Such a trend is cause for concern. Even though the problems are mostly soluble by even more advanced technologies, there will generally be a time lag between a problem arising and a solution being implemented, so the overall risk still increases with time.

However, the intention of the timeline as always is to illustrate the potential lying ahead for beneficial technologies. Not all will be successful in the marketplace. Some won't ever be implemented at all, but as the rest come on stream, our lives will improve in many ways. We will have more variety of entertainment, better health, greater wealth, and probably better social wellbeing. We will have more time saving devices and ultrasmart computers will do most of our admin, but the future world will offer so much more opportunity to be productively and socially busy that we will have even less free time than today! If we think of this as living life to the full rather than in terms of stress, then the future looks good.

We hope you enjoy reading our timeline as much as we enjoyed producing it.

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Artificial Inteligence & Artificial Life

AI doctors	2001
Virus aimed at toys released	2002
Chat show hosted by robot	2003
Computer agent personal shoppers	2003
First synthetic (but organic) life form	2003
Domestic appliances with remote (networked) intelligence	2003
Smart Barbie insists on allowance for clothes and accessories	2003
Real time language translation	2004
Toys with network based intelligence	2004
Confessions to AI priest	2004
AI teachers in school	2004
Action man toys engage in war games over networks	2004
Security Barbie used for locating lost offspring	2004
Shopping Barbie acts as personal shopper for children	2004
Machine use of common sense inference	2005
Behaviour alarms based on human mistake mechanisms	2005
Computers that write most of their own software	2005
Intelligent robotic pets	2005
AI chatbots indistinguishable from people by 95 % of population	2005
First artificial electronic life	2006
First organism brought back from extinction	2006
Software trained rather than written?	2006
Domestic appliances with personality and talking head interface	2007
Systems to understand text and drawings (e.g. patent information)	2007
People have some virtual friends but don't know which ones	2007
AI students	2007
AI models used extensively in business management	2010
Artificial Nervous System for autonomous robots	2010
Highest earning celebrity is synthetic	2010
Smart Barbie with personality chip and full sensory input	2010
AI houses which react to occupants	2010
25 % of TV celebrities synthetic	2010
Expert systems surpass human learning and logic abilities	2011
Most software written by machine	2011
Home manager computer	2011
Machine use of human-like memorising, recognising, learning	2012
Computer agents start being thought of as colleagues instead of tools	2013
Satellite location devices implanted into pets	2015
Office Automation systems using functions similar to brain functions	2015
Machine use of human-like creativity	2015
Leisure activities for intelligent software entities released	2015
Human knowledge exceeded by machine knowledge	2017
Electronic pets outnumber organic pets	2020
Electronic life form given basic rights	2020
Artificial insects and small animals with artificial brains	2020
Remote control devices built into pets	2020
Ubiquitous embedded intelligence	2020
Virus wipes out half of the electronic pet population	2021
Learning superseded by transparent interface to smart computer	2025
Robots physically and mentally superior to humans	2030
Living genetically engineered Furby (TM, Tiger Electronics)	2040

