



computer "revolution"









where are we?







17c: rooting for "tech"





overview

changing perceptions

changing business

the demand side

inventions

"Its inventor did not take it up already imperfectly formed ... not ... gradually advanced" —Lardner



"The invention [of television] was no single event. ... a very complex interaction between new needs and new inventions ... military ... government ... corporate interests"

-- Williams, Technology and Cultural Form, 1973

eye witness account

"What constitutes an invention?--Few simple mechanical contrivances are new; and most combinations may be viewed as a species, and classed under genera ... [and] pronounced old or new according to the mechanical knowledge of the person who gives his opinion."

--Babbage, On the Economy of Machinery, ... 1832



what difference a semester makes

1/27

McLuhan -- it's the medium that does it 45%

Williams -- no it's not 48%



maybe; maybe not: --

7%

"the first awareness that we had of the fact that computers and data processing had something in common with communications started in early '65" —Bernard Strasberg, FCC, 1988.



getting to (and beyond) the computer

"military ... government ... corporate interests"

individual inventors (and investors)
business / customers
government
military / intelligence
science / education

TECHNOLOGY

Silicon Valley Turns Its Eye to Education

By NATASHA SINGER JAN. 11, 2015

"Education is one of the last industries to be touched by Internet technology" -[CEO of EdSurge], 2015

 Mirifici Logarithmorum
 $93.6 \times 10^{1.971}$

 Canonis Descriptio, 1614
 $10^{1.971}$
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93.6 x 37.7 = 14 $10^{1.971} \times 10^{1.576}$ $= 10^{(1.971 + 1.576)} = 10^{3.547}$

=3,525.12

Analytical Society, 1813 & the "dot-age"

 $> d^2y$

John Napier

Charles Babbage

John Napier (1550-1617) (a 'computer')

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Charles Babbage, RS (1791-1871)

Table of Logarithms from 1 to 108000 1827

"I wish to God these calculations had been executed by steam" (1821)

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let's not forget

William Oughtred (c1575-1660)

ideas to objects (and to Christopher Wren)

on the economy of machinery and manufactures

chapters

- I: Sources of the Advantages Arising from Machinery
- 2: Accumulating Power

3: Regulating Power

- "that beautiful contrivance, the steam governor..."
- 4: Increase and diminution of velocity
- 5: Extending the time of action of forces "watches & clocks ... automatons"
- 6: Saving time in natural operations

- 7: Exerting Forces too great for human power; and executing operations too delicate for human touch
- 8: Registering Operations
- 9: Economy of the materials employed
- 10: Of the identity of the work when it is of the same kind, and its accuracy when of different kinds
- II: Of copying
- 12: On the method of observing manufacturies
- 19: On the division of labor

20 On the mental division of labour

I. "On Governors." By J. CLERK MAXWELL, M.A., F.R.SS.L. & E. Received Feb. 20, 1868.

A G overnor is a part of a machine by means of which the velocity of the machine is kept nearly uniform, notwithstanding variations in the drivingpower or the resistance.

274 Mr. J. C. Maxwell on Governors.

rs. [Mar. 5,

I shall call all such resistances, if approximately proportional to the velocity, by the name of "viscosity," whatever be their true origin.

In several contrivances a differential system of wheelwork is introduced between the machine and the governor, so that the driving-power acting on the governor is nearly constant.

I have pointed out that, under certain conditions, the sudden disturbances of the machine do not act through the differential system on the governor, or *vice versa*. When these conditions are fulfilled, the equations of motion are not only simple, but the motion itself is not liable to disturbances depending on the mutual action of the machine and the governor.

Distinction between Moderators and Governors.

In regulators of the first kind, let P be the driving-power and R the resistance, both estimated as if applied to a given axis of the machine. Let V be the normal velocity, estimated for the same axis, and $\frac{dx}{dt}$ the actual velocity, and let M be the moment of inertia of the whole machine reduced to the given axis.

Let the governor be so arranged as to increase the resistance or diminish the driving-power by a quantity $F\left(\frac{dx}{dt}-V\right)$, then the equation of motion will be

$$\frac{d}{dt}\left(\mathbf{M}\frac{dx}{dt}\right) = \mathbf{P} - \mathbf{R} - \mathbf{F}\left(\frac{dx}{dt} - \mathbf{V}\right). \quad . \quad . \quad . \quad (1)$$

When the machine has obtained its final rate the first term vanishes, and

$$\frac{dx}{dt} = \mathbf{V} + \frac{\mathbf{P} - \mathbf{R}}{\mathbf{F}}.$$
 (2)

Hence, if P is increased or R diminished, the velocity will be permanently increased. Regulators of this kind, as Mr. Siemens* has observed, should be called moderators rather than governors.

In the second kind of regulator, the force $F\left(\frac{dx}{dt} - V\right)$, instead of being applied directly to the machine, is applied to an independent moving piece, B, which continually increases the resistance, or diminishes the driving-power, by a quantity depending on the whole motion of B.

If y represents the whole motion of B, the equation of motion of B is

$$\frac{d}{dt} \left(\mathbf{B} \frac{dy}{dt} \right) = \mathbf{F} \left(\frac{dx}{dt} - \mathbf{V} \right), \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad (3)$$

CYBERNETICS

OR CONTROL AND COMMUNICATION IN THE ANIMAL AND THE MACHINE

Norbert Wiener PROFESSOR OF MATHEMATICS THE MASSACHUSETTS INSTITUTE

OF TECHNOLOGY

THE TECHNOLOGY PRESS

JOHN WILEY & SONS, INC., NEW YORK HERMANN et CIE, PARIS

Norbert Wiener, *Cybernetics*, 1948

Adam Smith 1723-1890

> Adam Ferguson 1723-1816

divisions & combinations

the "hands"

manual division of labor pin-making

—Smith, Wealth of Nations, 1776

the "head"

mental division of labor

"And thinking itself, in this age of

separations, may become a peculiar craft."

