The Power of Documents, Knowledge Capital & Information Systems

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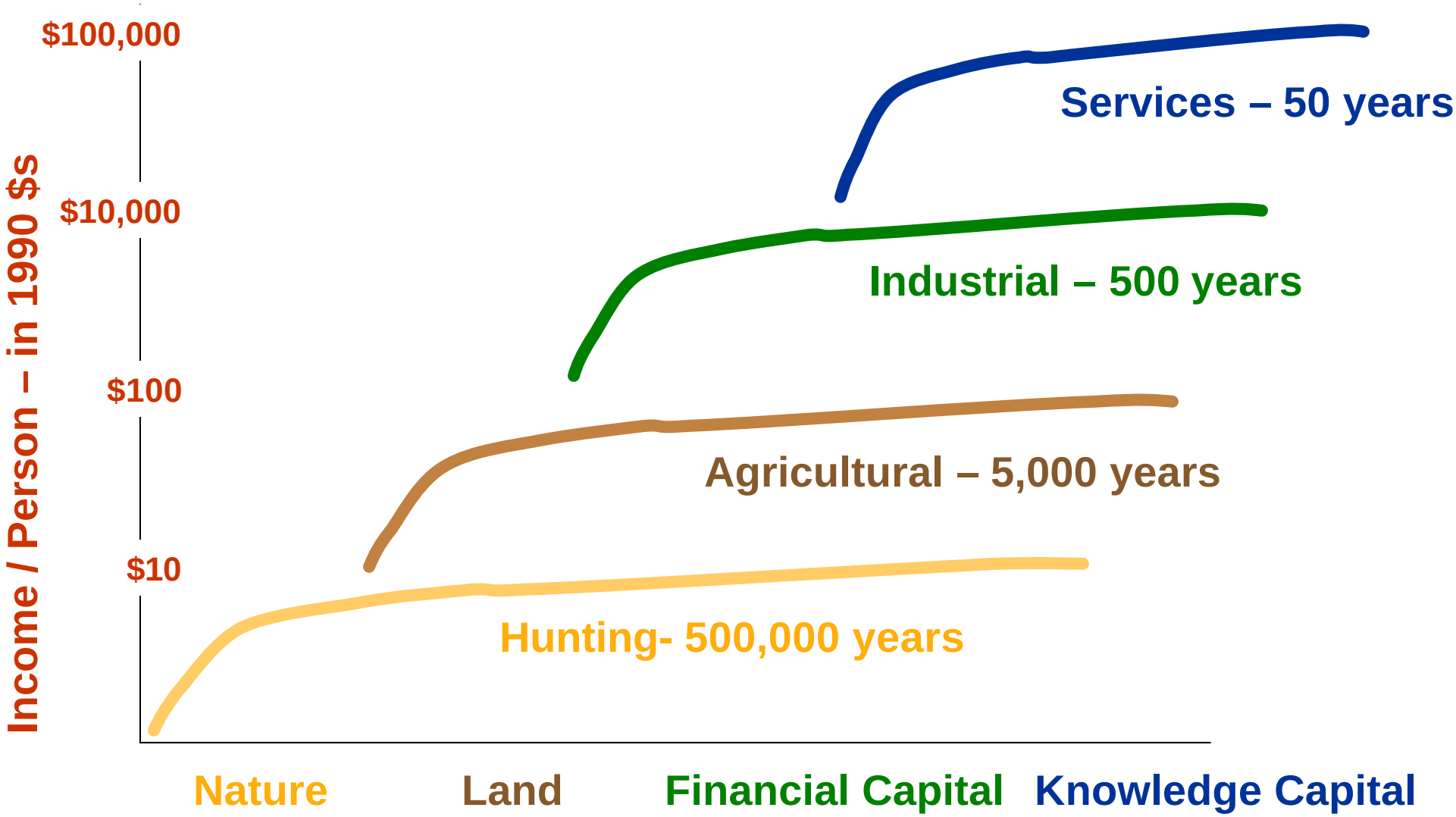
Outline of this Presentation – Part I

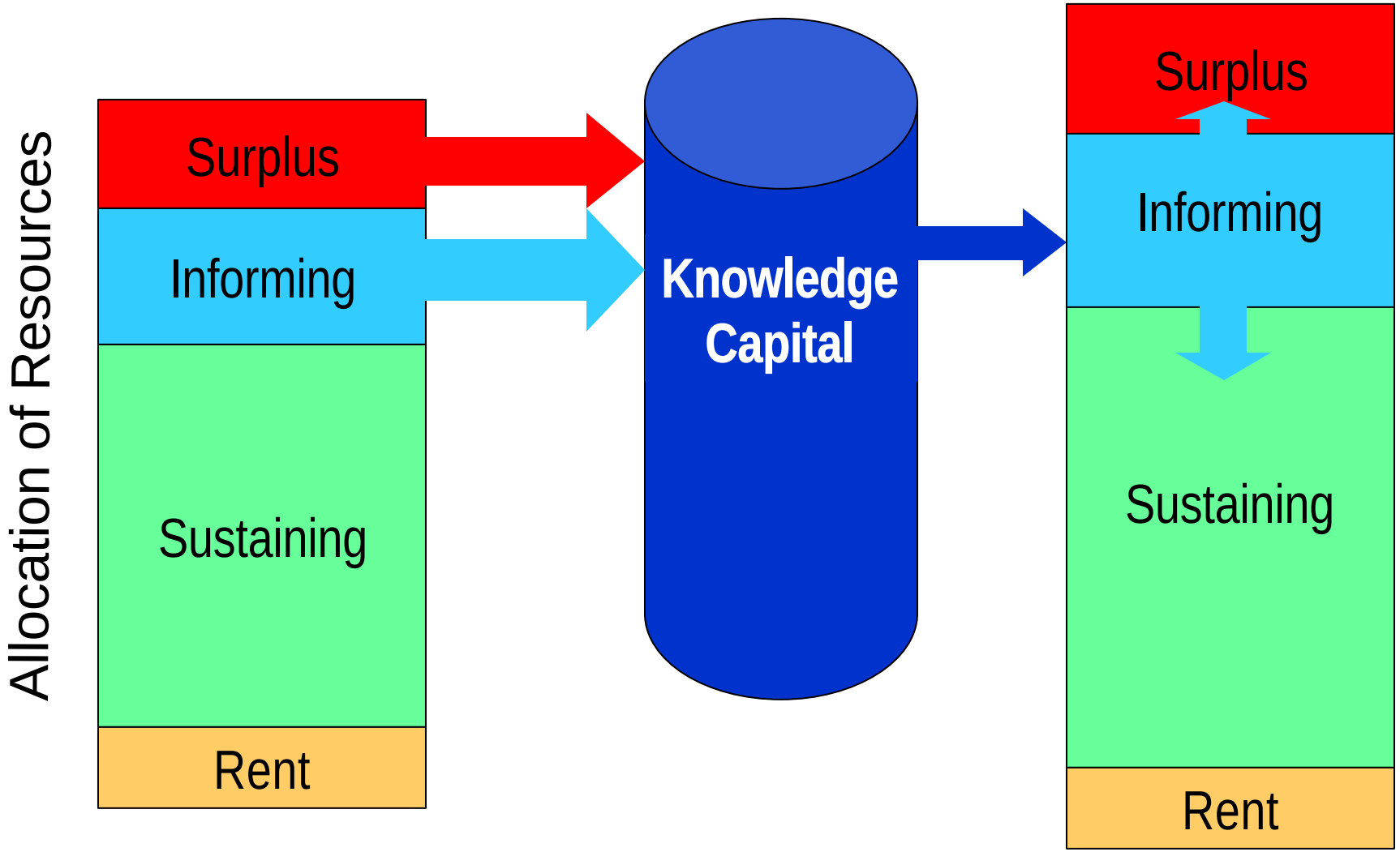
- **A Historical Context**

- **The Economics of E-Commerce**
- **Measuring Knowledge Capital**
- **Internet and Knowledge Capital**