Biotechnology, health & medical

Electronic implants used to stimulate muscles in disabled people	2001
Complete genome sequence of 5 individuals	2003
Kitchen food tester that identifies presence of food poisoning bacteria	2003
Smart pills with chip dispensing drugs	2003
Instant electronic diagnosis of illnesses	2004
Retinal implants linked to external video cameras	2004
Telepresence extensively used in rural clinics	2004
Brief human suspended animation	2005
Determination of whole human DNA base sequence	2005
Electronic patient records become valuable data mines	2005
Electronic prescriptions reduce fraud and improve speed	2005
Synthetic retinal implants for simple vision	2005
Designer babies	2005
All patients tagged in hospitals	2005
Expert systems used extensively in GP surgeries	2008
Hospitals use virtual queuing systems	2008
Neural networks used for patient appointment management	2008
Artificial heart (lab-cultured or entirely synthetic)	2010
Devices roaming within blood vessels under own power	2010
Multimedia patient records	2010
Genetic screening widely used	2010
Lifestyle monitoring and insurance linked to medical records	2010
Operations videoed and stored as part of medical record	2010
Use of human's own tissues to grow replacement organs	2010
Widespread genetic intervention programmes for animals and plants	2010
Direct electronic pleasure production	2010
Online surgeries dominate first line medical care	2010
Orgasm by email	2010
Quiz shows screen for implant technologies	2010
Artificial senses, sensors directly stimulating nerves	2012
Some implants seen as status symbols	2012
Fine particle beam gene engineering	2013
Shower body scan	2015
Artificial kidneys	2015
Artificial lungs	2015
Custom (GM) foods for particular medical conditions	2015
Gene-gel stimulation of regrowth of natural teeth on demand	2015
Genetic links of all 90% of diseases identified	2015
Individual's genome part of their medical record	2015
Artificial brain cells	2017
Artificial liver	2020
Electronic memory enhancement	2020
Many new forms of plants and animals from genetic engineering	2020
Only 15% of deaths worldwide due to infectious diseases	2020
Nanobots in toothpaste attack plaque	2020
Fully functioning artificial eyes	2024
Artificial brain implants	2025
Artificial peripheral nerves	2025
Genetic, chemical and physiological bases of human behaviour understood	2025
Artificial legs	2025
Intelligence enhancement by external means	2030
First Bionic Olympics	2030
Brain 'add-ons'	2033
Artificial brain	2035

Business & education

Pull advertising dominates over push	2003
Half of government services delivered electronically	2005
Paperless working (at least internally) the norm in most UK business	2005
Products widely customised	2005
85% of American management personnel are knowledge workers	2005
80% of US homes have PCs	2005
3rd world teleworkers with clockwork PCs and LEO satellite communications	2005
Virtual reality used to teach science, geography, art and history	2005
Widespread use of virtual reality for education and recreation	2005
B2B market worth $8.5 Tn	2005
Nomadic information companies paying no corporation tax	2006
Activators make any household object	2006
Lifestyle brands dominate	2007
Network based learning causes polarisation in classes - streaming is essential	2007
Global classes used for multicultural immersion	2007
All government services delivered electronically	2008
Universal monitoring of business transactions	2008
Email used to communicate with most social service claimants	2008
Inter-business financial transactions all electronic	2010
Virtual companies and virtual co-operatives dominate	2010
Superstar teachers use telepresence to lecture to dispersed classes	2010
Personalised degrees quantised to individual lectures	2010
95% of people in advanced nation computer literate	2010
Telematics market hits $50Bn	2010
AI Entity passes GCSE	2010
AI Entity passes A Level	2011
Purely electronic companies exist - minimal human involvement	2012
AI Entity gains Degree	2013
AI companies illegally cloned	2013
Academic learning is argued to be unnecessary in the age of smart machines	2013
AI Entity gains Masters Degree	2014
Spread of nomadic information companies leads to global taxation	2015
Integrated taxation in all transactions	2015
More people using telework centres than home working	2015
Telework centres double as community resources	2015
Police force privatised in many nations	2015
AI Entity gains PhD	2016
AI teachers get better results than most human teachers	2017
AI Entity awarded Nobel Prize	2018
Less than 10% of UK workforce in manufacturing	2020
AI Entity sets up higher level prize	2020
Learning superseded by transparent interface to smart computers	2025

Demographics

Asia-Pacific overtakes US in internet users	2005
Worldwide deaths due to HIV/AIDS peak at 1.7 million	2006
Less than 20% of UK workforce in manufacturing	2010
25% of UK workforce teleworking at least 2 days a week	2010
World population reaches 7 billion	2011
India population hits 1.2 billion	2015
population growth slows to 1% (1.3% today)	2015
400M people live in megacities of over 10M inhabitants	2015
China GDP overtakes EU GDP	2015
Retirement age raised to 70	2020
60% of the world's population living in cities	2025
70 million over 65s in USA (20%) with 9 million over 85s	2030
3Bn people water stressed (<1700 cu m per capita per year)	2030
3.5 Bn people water stressed (400M in 2001)	2040
1.42 billion over 65s in the world	2050
World population reaches 10 billion	2065