— Ferguson, An Essay on the History of Civil Society, 1767

)

"the division of labour can be applied with equal success to mental as to mechanical operations"

Babbge, On the Economy ...

the head and the hands

principals and agents

"Many mechanical arts require no capacity, they succeed best under a total suppression of sentiment and reason, and ignorance is the mother of industry as well as of superstition. Manufactures ... prosper most when the mind is least consulted; and where the workshop may .. be considered an engine, the parts of which are men." —Adam Ferguson, Essay on the History of Civil Society, 1767

"One great advantage which we may derive from machinery is from the check which it affords against the inattention, the idleness, or the dishonesty of human agents."

- Charles Babbage, On the Economy of Machinery and Manufactures, 1835

AN INDICTMENT OF THE NEW SCIENCE OF MANAGEMENT

Current Literature

The Principles of Scientific Management

724

the "efficiency men

Frederick Winslow Taylor

March 20, 1856 - March 21, 1915

1881 - time study ("time and motion")

The Principles of

"I can say, without the slightest hesitation ...

that the science of handling pig-iron is so great

that the man who is ... physically able to handle

pig-iron and is sufficiently phlegmatic and

stupid to choose this for his occupation is

rarely able to comprehend the science of handling

pig-iron."

-Congressional Testimony, 1912

Scientific Management, 1911.

BILLIANT TECHNOLOGIE

BIE BRYNIGLFELON

THE

BEGGAR'S COMPLAINT,

AGAINST

RACK-RENT LANDLORDS, CORN FACTORS, GREAT FARMERS, MONOPOLIZERS, PAPER MONEY MAKERS, AND WAR,

and many other

Oppressors and Oppressions.

ALSO,

SOME OBSERVATIONS

ON THE

CONDUCT OF THE LUDDITES,

In Reference to the Destruction of Machinery, &c. &c.

BY ONE WHO PITIES THE OPPRESSED.

" Nature and time destroy the vain opinions of the day, But fooner or later confirm the dictates of wildom. " CICERO.

THE SECOND EDITION GREATLY ENLARGED.

SHEFFIELD: Printed for the Author by J. Crome,

REFLECTIONS ON LUDDISM.

IT will, no doubt, be gratifying to some Readers, to be made acquainted with the origin of Luddism. From the enquiries I made in Nottinghamshire, where Luddism originated, I learnt the following particulars, namely, That a good many years ago, there lived a poor man at Loughborough, in Leicestershire, about fifteen

inites from Nottingham, whose name was Edward Ludd: This man was not one of the brightest cast, in regard to his intellects; and, as is commonly the case with such characters, was of an irritable temper. This Edward Ludd, called by his neighbours Ned Ludd, was by trade a Frame Work Knitter: or in plainer language, andwhich is all the same, a Stocking Weaver. This man, being irritated, either by his Employer, or his work, or both, took the desperate resolution of avenging himself, by breaking his Stocking Frame. As the value of a common Stocking Frame is considerable, being not much less than Forty Pounds, Ned's exploit was much more admired for its temerity than its utility.

However, the consequence of this affair was, a Bon Mot : for, whenever any Stocking Weaver was out of patience with his Employer or his Employment, he would say, speaking of his Frame, "I have good mind to Ned Ludd it :" meaning, I have a good mind to break it, &c.

About the latter end of the year 1811, the Stocking and Lace Weavers of Nottingham, having been for a long time harrassed by abridged wages, and want of employment, in whole or in

Prony's tables, and the time that could have been saved ... for longitude calculation

—Babbage

ON THE DIVISION OF MENTAL LABOUR. 193

"C'est à un chapitre d'un ouvrage Anglais,* justement célèbre, (I.) qu'est probablement due l'existence de l'ouvrage dont le gouvernement Britannique veut faire jouir le monde savant :---

"Voici l'anecdote : M. de Prony s'était engagé, avec les comités de gouvernement, à composer pour la division centesimale du cercle, des tables logarithmiques et trigonometriques, qui, non seulement ne laissassent rien à desirer quant à l'exactitude, mais qui formassent le monument de calcul le plus vaste et le plus imposant qui eut jamais été exécuté, ou même concu. Les logarithmes des nombres de 1 à 200,000 formaient à ce travail un supplement nécessaire et exigé. Il fut aisé à M. de Prony de s'assurer que même en s'associant trois ou quatre habiles co-operateurs, la plus grande durée presumable de sa vie, ne lui suffirai pas pour remplir ses engagements. Il était occcupé de cette fâcheuse pensée lorsque, se trouvant devant la boutique d'un marchand de livres, il apperçut la belle edition Anglaise de Smith, donnée a Londres en 1776; il ouvrit le livre au hazard, et tomba sur le premier chapitre, qui traite de la division du travail, et où la fabrication des épingles est citée pour exemple. A peine avait-il parcouru les premières pages, que, par une espèce d'inspiration, il conçut l'expédient de mettre ses logarithmes en manufacture comme les épingles. Il faisait, en ce moment, à l'école polytechnique, des leçons sur une partie d'analyse liée à ce genre de travail, la methode des differences, et ses applications à l'interpolation. Il alla passer quelques jours à la campagne, et revint à Paris avec le plan de fabrication, qui a été suivi dans l'exécution. Il rassembla deux ateliers, qui faisaient séparément les mêmes calculs, et se servaient de vérification reciproque."+

* An Enquiry into the Nature and Causes of the Wealth of Nations, by Adam Smith.