A View of Economic Development



The Knowledge Capital Accumulation Model

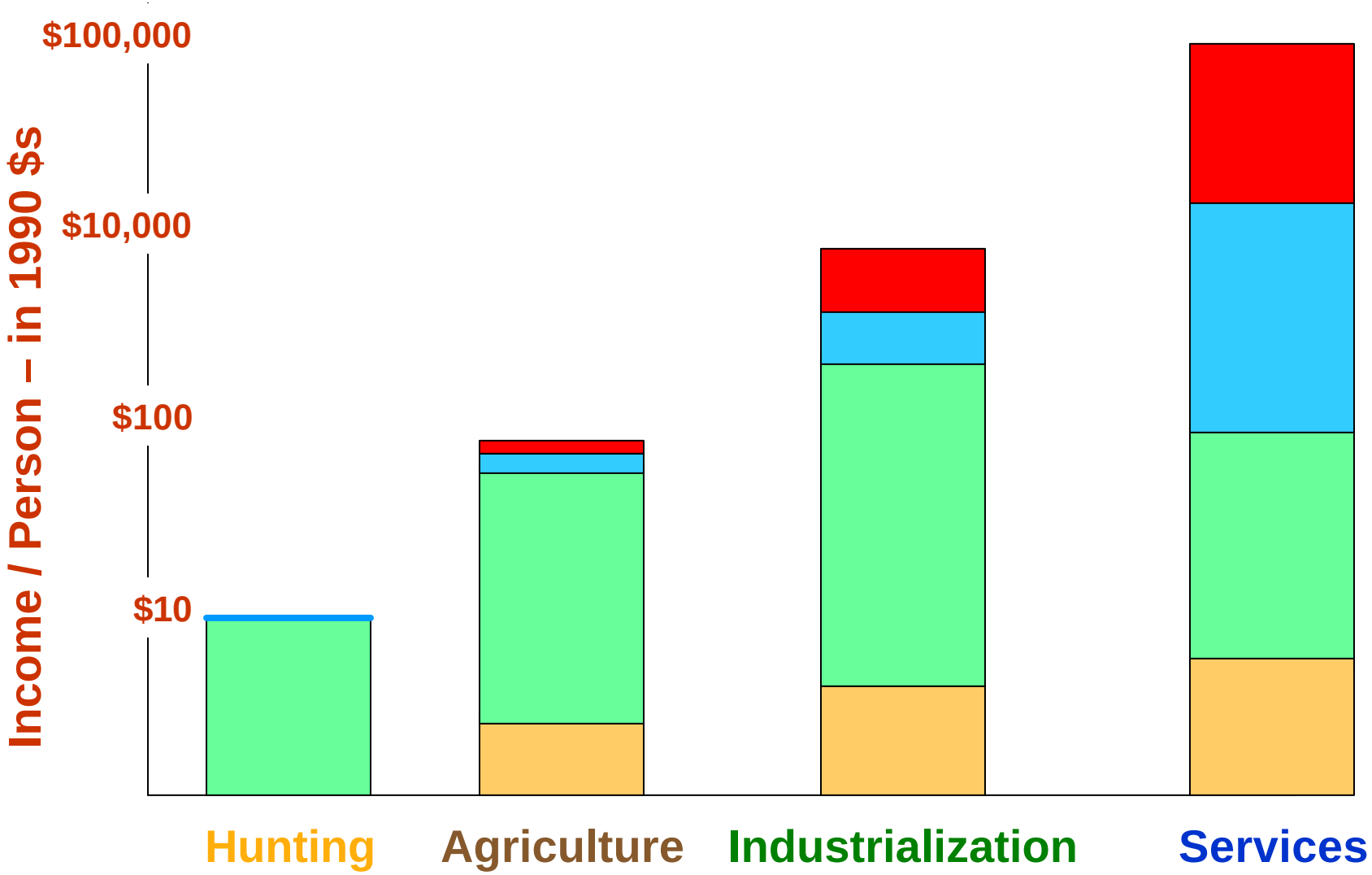


Definition of Terms, in Corporate Context

- **Rent: Interest and Depreciation**
- **Sustaining: Cost of Goods Sold**
- **Informing: Sales, General & Administrative**
- **Surplus: Economic Profit**

- **Knowledge Capital: Assets that Generate Economic Profit**

Composition of Resources at Stages of Growth



The Power of Documents, Knowledge Capital & Information Systems

In Hunting Society

Origins of Written Communications

Pech Merle Cave, France, cca. 18,000 B.C.