Displays

1.5m flat screens for £2000	2002
Personal display tablets for TV, magazines etc.	2002
Holographic animated or video advertisements (few second video clips)	2003
Roaming displays (accepting input from many different mobile sources)	2003
Net access using touch sensitive displays in kitchen white goods	2003
Cybersphere 'holodeck', using giant 'hamster ball' on air bearings	2003
Displays with image quality comparable to paper	2004
Polymer screen advertising billboards	2005
Video walls - single screens 2m across	2005
Personalised adverts on TV and Radio	2005
Voice control of many household gadgets	2005
Separate volume controls for different people in room	2010
3D TV without need for special glasses	2012
Holographic displays for continuous video	2015
3D video conferencing	2015
Holodecks using box room lined completely with polymer screens	2018
Use of free space holograms to convey 3D images	2020
Holographic TV	2025

Energy

Large area amorphous solar cells with efficiency > 20%	2001
Home fuel cell based 7kW generator	2001
LiMnO2 batteries with 200Ah/kg storage	2002
Solar chimney power station (1.5km tall)	2004
Clothes collect and store solar power	2005
Most portables powered by fuel cells	2005
Multi layer solar cells with efficiency over 50%	2008
Button sized gas turbine generators for portable device power	2010
Solar reflector satellites bringing sunlight to major Northern cities	2010
Nuclear power plants supply 16% of energy in Russia and Eastern Europe	2010
Worldwide energy consumption 50% greater than 1993	2010
Commercial magma power stations	2012
Catalytic water decomposition by sunlight	2015
Seabed gas hydrate crystals used as fuel source	2015
Worldwide oil consumption is 100M barrels of oil per day	2015
Systems based on biochemical storage of solar energy	2020
Space solar power stations	2030
Wave energy providing up to 50% of UK requirements	2040
Use of nuclear fusion as power source	2040

Environment & countryside

Satellite policing of farming subsidies	2003
Totally managed world logistics systems	2005
Complete list of 1.5 million known species available on web	2005
Growth of scientific environmentalism	2005
Rural databases for animals and crops	2005
Effective management of the organic environment	2005
New engineered organisms used to produce chemicals	2005
Virtual farming co-operatives	2007
Extensive remote sensing use in environmental management	2010
Effective prediction of most natural disasters	2010
Out-sourced vegetable plots	2010
All domestic animals tagged	2010
Landfills in London and surrounding region full	2012
Insect-like robots used for crop pollination	2012
Deep underground cities in Japan	2020
30% of world's arable land will be salty	2020
Widespread use of sensors in the countryside	2020
70% of landfills in USA full	2025
Carbon dioxide fixation technologies for environment protection	2030
Artificial precipitation induction & control	2035
Global environmental management corporations	2040
Another 10% of the world's forests lost	2050
50% of world's arable land will be salty	2050
Ozone hole disappears	2050
Between 15 and 95cm rise in sea level	2100

Home & office

Positioning sound at any point in space	2001
Doorstep videophone allowing remote interaction with callers	2001
Electronic notebook with contrast as good as paper	2002
Electronic paintings	2003
Chips on food packaging tell when food is at its best	2003
Devices registered in homes and won't work if stolen	2003
Hydraulic chair for VR games	2003
Garden audio systems	2004
Smart paint available (contains chips)	2004
3d fax	2005
Video photo frames	2005
Fibre optic plants in gardens	2005
Video tiles	2005
Emotional objects, switches etc around home	2007
Digital bathroom mirror	2008
Magazine tablets	2008
Electronic newspapers	2008
Personalised response from household gadgets	2008
Mood sensitive light bulbs	2010
Anti-noise technology built into homes	2010
Homes made in prefabricated modules	2010
Electronic wallpaper	2010
Chips in packaging control cooking	2010
Neighbourhood video surveillance networks	2010
Washing machine aware of contents and selects cycle	2010
Domestic positioning systems	2012
Kitchen rage caused by electronic gadgets	2013
Electronic response based on conversational inference	2013
Windows with holographic coatings to re-direct sunlight	2015
Virtual windows	2015
Nanotechnology toys	2015
Robotic plant care with health monitoring chips on plants	2015
Traditional pubs using technology to enhance illusion of tradition	2015
Kaleidoscopic windows using OLEDs	2015
Air quality monitoring in homes	2018
Kaleidoscopic flowers using electronic inks	2020
Patio display panels and slabs to simulate beach	2020
Insect sized robots banned in gardens due to effects on wildlife	2020
Anti noise technology in gardens	2020
3D home printers	2020
Nanotechnology plants	2025