† Note sur la publication, proposée par le gouvernement

vive les differences

" by the aid of differences, ... vast variety of equations .. may .. be solved ... tables .. produced "

difference engine

200 ON THE DIVISION OF MENTAL LABOUR.

_					
Repetitions	& Freema.	Move- ments.	CLOCK A. Hand set to I.	CLOCK B. Hand set to III.	CLOCE C. Hand set to II.
	ſ	Pall A.	TABLE. A. strikes 1	First Bifrease.	Second difference.
1	ł	B.	The hand is ad- vanced (by B.)	B.strikes 3	
	$\left(\right)$	— c.		The hand is ad- vanced (by C.) 2divisions	C. strikes 2
1	(Pull A.	A. strikes 4		
2	Į	B.	The band is ad- vanced (by B.)	B. strikes 5	
		— c.		The hand is ad- vanced (by C.) 2 divisions	C. strikes 2
-	7	Pull A.	A. strikes 9		
3	Į	— В.	The hand is ad- vanced (by B.)	B. strikes 7	••••
	l	— c.		The hand is ad- vanced (by C.) 2divisions	C. strikes 2
Ē	(Pell A.	A. strikes 16		
4	Į	— В.	The hand is ad- vanced (by B.) 9 divisions	B. strikes 9	• • • •
	l	c.		The hand is ad- vanced (by C.) 2 divisions	C. strikes 2
Γ	(Pull A.	A. strikes 25		
5	Į	— В.	(The hand is ad- vanced (by B.) 11 divisions	B. strikes 11	· • • •
	U	— c.		The hand is ad- vanced (by C.) 2 divisions	C. strikes 2
	(Pall A.	A. strikes 36		
6	Į	B.	The hand is ad- vanced (by B.)	B. strikes 13	
	l	c.		The hand is ad- vanced (by C.) 2 divisions	C. strikes 2

"by the word operation, we mean any process which alters the mutual relation of two or more things ... include all subjects in the universe. ...A new, a vast, and a powerful language ... to wield its truths" —Lovelace

analytical engine

general purpose machine

programmable

storing

looping

branching

Ada Byron/Lovelace

ADA AUGUSTA The Country of Landaur

Ada Lovelace 1815-1852 "a machine that not only would have foresight, but could act on that foresight"

"I want to put in something about Bernoulli's Number, in one of my notes, as an example of how an explicit function, may be worked out by the engine, without having been worked out by human head and hands first" --Lovelace to Babbage, 1843

"Analytical Engine weaves algebraical patterns just as the Jacquard loom weaves flowers and leaves"

—Taylor, Scientific Memoirs, 1843

#!/bin/sh var=false

else

< <= >= >

fi

= /=

or and

not

if [**\$**var];then

echo "false"

boolean binary operators on numbers

boolean binary operators on anything

boolean binary operators on booleans

boolean unary operator on booleans

string/list/record binary operator on

echo \$var

strings/lists/records

& (concatenation)

also 1815

George Boole

"Boolean logic is the basis for the design of all modern computers since the ultimate components of these devices were capable of storing just two values (equated with true and false) and their circuitry calculates the basic Boolean operators over these two values."

"who can foresee the consequences of such an invention?" —Lardner

Thamus reborn?

[people tend to]

"first, overrate what we find to be ... remarkable, and secondly, by a sort of natural reaction, to undervalue the true state of the case ... The Analytical Engine has no pretension whatever to originate anything"

--Ada Lovelace,

Taylor's Scientific Memoirs, 1843

overview

changing perceptions

changing business

the demand side

inventions

on the demand side

who might want these machines?

why?

what would they want?

"inextricably linked with our understandings of state and government"

--John Agar, The Government Machine, 2003

government

	A generall Bill for this prefent year, ending the 19 of December 1665, according to the Riport made to the KINGS mod Excellent March. Br the Compassy of Particle and Acceleration, 84	
A Bortive an Aged Agus and Sectors and Sectors Gained Bleeding	The Difester and Calubier the year, nd Stilberne-517 Executed	
Solution of Scal alentitie Cances, Gauge Cances, Gauge Cances, and The Childoed Childoed Childoed Conformation Conformation Convoltion an Dilloated	Before and Fifther & Bengel Semale around here fiber 7 IL genre	997
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(294) The Mandre of the Woldings, Choise- ings, and Basish, data were in the Pa- relio of Crashwook, free Manch et, syste to Manch 24, 1549 ; Cat oppos- ed by the Beylinet only in the post 1574 and by the Beylinet on t	(198) The Table of the Parch of Cambrack, The Table of the Tabl
	0. 74

registration

property bills of mortality births & marriages parish members population taxpayers military eligible aliens racial groups the poor professions midwives prostitutes cars 'National Insurance' social security

John Harrison 1693-1776

"calculating longitude tables ... by difference ... Prony's tables, and the time that could have been saved —Babbage fixing longitude

Harrison vs Men of ScienceHI - Lisbon Trial, 1736awarded prize, 1773

"meridian ... of a country whose interests are so inseparably connected as ours are with ... navigation"