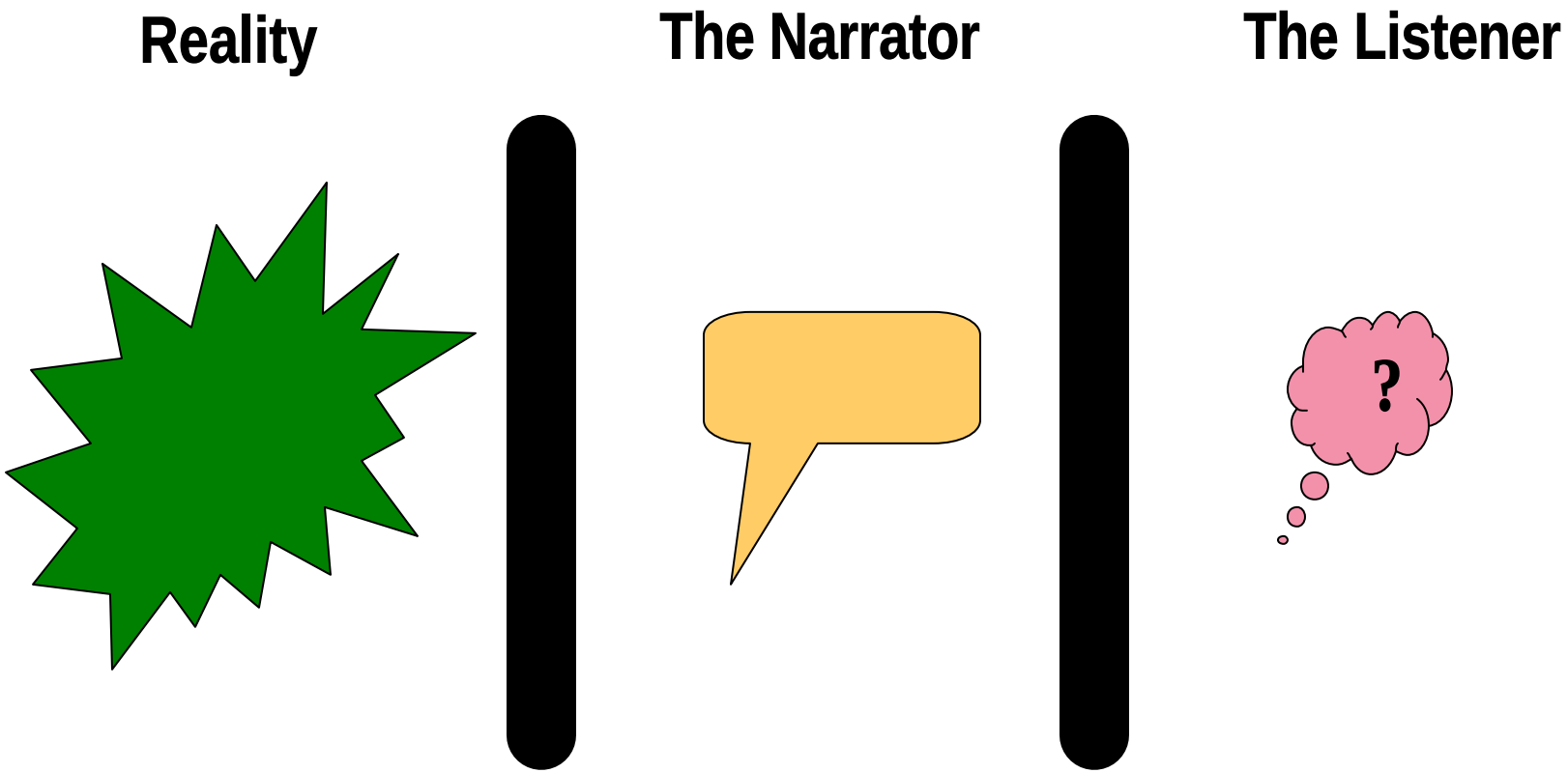
Hunting Society Memory-Aids

Birch-bark Records, Ojibwa Indians

Next Evolutionary Step: Pictographic Memory-Aid Clues

Na-Khi Tribe, Burma/Laos

Hunting Society Barriers to Understanding



The Economics of a Tribal Hunting Society

- **Rent: None**
- **Sustaining: Foraging, Hunting, Gathering**
- **Informing: Verbal, limited**
- **Surplus: Primitive Tools**

- **Knowledge Capital: Customs and Rituals**

RESULT: 500,000 years to reach $10/person

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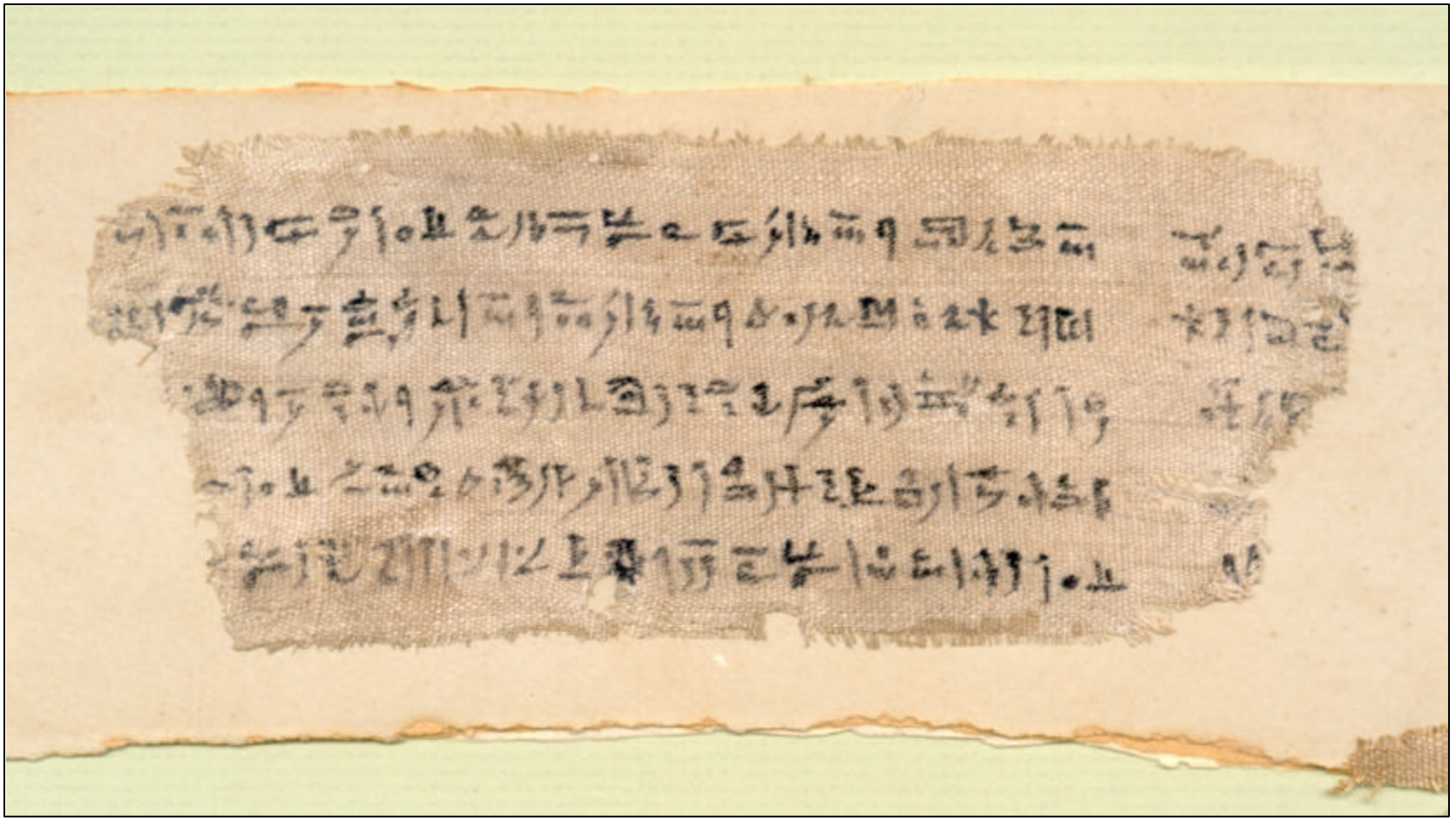
In Agricultural Society