Life & leisure in a cyberspace world

Hybrid rollercoasters using real and virtual effects	2001
Automatic music composition in any style	2002
Software Lego (Individual bricks contain software objects)	2002
Use of talking head technology for conferencing	2002
Avatar cosmetic surgery	2003
Cyberspace make-up	2003
Various forms of electronic addiction	2003
People have cyberspace wardrobe	2004
Frequent use of multiple Net identities causes personality disorders	2005
Cheap miniature cameras cause social backlash	2005
Plane zorbing, jumping out of planes in inflatables	2005
Toy soldiers with video camera eyes enrich play	2005
Theatres gain extra revenue by allowing internet attendance	2005
Living area use of virtual reality scenes	2005
Conferencing technology for remote socialising in public places	2005
1Bn internet users	2005
People reduce tax liability by being partially paid in information products	2007
On line voting in UK	2007
Net chat sites insist on proof of identity	2008
Replacement of people leads to anti-technology subculture	2008
Automated real life highlight channels on digital TV	2008
VR overlays on real world	2008
Video surveillance of neighbours becomes social problem	2010
Government introduce legislation to protect local community IP	2010
Loneliness in aged population greatly reduced by network communities	2010
National UK decisions influenced by electronic referenda	2010
Worldwide population of over 65s increases by 1 million monthly	2010
Cybercommunity with 100 million people	2010
Make-up by numbers	2010
Social software, organising functions etc	2010
Holodeck' meeting room	2010
1st Xtreme Olympics	2012
Shadow democracy used in community networks	2012
Orgasmatron	2012
VR escapism is a major social problem	2015
Dual geo/cyber-nationality recognised internationally	2015
Use of virtual environments for proxy space exploration	2015
Most towns echoed in cyberspace	2016
Major pensions crisis	2019
Digital bore filter technology	2020
Emotion transmission and conversion (feel love or anger)	2020
Digital image overlays enhance relationships	2020
Global voting on some issues	2024
Network based telepathy	2025
Creation of The Matrix	2025
VR extensively used in retirement homes	2025
Restricted capability home genetic engineering kits	2030
Experience recording	2035
Real' toy soldiers using nanotechnology	2035

Machine input/output

Robotic kitten interface	2002
One chip, multi-speaker voice recognition	2002
Air mouse and air typing	2003
Tactile sensors comparable to human sensation	2004
Odour and flavour sensors comparable to human	2005
Full voice interaction with machine	2005
Voice synthesis quality up to human standard	2005
Talking head technology used in public terminals	2005
TV internet users overtakes computer-based users	2005
emotionally responsive toys and robots	2006
Smelly telly using chips with small reservoirs of chemicals	2010
Voice interface for home appliances	2010
Highly integrated biosensors	2017
Biosensors capable of processing information	2008
Computer link to biological sensory organs	2018
Odour and flavour sensors comparable to dog	2020
Thought recognition as everyday input means	2025
Full direct brain link	2030