				—Lardner
		THE		
ACCOUNT	NARRATIVE	PRINCIPLES	REMARKS	DESCRIPTION
	OF THE PROCEEDINGS	0 F	ON A	SUCH MECHANISM
PROCEEDINGS,	FROCEEDINOS BILATIVE TO	MR. HARRISON'S TIME-KEEPER,	PAMPHLET	MENSURATION OF TIME;
DISCOVERY	The DISCOVERY of THE	W178	Lonly published by the	SOME ACCOUNT
LONGITUDE	Longitude at Sea ;	PLATES OF THE SAME.	Rev. Mr. MASKELYNE,	LONGITUDE BY THE MOON:
19.4	Mr. JOHN HARRISON'S	PERLINER BY DEDIN TO	Valorite Suttemport dida	As ACCOUNT
LETTER	TIME-KEEPER;	THE COMMISSIONERS OF LONGITUDE	BOARD or LONGITUDE.	DISCOVERY
RIGHT HONOURABLE *******,	1763.		By JOHN HARRISON.	SCALE or MUSICK.
MEMBER OF PARLIAMENT.	LONDON	PROPERTY OF W. RECEARED AND S. COARE;		By JOHN HARRISON, Investors of the Time-Kanna for the Longerung at En.
L O N D O N i Frind by T. and J. W. Parsano, in Black-Prine, and Sold by	Mr. SANDEY, in Flot-Street,	JOHN NOURCE, AND MELL MOUNT AND PAGE. 10 DOC LAND.	Prised for W. SANDER in Floxburt,	LONDON: 70
the Brokett LETS, in London and Weltmindar, M. Pers LETE. [Price One-Bulling.]	MDCCLXV.	<u> </u>	(PRICE SIXPENCE,)	Piconi for the Avernon, and faid by T. Josep, 20 No. 136, Farran-Laws.

"Statistics should reveal the quantum of happiness in a population [and] the means of further improvement." —John Sinclair

the demand side

*

*

big data

"Statistics: a word lately introduced to express a view or survey of any kingdom, country, or parish"

> Encyclopaedia Britannica, 1797

John Sinclair 1754-1835

тне STATISTICAL ACCOUNT ΟF SCOTLAND. DRAWN UP FROM THE COMMUNICATIONS OF THE MINISTERS OF THE DIFFERENT PARISHES. BY SIR JOHN SINCLAIR, BART. VOLUME TWENTY-FIRST. " Ad confilium de republica dandam, capas est nosse rempublicam." Ciceno de Orat, lib. ii. EDINBURGH: PRINTED AND SOLD BY WILLIAM CREECH ; AND ALSO SOLD BY J. BONALDION. A. GUTHAIE, W. LAING. AND JO. FAIRBAINS, IDINBURGH ; T. CADELL, J. DEB-RETT, AND J. SEWEL, LONDON ; DUNLOF AND WIL-SON, GLASGOW ; ANGUS AND SON, ABERDEEN. N.D.C.XCIX. 21-Hofl15-Computer-PD.4.7 29

Scots & statistics

STATISTICAL BREVIARY;

SHEWING,

ON A PRINCIPLE ENTIRELY NEW,

THE RESOURCES

OF EVERY

STATE AND KINGDOM IN EUROPE;

TLUGTRATED WITH STAINED COPPER-PLATE CHARTS,

· REPRESENTING THE

PHYSICAL POWERS OF EACH DISTINCT NATION WITH EASE AND PERSPICUITY.

By WILLIAM PLAYFAIR.

A SIMILAR EXHIBITION OF THE RULING POWERS OF HINDOOSTAN.

× C

Printed by T. BENSLEY, Bolt Court, Fleet Street, For J. WALLIS, 46, Patermoster Row; CARPENTER and Co. Bond Street; EGERTON, Whitehall, VERSER and HORD, Fooltry; BLACK and PARRY, Leadenhall Street; and TERRET and DIDIER, St. James's Street.

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THE THIRD EDITION, Corrected and brought down to the End of loft Year.

By WILLIAM PLAYFAIR,

Printed by T. Barton, Linde Queen-dreet, Linde's-Ins Fidds, FOR J. WALLIS, NO. 46, PATERNOSTER-BOW; CARPENTER AND CO. BOND-STREET; BOERTON, WHITEHALL; VERNOR AND ROOD, FOULTRY; BLACK AND PARRY, LEADENHALL-STREET.

1801.

business interests

sorting operation: the clearing house

"In a large room in Lombard-street, about thirty clerks from the several London bankers take their stations ... at desks placed around the room. ... From time to time other clerks from every house enter the room, and passing along, drop into the box the checks due by that firm to the house from which this distributor is sent. ... The whole of these payments are made by a double system of balance, a very small amount of bank notes passing from hand to hand. --Babbage, On the Economy, 1835

"[1839] £954 million was cleared--\$250 billion in today's money." --Campbell-Kelly & Aspray

dream come true?

Georg Scheutz 1785-1873

Edvard Scheutz 1822-1881

spreading the word

Scheutz Difference Engine, with printer c 1853

stepping westward

Dudley Observatory, Schenectady

lifelong calculations

British Government, actuarial calculations "English Life Table" 1864 Of this maritime chief of police, the ship's corporals, so called, were the immediate subordinates, and compliant ones; and this, as is to be noted in some business departments ashore, almost to a degree inconsistent with entire moral volition" —Melville, "Billy Budd, Sailor," [1891] * (the demand side * (the demand side

clerks & copyists (UK)

1871: 262,100 1891: 534,622 1911: 918,186

female clerks

1891: 17,8591911: 117,0571921, women 46% of all clerks

typewriter girls 1931, 212,296 female typists

5,155 male typists

PUTNAM'S MONTHLY.

A Magazine of Literature, Science, and Art.

VOL. II.-NOVEMBER 1853.-NO. XI.

BARTLEBY, THE SCRIVENER.

A STORY OF WALL-STREET.

I AM a rather elderly man. The nature of my avocations for the last thirty years has brought me into more than ordinary contact with what would seem an interesting and somewhat singular set of men, df whom as yet nothing that I know of has ever been written:—I mean the law-copyists or scriveners. I have known very many of them, professionally and privately, and if I pleased, could relate divers histories, at which good-matured gentlemen might smile, and sentimental souls might weep. But I waive the biographies of all other scriveners for a few passages in the life of Bartleby, who was a scrivener the strangest I ever saw or heard of. While of other lawcopyists I might write the complete life, of Bartleby nothing of that sort can be done. I believe that no materials exist for a full and satisfactory biography of this man. It is an irreparable loss to literature. Bartleby was one of those beings of whom nothing is ascertainable, except from the original sources, and in

I AM a rather elderly man. The nature of my avocations for the last thirty years has brought me into more than ordinary contact with what would seen an interesting and somewhat singular set

vague report which will appear in the sequel. Ere introducing the scrivener, as he first appeared to me, it is fit I make som mention of myself, my employées, my business, my chambers, and general surroundings; because some such description is indispensable to an adequate understanding of the chief character about to be presented.