Read Only by the Class That Wrote It

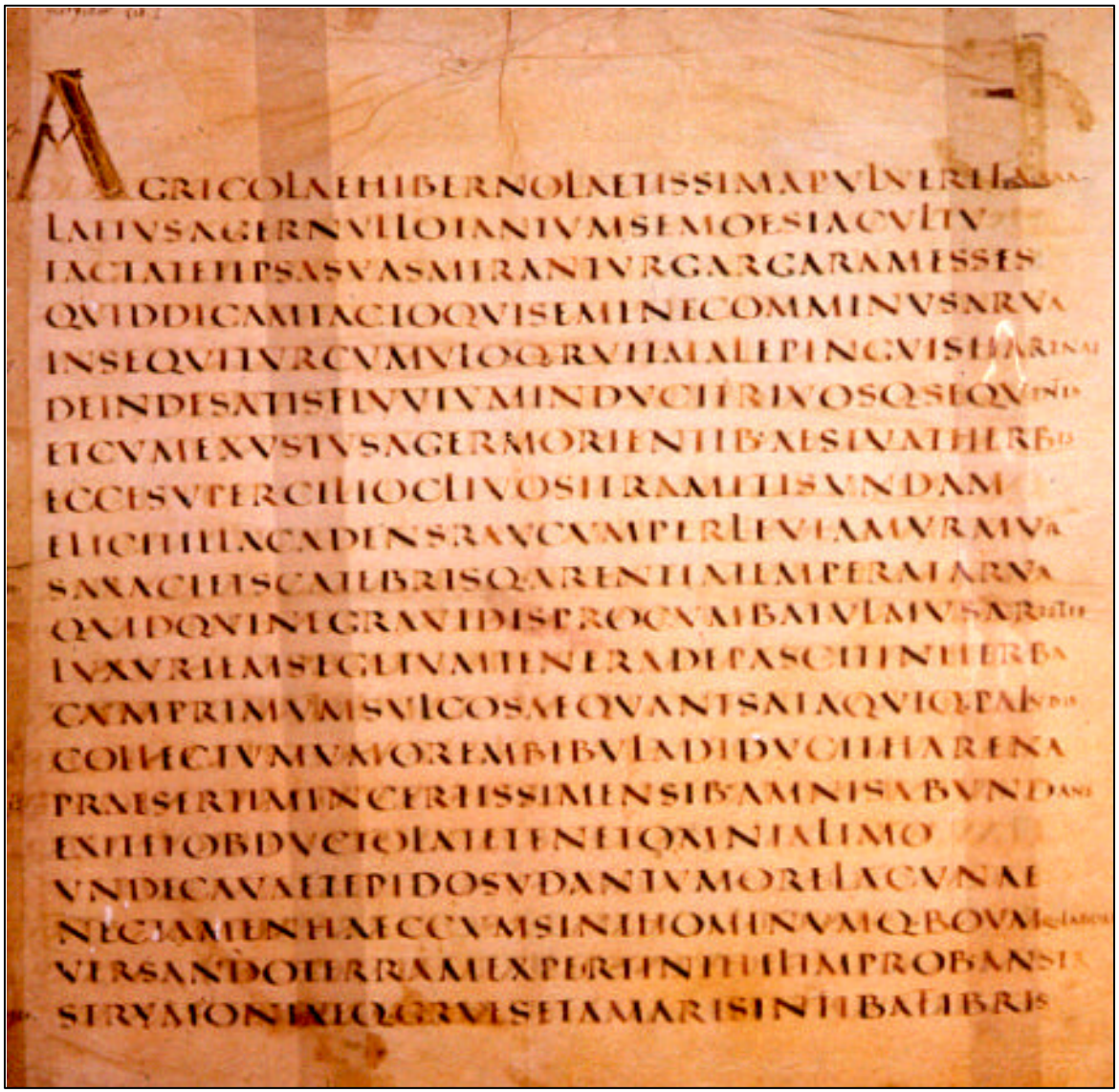
Cuneiform Receipt for 6 Sheep and 5 Goats, Babylon, cca. 3,000 B.C.

Hieroglyphs Representing Pictographs

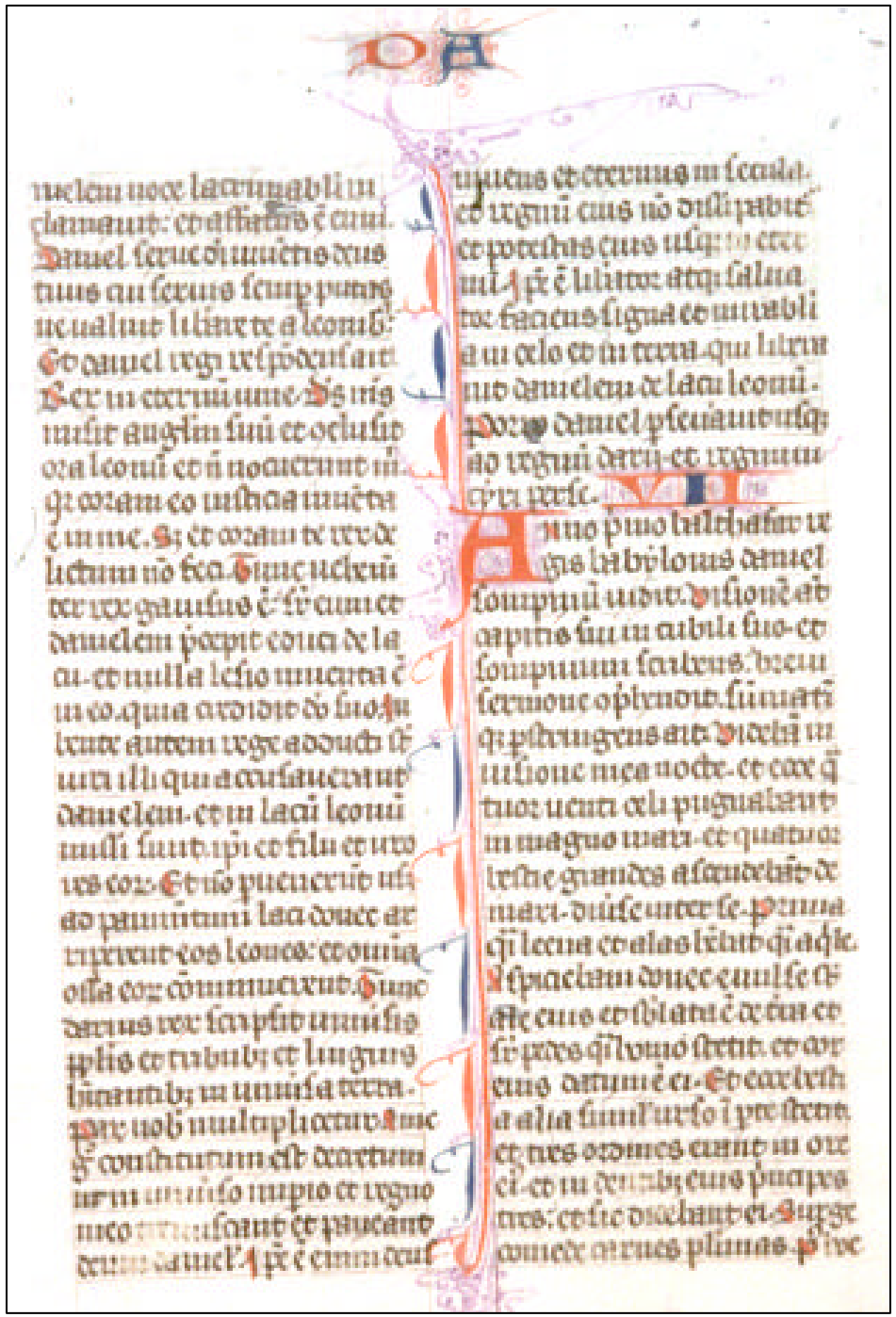


Syllabic Representation, on Cotton Cloth, Egypt, cca. 1,000 B.C.