Materials & electronic devices

1cm inertial accelerometers built into electronic devices	2002
Optical inter-chip connection	2002
All polymer flexible integrated circuits	2002
Spherical silicon integrated circuits	2003
Number of PCs sold, 160 Million	2003
Chips with clock speed of 10GHz	2003
Polymers with lower resistance than copper at room temperature	2005
Composite materials based on carbon nanotubes	2005
Semiconductor devices based on 0.01 micron technology	2005
Integrated logic devices with switching speed below 1 picosecond	2005
1Bn Bluetooth devices worldwide	2005
Material with refractive index variable by 0.1 in electric or magnetic field	2007
Self organising adaptive integrated circuits	2007
Chips with 1 billion transistors	2009
Use of polymer gels for muscles, bioreactors, information processing	2010
Quantum effect interferometer for flux measurement	2010
Use of carbon fullerenes for on chip interconnect	2010
Molecular sized switches	2010
Chips with 10 billion transistors	2013
Atomic customisation of materials	2015
Intelligent materials with sensors, storage and effectors	2015
Use of nanotechnology	2015
Single electron technology devices	2015
Membranes with active transport and receptors	2017
Chips with 100 billion transistors	2018
Materials exhibiting superconductivity at room temperature	2020
Smart skin for intelligent clothing and direct human repair	2020
Manufacture of long diamond fibres	2020

Processing, memory and storage

200GByte hard drives	2002
Disposable Paper Cellphone ($10)	2002
Room temperature reconfigurable molecular switch	2002
22 hours of CD quality audio on a CD (MPEG4 format)	2002
Single sheet PC or TV with processing built into display	2002
Notebooks with P4 chips	2002
Use of molecular computing	2003
Integrated circuits on 1mm silicon spheres	2003
Memory with access time of 1 ns	2003
11 terabytes credit card sized storage for $50	2003
37GByte DVD	2004
Holographic storage with 1 terabyte capacity and 1 Gbit/s retrieval rate	2004
100 TFLOPS computer	2004
200 companies with petabyte storage requirements	2004
Sony GS3 chip, 250M transistors, 2000 bit internal bus, 2.6Gpixels/sec	2004
1terabyte per cu cm storage density	2005
Solid State replacement for CD	2005
IBM Blue Gene computer with 1 petaflops power	2005
ANT based operating system	2005
Retrieval from 1TB database within 10 seconds	2006
10GHz chips	2006
Cell PDA and games machine chip, <0.1 micron, 1TeraFLOPS	2006
Optical neuro-computers	2007
Quantum computer	2007
Computers used for creativity enhancement	2010
Supercomputer as fast as human brain	2010
1 Terabit memory chip	2010
DNA storage device	2010
Optical card storage - replaces CD, VHS, audiotape, magnetic disk	2010
Quantum dot memory using 20nm dots, 50MBytes in a full stop	2010
Supercomputers with speed exceeding 1 ExaFLOPS	2010
Use of analogue co-processors in PCs	2010
MP3 Net downloads dominate over CD distribution	2010
1.8 billion transistor, 30GHz chips, 1TIPS	2010
DNA computer	2012
Desktop computer as fast as human brain	2015
100GB non volatile erasable RAM in few cm square	2015
1 Petabit memory chip	2018
AI technology imitating thinking processes of the brain	2018
Molecular memory with density of 1 TB/sq. cm	2020
Parallel computer with 1000 million processors	2020
National Library of Congress available in sugar cube sized device	2030

Robotics

First Robolympics held in Japan	2001
Electronic fish in aquariums	2001
Robotised space vehicles and facilities	2005
Fractal shape-changing robots	2005
Fire fighting robots that can find and rescue people	2006
Totally automated factories	2007
Autonomous robots with environmental awareness sensors	2008
Anthropomorphic robots used for factory jobs	2008
Robotic security & fire guards	2008
40% of paid workforce will be women (worldwide)	2010
Insect-like robots used in warfare	2010
Robotic dolls and pets account for 10 % of domestic telecomm traffic	2010
Self monitoring infrastructures using smart materials and sensors.	2010
Robots for almost any job in home or hospital	2012
Fleet of garden robots for plant and lawn care and tidying	2014
Housework robots - fetch, carry, clean & tidy, organise etc.	2015
Robots for guiding blind people	2015
Reconfigurable buildings	2015
Cybernetic use in sports	2015
Housework robots for cleaning, washing etc	2016
Self diagnostic self repairing robots	2017
Actuators resembling human muscles	2019
Robotic mail delivery	2020
Robotic exercise companion	2020
Micromechanical gnomes	2020
More robots than people in developed countries	2025
Cybernetic gladiators	2025
Micro-Mechano fractal construction kit	2028