Imprimis: I am a man who, from his youth upwards, has been filled with a profound conviction that the easiest way of life is the best. Hence, though I belong to a profession proverbially energetic and nervous, even to turbulence, at times, yet nothing of that sort have I ever suffered to invade my peace. I am one of those unambitious lawyers who never addresses a jury, or in any way draws down public applause; but in the cool tranquillity of a snug retreat, do a snug business among

When the for the second of the

At Sought John may May 2 S.S.

revolutionary tech

carbon paper Wedgewood, 1806

typewriter

Remington, 1874

calculator

Burroughs, 1892

cash register mechanical register, 1884

"the check which it affords against ... the dishonesty of human agents." — Babbage

ESSA or the PRINCIPLE OF P As it after The future improvem with sime on the speculations M. condor	Y DPULATION, TS LENT OF SOCIETY. RES OF MR. GODWIN, CET,	"[An] Years of the subsec as the	Enumer after White uent T ey shal	at: the d er 1 1
AND OTHER W	RITERS.		Year	Pc
LONDON			1900	76
FRINTED FOR J. JOHNSO CHURCH-Y/	N, IN ST. PAUL'S		1890	62
1798.			1880	50
			1870	38
Spain:	1787		1860	31
US:	1790		1850	23
IIV.	1901		1840	17
UK:	TOOT		1830	12
			1820	9,6
			1810	7,2
			1800	5,3

4.8

.

[An] Enumeration shall be made within three Years after the first Meeting of the Congress of the United States, and within every subsequent Term of ten Years, in such Manner as they shall by Law direct."

enumerating

Year	Population	Gain		Clerks
1900	76,212,168	13,232,402	21.0	
1890	62,979,766	12,790,557	25.5	
1880	50,189,209	11,630,838	30.2	2000
1870	38,558,371	7,115,050	22.6	1495
1860	31,443,321	8,251,445	35.6	483
1850	23,191,876	6,128,523	35.9	
1840	17,063,353	4,202,651	32.7	28
1830	12,860,702	3,222,249	33.4	
1820	9,638,453	2,298,572	33.1	
1810	7,239,881	1,931,398	36.4	
1800	5,308,483	1,379,269	35.1	
1790	3,929,214	-	-).4.7 35

tabulating

Herman Hollerith 1860-1929

Hollerith Electronic Tabulating Machine

1890 Census

"This apparatus works unerringly as the mills of the gods, but beats them hollow as to speed."

-The Electrical Engineer, 11 Nov 1891

the punch card

* * the demand side "Hollerith, then IBM, managed to maintain a near monopoly by periodically filing for new key patents or by acquiring those of unsuccessful rivals."

> -- Mounier-Kuhn,2012 government & business

Tabulating Machine Company

CTR:

Hollerith

Computing-Tabulating-Recording Company

Thomas Watson NCR to CTR to ...

a whole new deal

Social Security Act, 1935

"the world's largest bookkeeping job"

Sevenig-fourth Congress of the United States of Imerica; At the First Dession,

Begun and held at the City of Washington on Thursday, the third day of January, one thousand nine hundred and thirty-five.

AN ACT

To provide for the general welfare by establishing a system of Federal old-age benefits, and by enabling the several States to make more adequate provision for aged persons, blind persons, dependent and crippled children, maternal and child welfare, public health, and the administration of their unemployment compensation laws; to establish a Social Security Board; to raise revenue; and for other purposes.

Be it exacted by the Senate and House of Representatives of the United States of America in Congress assembled,

TITLE I-GRANTS TO STATES FOR OLD-AGE ASSISTANCE

APPROPRIATION.

SECTION 1. For the purpose of enabling each State to furnish financial assistance, as far as practicable under the conditions in such State, to aged needy individuals, there is hereby authorized to be appropriated for the fiscal year ending June 30, 1936, the sum of \$19,750,000, and there is hereby authorized to be appropriated for

ollerith-Maschine Dehomag D11, die 1933 in Deutschland

controlling numbers

SSENAM

... controlling people

The Nazi Census -- Aly & Roth, 2004

IBM DI I

Census, 1933, 1939

Labor Book, 1935

Health Pedigree book, 1936

Registry of the Populace, 1939

Blood (high, average, acceptable, inferior), 1940

Personal Identification Number, 1944

igrant farm worker peers into an iris scanner in New Delhi in the first effort to officially record each Indian's identity as an individual.

LYDIA POLGREEN fished: September 1, 2011

still registering

"sailors ... trace their family ...names upon the wrist ... If it were possible for such a practice to become universal ... Who are you? ... no room for prevarication in the answer ... men were thus held as it were by an invisible chain."