Virgil, Roman Lettering, 4th Century A.D.



French Bible, Gothic Script A.D. 1310



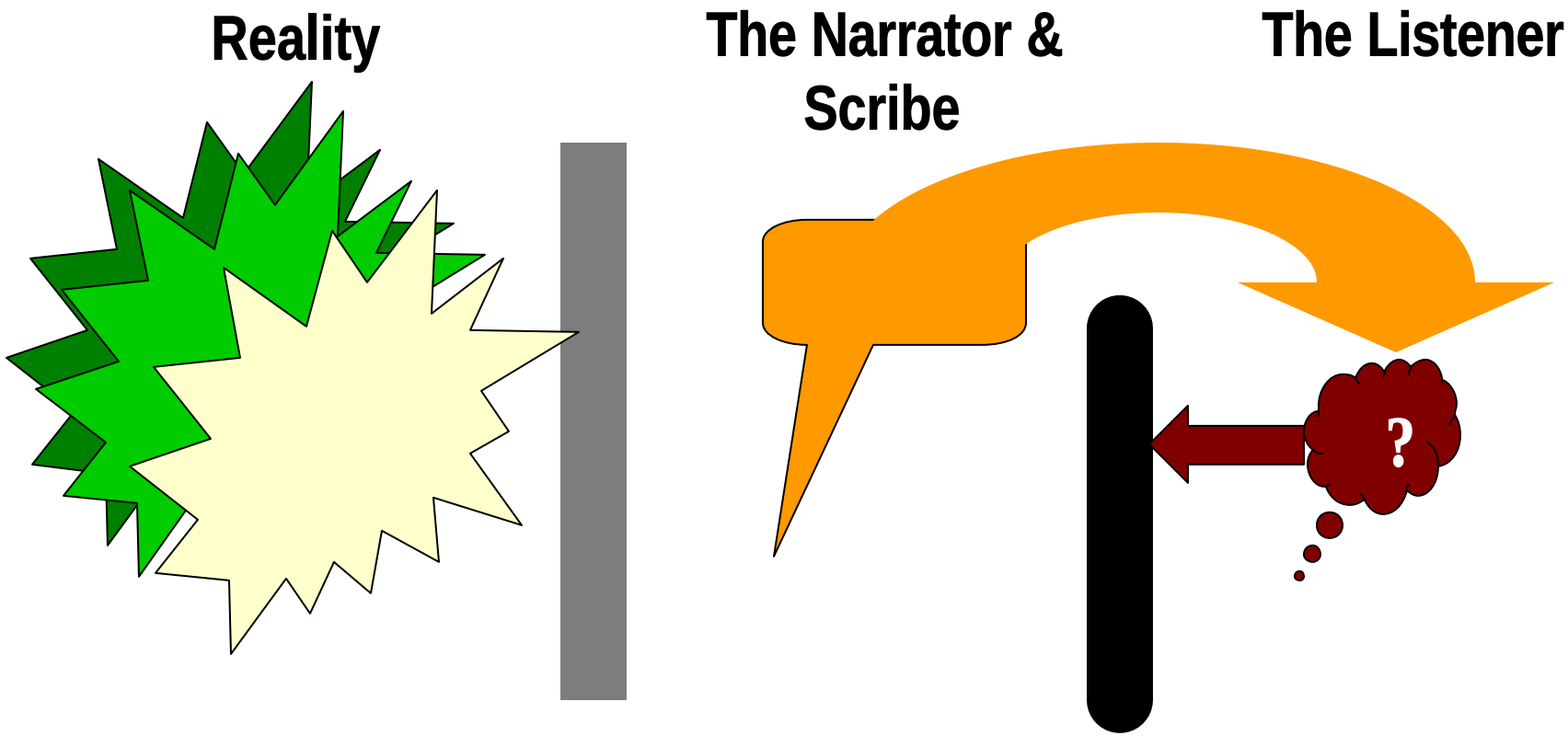
Means for Reproduction of Sacred Texts

Buddhist Sutra, Tibet, cca. 1960

Example of Technology Ahead of Social Economics

Movable Metal Type, Japan, cca. 770 A.D. – Print run of 1 million

Extensive Barriers to Understanding and to Communicating



The Economics of a Feudal Agricultural Society

- **Rent: Serfdom**
- **Sustaining: Land Cultivation, Animal Husbandry**
- **Informing: Record-keeping, law**
- **Surplus: Limited, in the hands of nobility**