Security, law, war

Automatic hacker detection using pattern matching	2001
Face recognition in public video surveillance systems	2001
Fire detection by odour or vibration	2002
Almost all transmissions encrypted	2003
Peoples courts on internet for minor disputes	2004
Crime and terrorism mainly computer based	2005
Use of quantum cryptography	2005
VR use in courtrooms for evidence	2005
Soldiers weapons fired remotely	2005
War fought over water supply	2005
Cracking of public key cryptography within a few seconds	2006
Data mining use in trials	2007
First net war between cyber-communities	2007
Remote override capability on planes	2007
Logic checkers highlighting contradictory evidence	2008
Household access by facial recognition	2010
Universal ID cards in UK	2010
Jargon translators	2010
Computer advice to jurors on probability issues	2010
Criminal tagging augmented with video and audio sensors	2010
Extensive use of electronics to monitor police behaviour	2010
Most weapons attack systems rather than injure people	2010
Most fighters and bombers flown remotely	2010
Gene dependent weaponry	2010
Attacks based on facilitating natural disasters	2010
Phasers issued to police, using laser/taser hybrid	2012
Automated stenographers	2014
Plastic stealth tank	2015
ID cards replaced by biometric scanning	2015
Emotion control chips used to control criminals	2030
Asteroid diversion used as weapon	2040

Shopping & money

Automatic measurement of body using laser scanning booths in shops	2002
Automated catalogue shopping using Calling Line Identification	2002
Laser body scanning units in clothes shops	2002
Cash badges	2004
Net bring and buy exchanges	2004
Local warehousing for local distribution systems	2004
Shopping lists automatically compiled by supermarkets	2005
Personal shopping tablets	2005
Global electronic currency in use	2005
Paper and coins largely replaced by electronic cash	2007
Shops start being paid by manufacturers as try-on outlets	2007
Electronic cash from internet migrates onto high street	2007
10% of UK shopping is electronic	2008
Personal banking replaced by agents	2012
Global barter sub-economy	2012
Most tickets electronic	2012
In-store positioning systems enable personalised guides	2013
Personal taxation at point of sale	2015
25% of UK shopping is network based	2015

Space

First all woman space crew	2002
Sub-orbital space tourism	2002
Mars robotic aircraft flight celebrating Wright Brothers' 100 anniversary	2003
Supercollider to create and study Higgs Boson completed	2003
X38 'Lifeboats' on international space station	2003
Europa orbiter launch (search for water on Europa)	2003
Cassini reaches Saturn & releases Huygens lander into Titan's atmosphere	2004
Space tug to take satellites into high orbits	2005
Private space mission to examine asteroid with a view to space mining	2005
Next generation space telescope launch	2007
Mars lander returns soil samples to Earth	2008
Weapon systems based on Ionespheric heating	2010
Helium 3 mining on moon	2012
First manned mission to Mars	2015
Space hotel for 350 guests, using recycled Shuttle fuel tanks	2015
Near Earth space tours	2015
OWL (Overwhelmingly Large Telescope) completed with 100m mirror	2016
Regular manned missions to Mars	2020
Production, storage and use of antimatter	2025
Space factories for commercial production	2025
Start of construction of manned Mars laboratory	2030
Use of human hibernation in space travel	2030
Moon base the size of small village	2040
Orbiting international space station completed	2003-2006
Return of Keo satellite	51998