> -- Jeremy Bentham, Principles of Penal Law [1843]

OR CONTROL AND COMMUNICATION IN THE ANIMAL AND THE MACHINE

Norbert Wiener PROFESSOR OF MATHEMATICS THE MASSACHUSETIS INSTITUTE OF TECHNOLOGY

THE TECHNOLOGY PRESS

HERMANN et CIE, PARIS

JOHN WILEY & SONS, INC., NEW YORK

military takeover

.oad Informatior	n Ballistics Ca	lculator	Misc Functions	Firearm Data	base H	lelp		
4 3 2 1 -1 -2 -3 -4 -5 -6 -7 -8 								
-9	·					····-/·	·····	
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Name: .257 Cal, Barne Ballistic Coeff	es XBT, 100 gm Bullet Weight	n Velocity	Std Dev	Targ Dist	Scope	Г А e Height	uto Update Temp (F)	e Load Data Altitude (ft)
0.420	100	2222	0.00	250	1.50		70	500
<u>R</u> e-Compute	Calculate		<u>T</u> aylor KO	<u>P</u> rint	<u>S</u> a	ave to TX	(T <u>G</u> et	Load Data

military processing

My Mother Was a Computer District SUBJECTS AND LITERARY TEXTS IN Katherine Rayles

ballistics "firing tables"

Vannevar Bush, 1935,

Differential Analyzer

analytical work (Babbage) Bush Shannon, "A Symbolic Analysis of Relay and Switching Circuits," 1937

Harvard mark I

aka IBM Automatic Sequence Controlled Calculator, 1944

John von Neumann 1903-1957

Aberdeen Proving Ground

Eckert & Mauchly 1945, ENIAC

stored-program (Electronic Numerical Integrator Computer) 18,00 vacuum tubes, 70, 000 resistors, 10,000 capacitors, 6,000 switches, 1,500 relays

military processing

Alan Turing 1912-1954

decoding

1943, Colossus

Bletchley Park

[just one] "would suffice the needs of the whole world" - Georg Scheutz

back to Thamus

"I went to see Professor Douglas Hartree, who had built the first differential analyzers in England and had more experience in using these very specialized computers than anyone else. He told me that, in his opinion, all the calculations that would ever be needed in this country could be done on the three digital computers which were then being built-one in Cambridge, one in Teddington, and one in Manchester. No one else, he said, would ever need machines of their own, or would be able to afford to buy them."

--Lord Bowden, American Scientist 58 (1970) pp. 43–53

Times, June 11, 1949

"at most" or "only a foretaste"?

"In reports to the US government, and in funding requests to the military (to calculate the effects of thermonuclear explosions), von Neumann and his colleagues expressed the view that 'at most six or so machines should suffice for the whole country.' Turing, in an interview with the *Times* in 1949, declared: 'This is only a foretaste of what is to come, and only the shadow of what is going to be ... I do not see why it should not enter any one of the fields normally covered by the human intellect and eventually compete on equal terms.'"

—Philip Welch, London Review of Books, 2012

ANSWER FOUND TO 300 YEAR OLD SUM From Our Special Correspondent

THE MECHANICAL

BRAIN

Experiments which have been in progress in this country and the United States since the end of the war to produce an efficient mechanical "brain" have been successfully completed at Manchester University, where a workable "brain" has been evolved. Not only is it working satisfactorily, but for the first time a machine has been brought to the point at which it can work out problems which it is practically impossible to execute on paper.

The Manchester " mechanical mind " was built by Professor F. C. Williams, of the Department of Electro-Technics, and is now in the hands of two university mathematicians, Professor M. H. A. Newman and Mr. A. W. Turing.

It has just completed, in a matter of weeks, a problem, the nature of which is not disclosed, which was started in the seventeenth century and is only just being completed by human calculation.

Its appearance is somewhat unprepossessing. It is composed of racks of electrical apparatus consisting of a mass of untidy wires, valves, chassis, and display tubes. When in action, the cathode ray becomes a pattern of dots which shows what information is in the machine. There is a close analogy between its structure and that of the human brain. It differs from other mechanical brains in its method of storing

that information is more readily accessible.

CALCULUS TO SONNET Mr. Turing said yesterday: " This is only a foretaste of what is to come, and only the shadow of what is going to be. We have to have some experience with the machine before

years before we settle down to the new possibilities, but I do not see why it should not enter any one of the fields normally covered by the human intellect, and eventually compete on equal terms,

" I do not think you can even draw the line about sonnets, though the comparison is perhaps a little bit unfair because a sonnet written by a machine will be better appreciated by another machine."

Mr. Turing added that the university was really interested in the investigation of the possibilities of machines for their own sake. Their research would be directed to finding the degree of intellectual activity of which a machine was capable, and to what extent it could think for itself.

News of the experiments was disclosed by Professor Jefferson in the Lister oration reported in The Times yesterday.

Manchester's mechanical brain

first storedprogram computer

THE MECHANICAL BRAIN.—The apparatus which has been evolved in the electrical engineering laboratories of Manchester University to work out problems which are almost impossible to execute on paper. The section on the left contains the control circuit, in the middle rack of which is a cathode ray tube screen with (below) the control desk. The racks on the right-centre of the picture with the box-like containers provid the memory section of the machine. Nearer the camera are racks containing the calculating circuits. The machine is "fed" at the control desk and the answer is read on the cathode ray tube, which is the only visible means of showing that the brain is at work

back in business vertical integration

How a chain of tea shops kickstarted the computer age

In November 1951 a British company switched on the world's first business computer

Image 1 of 3 LEO at Lyons HQ in Hammersmith

By Christopher Williams, Technology Correspondent 7:00AM GMT 10 Nov 2011

breaking down

Cathode-ray tube memory, from the IBM 701 Defense Calculator, 1952

breaking things down

1947 transistor

Bell Labs John Bardeen, William Brattain, William Shockley

1958 integrated circuit

Texas Instruments Jack Kilby

Shockley Fairchild Intel

corporate computing

100. Console - IBM System/300 Model 30

1960 DEC PDP-1

"programmable data processor"

1964 IBM 360

1969 Xerox PARC

"the architecture of information"

(1946 SRI)

more breaking down

vertical disintegration 1970-1990

Software	IBM
OS	IBM
CPU	IBM
Hardware	<u>IBM</u>

The Mainframe Is Dead! Long Live the Mainframe!