- **Knowledge Capital: For priesthood and feudal overlords**

RESULT: 5,000 years to reach $100/person

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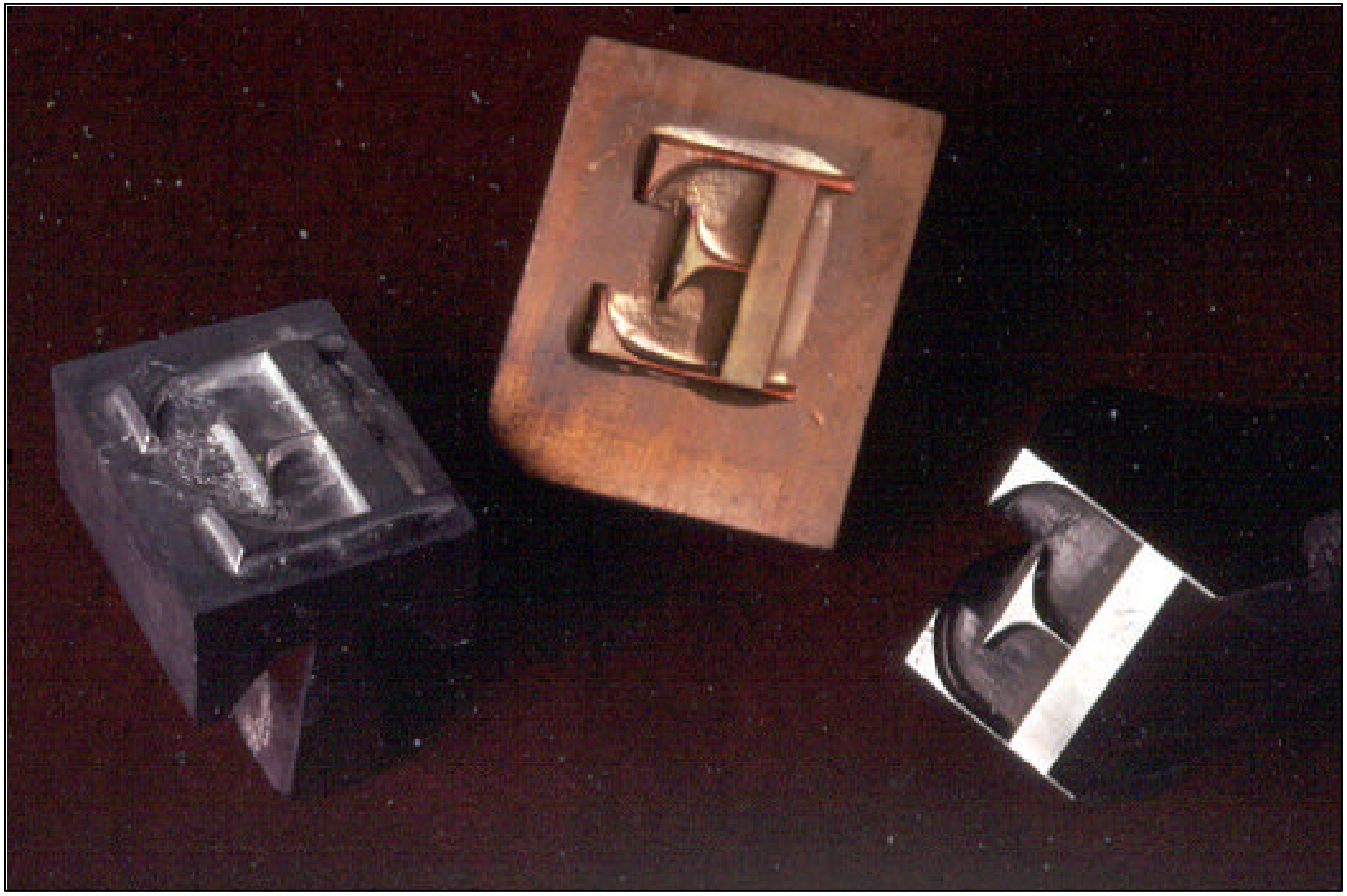
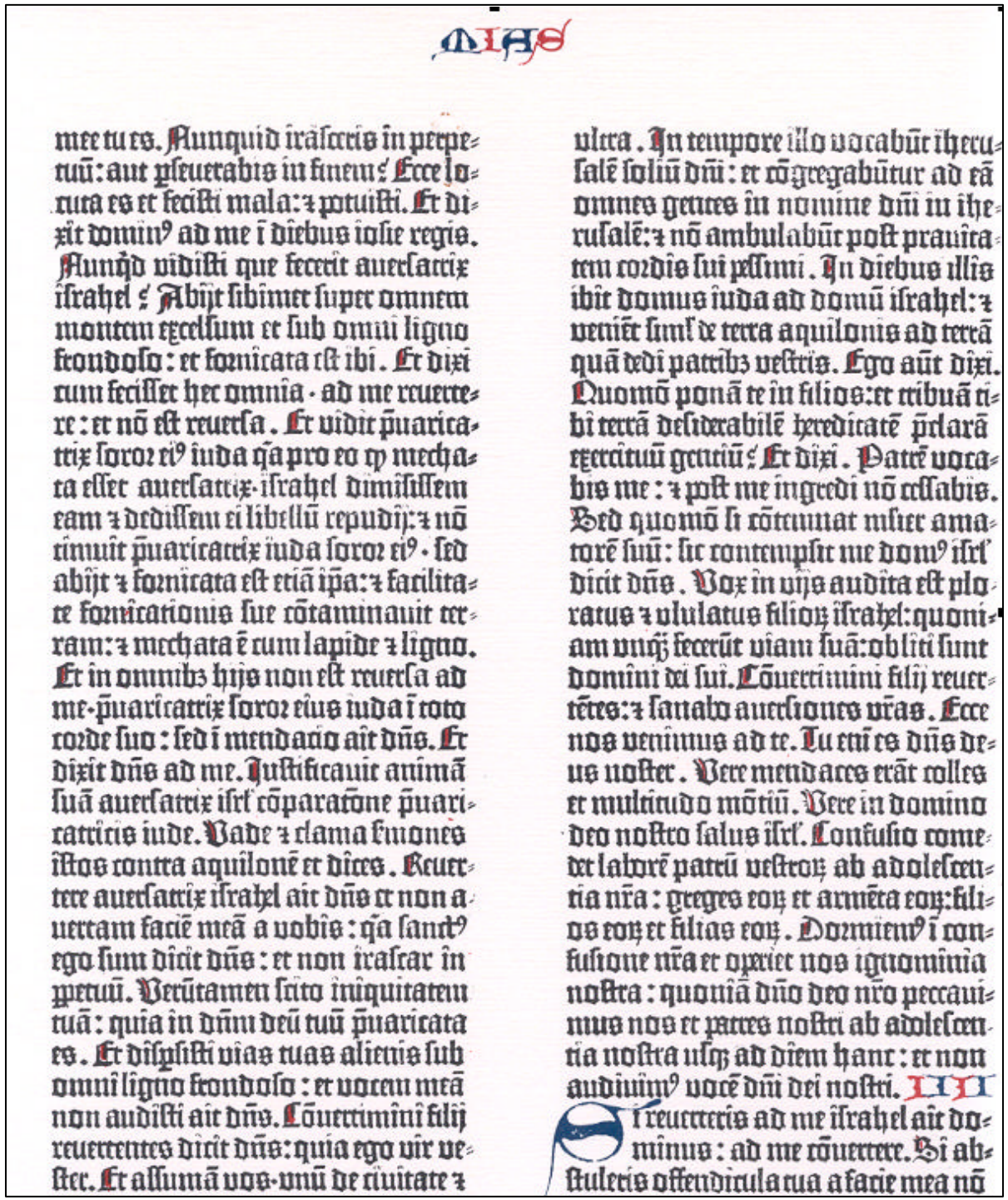
In Industrial Society