Telecommunications

Cordless home networks using Bluetooth, Piano or Jini	2001
Photonic crystal fibre	2001
Go-anywhere personal numbering	2002
70M European computers connected to Internet	2002
Use of passive picocell	2003
1 billion cellular users worldwide	2003
10 Terabit/s on single fibre	2003
ANT based services	2003
Home intranet	2003
Global terabit network	2003
UMTS launch in U.K.	2003
1 Gbyte optical fibre loop memory	2005
Video download over network at 10 x normal speed	2005
Global broadband fibre based network	2005
ANT based network management	2005
Intranets dominate over Internet	2005
Neighbourhood intranets	2005
1 billion mobile communication devices worldwide	2005
Video surveillance built into phone boxes	2005
60% of internet accesses from mobile devices	2005
50% of traffic on mobile networks will be data	2005
Domestic demand reaches 100Mbit/s per home	2010
90% of calls tetherless	2010
All optic integrated logic, switching below 1 ps	2010
Use of high density wavelength multiplexing for trunk	2010
Use of WDM in local access	2015
Internet achieves 75% penetration in UK	2015
Electronic ATM switches largely obsolete & replaced by photonic versions	2020
Simultaneous data delivery in the City	2020
Cyberspace covers 75% of developed world	2020

Transport & travel

Intelligent cruise control keeping distance automatically	2001
Automated highway prototype	2002
Intelligent cat's eyes with built in speed cameras	2002
Integrated RTI system	2003
Blimp cargolifters, carrying 160 tonnes, 6000 miles at 60mph	2004
Cars powered by hydrogen fuel cells	2004
Cellular phone locations used in traffic management system	2004
Ships with super conductive electromagnetic thrust	2005
Hydrogen fuelled executive jets (cryoplanes)	2005
Fully automatic ships able to navigate and dock automatically	2005
Assisted lane keeping systems in trucks and buses	2005
Packetised' automatic rail transport systems	2005
Smart tickets for navigation through airports	2005
Superblimp troop carriers 800 x 250ft carrying 500 tons	2006
All new cars fitted with positioning systems as standard	2007
Pollution monitor chips built into cars	2008
Cars with automatic steering	2008
Scramjet' engine powered planes flying at Mach 10	2008
Urban car co-pilot	2010
High Speed Civil Transport supersonic jet, 300 passengers, 1500mph	2010
All new cars fitted with basic cellular comms with automated distress system	2010
Tourism in some areas limited to net access	2010
GPS and engine management systems linked to limit speed automatically	2010
Road trains using adhoc networking	2010
Bus routes based on star and ring architectures	2015
Automatic driving makes car pooling feasible	2015
Number of air travellers passes 5 billion	2017
Driverless truck convoys using electronic towbar	2018
Total world travel passes 50 trillion passenger km	2020
Need to book time slots to use some key roads	2020
1 Billion cars worldwide	2025
Total world travel passes 100 trillion passenger km	2050

Wearable technology

Smart clothes that can alter their thermal properties	2001
Emotional jewellery	2002
Audio jewellery	2002
Camera on flexible mounting linked to toolkit headset	2002
Video jewellery	2003
Comm-badge linked to virtual retinal display	2003
Wide range of wearable electronic devices	2003
Virtual retinal displays, glasses based	2003
Folding watch computers	2003
Cameras built into glasses recording what we see	2004
Polymer video screens built into clothes	2005
Emotion badges	2005
Jewellery that changes shape and colour	2005
Portable translation device for simple conversation	2007
Kaleidoscopic clothes using materials with embedded pigment micro-capsules	2007
Video tattoos	2010
Active contact lens	2010
Alpha-wave induction sets	2012
Micro-actuators built into clothes for sensory feedback from computers	2012
Thought recognition used in sleep enhancement	2015
Computer enhanced dreaming	2020
Emotion control devices	2025
Dream link technology	2030

Addendum: Wild cards (that could happen almost anytime[1])