Posted by samzenpus on Thursday January 15, 2015 @04:06AM _____ from the brand-new-stuff dept.

HughPickens.com writes

The death of the mainframe has been predicted many times over the years but it has prevailed because it has been overhauled time and again. Now Steve Lohr reports that IBM has just released the z13, a new mainframe engineered to cope with the huge volume of data and transactions generated by people using smartphones and tablets. "This is a mainframe for the mobile digital economy," says Tom Rosamilia. "It's a computer for the bow wave of mobile transactions coming our way." IBM claims the z13 mainframe is the first system able to process 2.5 billion transactions a day and has a host of technical improvements over its predecessor, including three times the memory, faster processing and greater data-handling capability. IBM spent \$1 billion to develop the z13, and that research generated 500 new patents, including some for encryption intended to improve the security of mobile computing. Much of the new technology is designed for real-time analysis in business. For example, the mainframe system can allow automated fraud prevention while a purchase is being made on a smartphone. Another example would be providing shoppers with personalized offers while they are in a store, by tracking their locations and tapping data on their preferences, mainly from their previous buying patterns at that retailer.

IBM brings out a new mainframe about every three years, and the success of this one is critical to the company's business. Mainframes alone account for only about 3 percent of IBM's sales. But when mainframe-related software, services and storage are included, the business as a whole contributes 25 percent of IBM's revenue and 35 percent of its operating profit. Ronald J. Peri, chief executive of Radixx International was <u>an early advocate in the 1980s of moving off</u> <u>mainframes and onto networks of personal computers</u>. Today Peri is shifting the back-end computing engine in the Radixx data center from a cluster of industry-standard servers to a new IBM mainframe and estimates the total cost of ownership including hardware, software and labor will be 50 percent less with a mainframe. "We kind of rediscovered the mainframe," says Peri.

not dead yet

ENTERPRISE COMPUTING

IBM Introduces z13, a Mainframe for the Smartphone Economy

By STEVE LOHR JANUARY 13, 2015 4:30 PM The Comments

IBM's new z13 mainframe includes more than 500 new patents. Augusto Menezes/Feature Photo Service for IBM

They seem a computing odd couple: the mainframe, the old workhorse, and the smartphone, the cool-kid computer of today.

changing perceptions

changing business

the demand side

inventions

THE

BEGGAR'S COMPLAINT,

AGAINST

RACK-RENT LANDLORDS, CORN FACTORS, GREAT FARMERS, MONOPOLIZERS, PAPER MONEY MAKERS, AND WAR,

and many other

Oppressors and Oppressions.

ALSO,

SOME OBSERVATIONS

ON THE

CONDUCT OF THE LUDDITES.

In Reference to the Destruction of Machinery, &c. &c.

BY ONE WHO PITIES THE OPPRESSED.

" Nature and time destroy the vain opinions of the day, But fooner or later confirm the dictates of wifdom. " CICERO.

THE SECOND EDITION GREATLY ENLARGED.

SHEFFIELD: Printed for the Author by J. Crome, 1812

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RASSENAMT-44

social networks?

PUTNAM'S MONTHLY.

A Magazine of Fiterature, Science, and Art.

VOL. II.-NOVEMBER 1853.-NO. XL

BARTLEBY, THE SCRIVENER.

A STORY OF WALL-STREET.

I AM a rather elderly man. The nature of my avocations for the last thirty years has brought me into more than ordinary contact with what would seem an interesting and somewhat singular set of men, of whom as yet nothing that I know of has ever been written:—I mean the law-copyists or scriveners. I have known very many of them, professionally and privately, and if I pleased, could relate divers histories, at which good-natured gentlemen might smile, and sentimental souls might weep. But I waive the biographies of all other scriveners for a few passages in the life of Bartleby, who was a scrivener the strangest I ever saw or heard of. While of other lawcopyists I might write the complete life, of Bartleby nothing of that sort can be done. I believe that no materials exist for a full and satisfactory biography of this man. It is an irreparable loss to literature. Bartleby was one of those beings of whom nothing is ascertainable, except from the original sources, and in

his case those are very small. What my own astonished eyes saw of Bartleby, that is all I know of him, except, indeed, one vague report which will appear in the sequel.

sequel. Ere introducing the scrivener, as he first appeared to me, it is fit I make som mention of myself, my employées, my business, my chambers, and general surroundings; because some such description is indispensable to an adequate understanding of the chief character about to be presented.

Imprimis: I am a man who, from his youth upwards, has been filled with a profound conviction that the easiest way of life is the best. Hence, though I belong to a profession proverbially energetic and nervous, even to turbulence, at times, yet nothing of that sort have I ever suffered to invade my peace. I am one of those unambitious lawyers who never addresses a jury, or in any way draws down public applause; but in the cool tranquillity of a snug retreat, do a snug business among

Trage against the machine

FSM

"And you've got to put your bodies upon the gears and upon the wheels, upon the levers, upon all the apparatus -- and you've got to make it stop! And you've got to indicate to the people who run it, to the people who own it -- that unless you're free the machine will be prevented from working at all!!" —Mario Savio, December 2, 1964

"I am a student at the University of California. Please do not fold, spindle or mutilate me."

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culture clash

home brew, fone freaks

1975 Altair

1976 Apple 1

1983 Lisa

1984 Macintosh

Stewart Brand, "Fanatic Life and Symbolic Death Among the Computer Bums" --Rolling Stone, 7 December, 1972

killer apps

Ken Thompson Dennis Ritchie Bell Labs

unix

Thompson, Ritchie, & AT&T 1965: AT&T, MIT& GE work on multics

1969: multics to unix

tty; FILENAME CHANGEDIRECTORY PATHNAME

"What we wanted to preserve was not just a good environment in which to do programming, but a system around which a fellowship could form. We knew from experience that the essence of communal computing, as supplied by remote-access, time-shared machines, is not just to type programs into a terminal instead of a keypunch, but to encourage close communication."