The Guttenberg Invention: The Reproducible Font

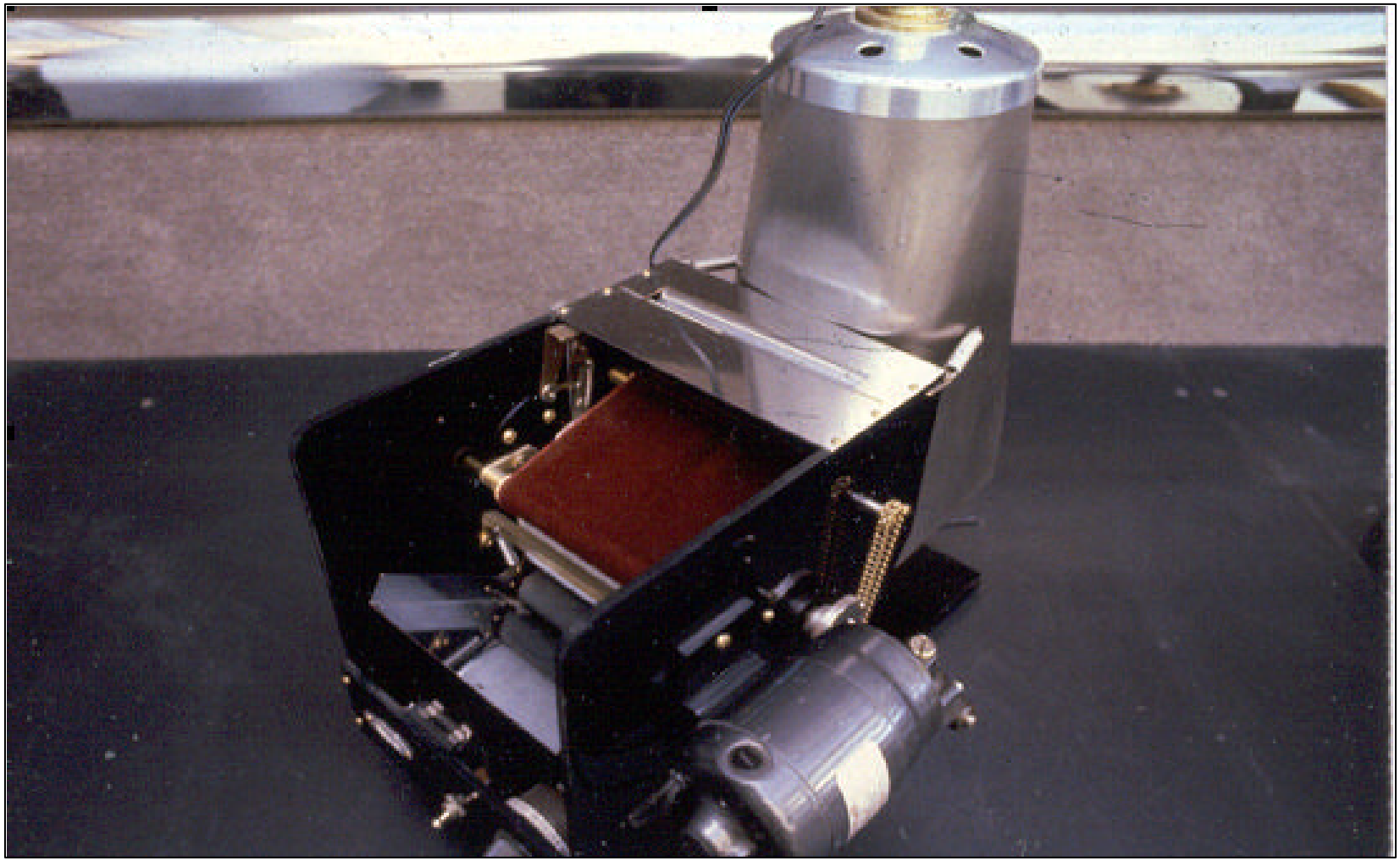


Gutenberg Bible, Mainz, Germany 1455



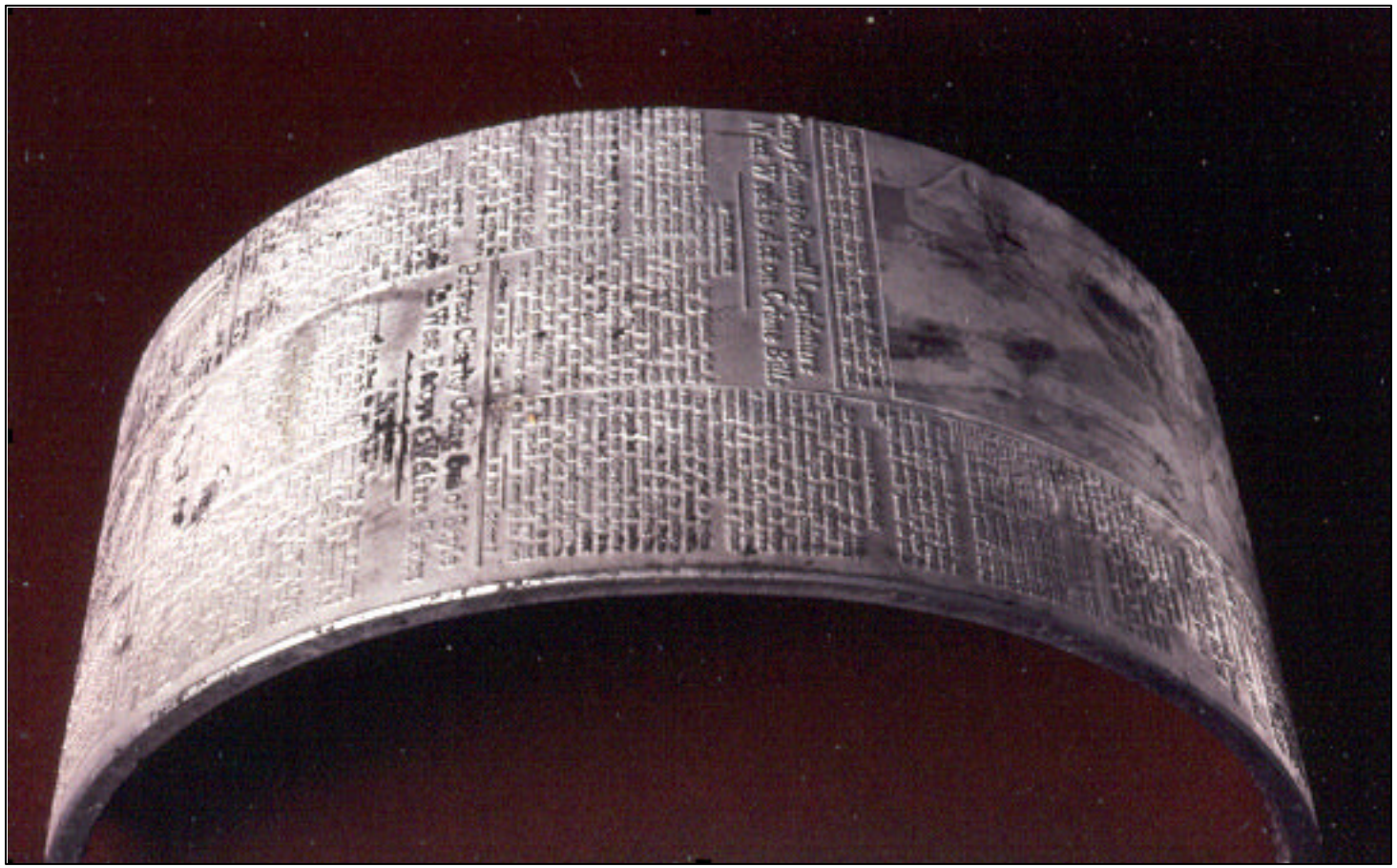
mee tu es. Nunquid irascetis in perpe-
tuū: aut pseuerabis in finem? Ecce lo-
cuta es et fecisti mala: et potuisti. Et di-
xit dominꝰ ad me ī diebus iosie regis.
Nunqd vidisti que fecerit aueisatrix
israhel? Abiit sibimet super omnem
montem excelsum et sub omni ligno
frondoso: et fornicata est ibi. Et dixi
cum fecisset hec omnia. ad me reuerte-
re: et nō est reuersa. Et vidit p̄uarica-
trix soror eiꝰ iuda q̄a pro eo q̄ mecha-
ta esset aueisatrix israhel dimisissem
eam et dedissem ei libellū repudij: et nō
timuit p̄uaricatrix iuda soror eiꝰ. sed
abiit et fornicata est etiā ipa: et facilita-
te fornicationis sue cōtaminauit ter-
ram: et mechata ē cum lapide et ligno.
Et in omnibꝫ hijs non est reuersa ad
me. p̄uaricatrix soror eius iuda ī toto
corde suo: sed ī mendacio ait dñs. Et
dixit dñs ad me. Iustificauit aiam
suā aueisatrix isrl cōparatione p̄uari-
catricis iude. Vade et clama hmones
istos contra aquilonē et dices. Reuer-
tere aueisatrix israhel ait dñs et non a-
uertam faciē meā a vobis: q̄a sanctꝰ
ego sum dicit dñs: et non irascar in
petuū. Verūtamen scito iniquitatem
tuā: quia in dñm deū tuū p̄uaricata
es. Et dispsisti vias tuas alienis sub
omni ligno frondoso: et vocem meā
non audisti ait dñs. Cōuertimini filij
reuertentes dicit dñs: quia ego vir ve-
stet. Et assumā vos. vnū de ciuitate et
ultra. In tempore illo vocabūt iheru-
salē soliū dñi: et cōgregabūtur ad eā
omnes gentes in nomine dñi in ihe-
rusalē: et nō ambulabūt post prauita-
tem cordis sui pessimi. In diebus illis
ibit domus iuda ad domū israhel: et
venient simł de terra aquilonis ad terrā
quā dedi patribꝫ vestris. Ego aūt dixi.
Quomō ponā te in filios: et tribuā ti-
bi terrā desiderabilē hereditatē p̄clarā
exercituū gentiū? Et dixi. Patrē vocā-
bis me: et post me ingredi nō cessabis.
Sed quomō si cōtemnat mulier amato-
rē suū: sic contempsit me domꝰ isrl
dicit dñs. Vox in vijs audita est plo-
ratus et vlulatus filiorꝫ israhel: quoni-
am vnꝫ fecerūt viam suā: obliti sunt
domini dei sui. Cōuertimini filij reuer-
tētes: et sanabo aueisiones vras. Ecce
nos venimus ad te. Tu enī es dñs de-
us noster. Vere mendaces erāt colles
et multitudo mōtiū. Vere in domino
deo nostro salus isrl. Confusio come-
dit laborē patrū vestrorꝫ ab adolescen-
tia nra: greges eorꝫ et armēta eorꝫ: fili-
os eorꝫ et filias eorꝫ. Dormiemꝰ ī con-
fusione nra et operiet nos ignominia
nostra: quoniā dño deo nro peccaui-
mus nos et patres nostri ab adolescen-
tia nostra usqꝫ ad diem hanc: et non
audiuimꝰ vocē dñi dei nostri. IIII
Si reuertēris ad me israhel ait do-
minus: ad me cōuertere. Si ab-
stuleris offendicula tua a facie mea nō