	Earliest potential occurrence
Asteroid or comet hits earth	BC
Massive solar flare wipes out life on earth	BC
Natural evolution of superbug	BC
Climatic Instability, Turn For The Worst	BC
Extraordinary US West Coast Natural Disaster	BC
First Unambiguous Contact with Extraterrestrial Life -- The Arrival of ETs	BC
Human Mutation	BC
Ice cap breaks up -- Oceans rise one hundred feet	BC
Mass Migrations	BC
Return of the Messiah	AD
Another Chernobyl	1950
Collapse of the United Nations	1950
Global nuclear war	1960
Environmental pressure causes evolution of superbug	1980
Aids or similarly deadly disease mutates and becomes transmittable by air	1990
Bugs resistant to all known antibiotics	1990
Rules Change: Economic and/or Environmental "War Criminals" Are Prosecuted	1995
Terrorists Go Biological	1995
US Economy Fails or collapse of the dollar	1995
Civil nuclear war	2000

1 Based on an original idea by John Petersen, The Arlington Institute

	Earliest potential occurrence
Global economic collapse causes mass starvation and conflict	2000
Global civil war	2000
Space exploration creates superbug	2000
Civil War Between Soviet States Goes Nuclear	2000
Collapse of World's Fisheries	2000
Computer/Chip/Operating System Maker Blackmails Country or World	2000
End of Intergenerational Solidarity	2000
Gulf or Jet Stream Shifts Location Permanently	2000
International Financial Collapse	2000
Large-scale lengthy disruption of national electrical supply	2000
Major Break in Alaskan pipeline - Significant ecological damage	2000
Major Chaos in Africa	2000
Nuclear Terrorist Attack on United States or Europe	2000
Rise of an American Dictator	2000
Social breakdown in US or Europe	2000
Stock market crash	2000
Human Cloning Perfected, Human Genetic Engineering Arrives	2002
Accidental creation of lethal organism during research	2005
Antitech backlash destroys systems – chaos and starvation	2005
Deliberate biotech self-destruct by malicious biotech researcher	2005
Major genetic engineering accident	2005
Terrorism rises beyond capability of government systems	2005
Transgenic accident	2005
Encryption Invalidated	2005
Hackers Blackmail Federal Reserve	2005
Biotech terrorist attack goes wrong	2010
Evolved crime destroys human systems	2010
Global civil war between cybernations	2010
Hackers wipe out networks, causing chaos and mass starvation	2010
The hostile arrival of ETs detecting our transmissions	2010
Viruses become immune to all known treatments	2010
End of the Nation State	2010
Foetal Sex Selection Becomes the Norm	2010
Computers and robots become superior to humans	2015
Self-aware machine intelligence	2015
Third world exodus destabilises global system	2015
Computers/Robots think like humans	2015
Collapse of the sperm count	2020
Global epidemic with high speed travel and high population density	2020
Global famine caused by manmade environmental change	2020
Hybrid nanotech-organic creatures	2020
International social collapse - widespread civil conflict	2020
Major information systems disruption	2020
Major technology or science research accident	2020
Rise of a global machine dictator	2020
Total social breakdown in US or Europe	2020
Fuel cells replace internal combustion engines	2020
Life Expectancy Approaches 100	2020

Technology timeline

	Earliest potential occurrence
Nanotechnology takes off	2020
Megacities cause global epidemic	2025
Nanotech development by individuals	2025
Nanotechnology accident	2025
Networks become conscious and won't co-operate	2025
Second World Nation Demonstrates Development of Nanotech Weapons	2025
Elimination by smart machines - terminator	2030
Nanotechnology war	2030
Humans access net directly, become an integral part of global information system.	2030
No-Carbon Economy Worldwide	2030
Creation of Star Trek's Borg	2040
Fatal climatic instability	2040
Global electromagnetic communications disrupted for foreseeable future	2040
Religious environmentalism destroys environment	2040
Political correctness creates new dark age	2050
Whole generation unable to effectively read, write, think, and work	2050
Human genetic engineering creates hostile super-race	2070
Humans assimilated into net	2075
Invention of elimination phaser	2075
Time travel invented	2075
Faster than light travel	2100
Immortality chip - people move into cyberspace	2100