--Ritche, "Evolution of the Unix Time-Sharing System"

unix at ucb

Bill Joy UCB 1973: Thompson at Berkeley

Bill Joy develops em editor

1977: IBSD released

1979: 3BSD (for Vax)

1981: 4.1BSD

1983: 4.2 BSD (with tcp/ip stack)

I-800-ITS-UNIX

IP(roblems)

1991: Networking release 2; 386 BSD 1992: AT&T sues UCB

UNITED ST	PATES DISTRICT COURT
FOR THE DI	ISTRICT OF NEW JERSEY
	,
)
UNIX SYSTEM LABORATORIES, IN	NC.)
)
Plaintiff,)
) Civ. No. 92-1667
vs.) OPINION
)
BERKELEY SOFTWARE DESIGN, IN	NC.,)
and certain named individual	ls in)
their collective capacity as	
Deserts of the University of	, ine)
Regents of the University of	.)
California,)
)
Defendants.)

1994 settlement: USL, UCB, Novell

SETTLEMENT AGREEMENT

This Settlement Agreement is entered into between UNIX System Laboratories, Inc. ("USL"), a Delaware corporation, and The Regents of the University of California (the "University"), a California corporation.

Recitals

USL contends it is the owner of the intellectual 1. property rights in portions of certain computer operating system software (the "UNIX System").

USL and USL's predecessor in interest, the 2. American Telephone and Telegraph Co. ("AT&T"), have licensed the University to use certain versions of UNIX® system software,

The GNU Manifesto by Richard Stallman

GNU, which stands for GNU's Not Unix, is the name for the complete Unix-compatible software system that I am writing so that I can give it away free to everyone who can use it. Many other programmers are helping me. Contributions of time, money, programs, and equipment are greatly needed.

So far we have a portable C and Pascal compiler which compiles for Vax and 68000, an Emacs-like text editor with Lisp for writing editor commands, a yacc-compatible parser generator, a linker, and around 35 utilities. A shell (command interpreter) is nearly completed. When the kernel and a debugger are written, by the end of 1985 I hope, it will be possible to distribute a GNU system suitable for program development. After this we will add a text formatter, an Empire game, a spreadsheet, and hundreds of other things, plus on-line documentation. We hope to supply, eventually, everything useful that normally comes with a Unix system, and more.

GNU will be able to run Unix programs, but will not be identical with Unix. We will make all improvements that are convenient, based on our experience with other operating systems. In particular, we plan to have longer filenames, file version numbers, a crashproof file system, filename completion, perhaps, and eventually, a Lisp-based window system through which several Lisp programs and ordinary Unix programs can share a screen.

GNU - March 30, 1985

Dr Dobbs Journal

elsewhere ...

From: torvalds@klaava.Helsinki.FI (Linus Benedict Torvalds)
Newsgroups: comp.os.minix
Subject: What would you like to see most in minix?
Summary: small poll for my new operating system
Message-ID:
Date: 25 Aug 91 20:57:08 GMT
Organization: University of Helsinki

Hello everybody out there using minix -

I'm doing a (free) operating system (just a hobby, won't be big and professional like gnu) for 386(486) AT clones. This has been brewing since april, and is starting to get ready. I'd like any feedback on things people like/dislike in minix, as my OS resembles it somewhat (same physical layout of the file-system (due to practical reasons) among other things).

I've currently ported bash(1.08) and gcc(1.40), and things seem to work. This implies that I'll get something practical within a few months, and I'd like to know what features most people would want. Any suggestions are welcome, but I won't promise I'll implement them :-)

Linus (torvalds@kruuna.helsinki.fi)

PS. Yes - it's free of any minix code, and it has a multi-threaded fs. It is NOT protable (uses 386 task switching etc), and it probably never will support anything other than AT-harddisks, as that's all I have :-(.

natural monopoly?

Ma Bell

1876 Bell Telephone 1885 AT&T 1894 Bell Patents expire 1899 AT&T incorporates Bell 1910 AT&T buys Western Union 1913 Kingsbury (monopoly) Commitment 1915 AT&T San Francisco 1927 transatlantic telephone 1982 break up: the Baby Bells

going "open"?

101 Ways to Save Apple

By James Daly

An assessment of what can be done to fix a once-great company.

Dear Apple,

In the movie Independence Day, a PowerBook saves the earth from destruction. Now it's ti you look a little beleaguered these days: a confusing product line, little inspiration from the

But who wants to live in a world without you? Not us. So we surveyed a cross section of har salvation. We chose not to resort to time travel or regurgitate the same old shoulda/could your price/performance in 1993).

We don't believe Apple is rotten to the core. Chrysler nearly went under in the late 1970s a to fix your once-great company using the material at hand. Don't wait for a miracle. You ha

Edited by James Daly

Admit it. You're out of the hardware game. Outsource your hardware production, or semanufacturing boxes.

2. License the Apple name/technology to appliance manufacturers and build GUIs for them all use the same communications protocol. Result: you monopolize the market for smallers and second sec

up ahead

9 April: Advent of the Internet

Required Reading

Berners-Lee, Tim. 2000. "info.cern.ch." Chapters 1-3 in Weaving the Web. New York City: HarperCollins. Read: pp. 266-279.

Source: Course reader.

Additional Materials

Leiner, Barry M., Vinton G. Cerf, David D. Clark, Robert E. Kahn, Leonard Kleinrock, Daniel C. Lynch, Jon Postel, Larry G. Roberts, Stephen Wolff, "A Brief History of the Internet," *The Internet Society. Source:* The Internet Society [hyperlink 2].