The End of Electro-Optical Reproduction

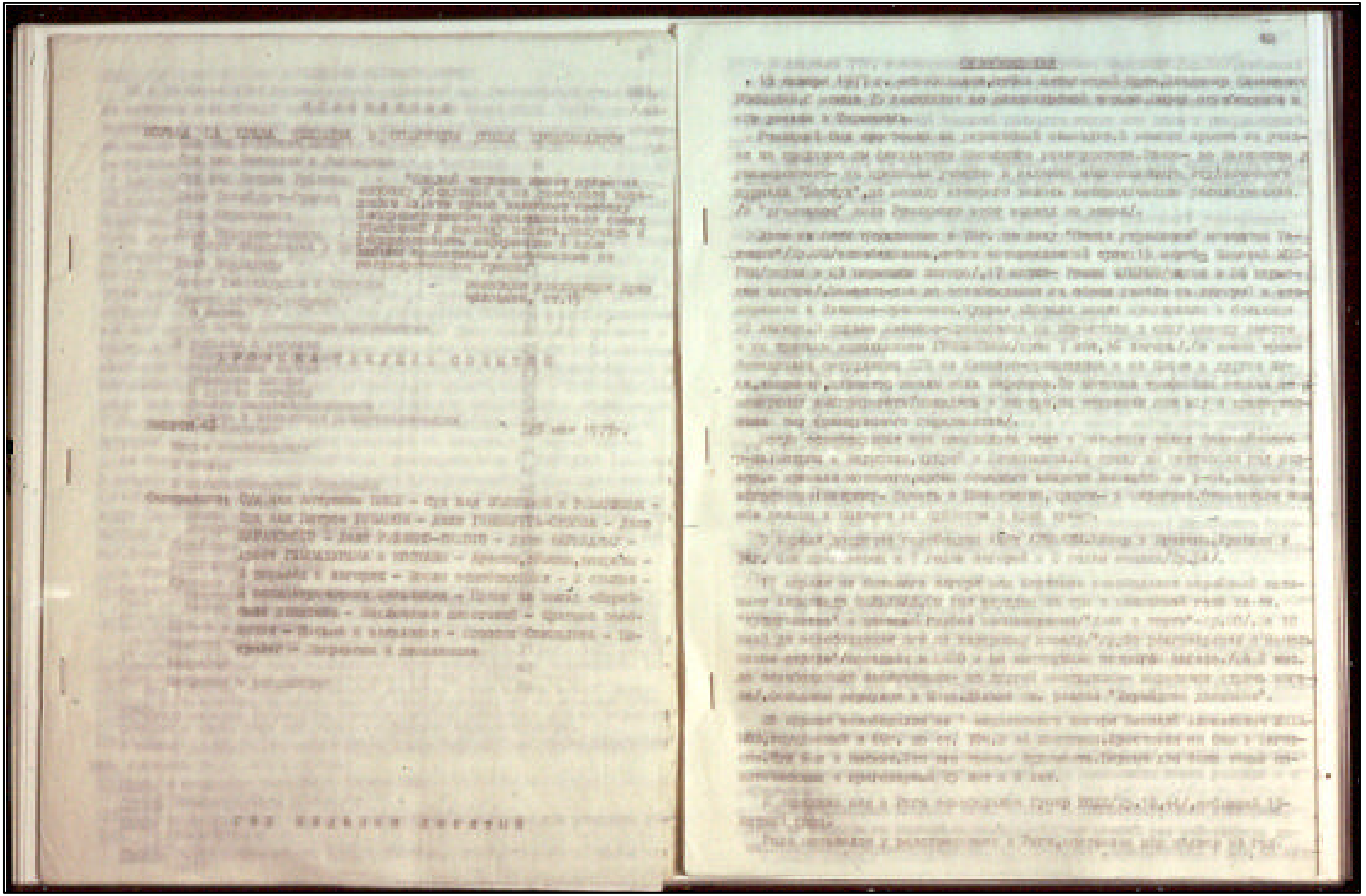


The first xerographic machine – Chester Carlson, 1939

Last Metal Plate from New York Times Rotary Presses - 1978

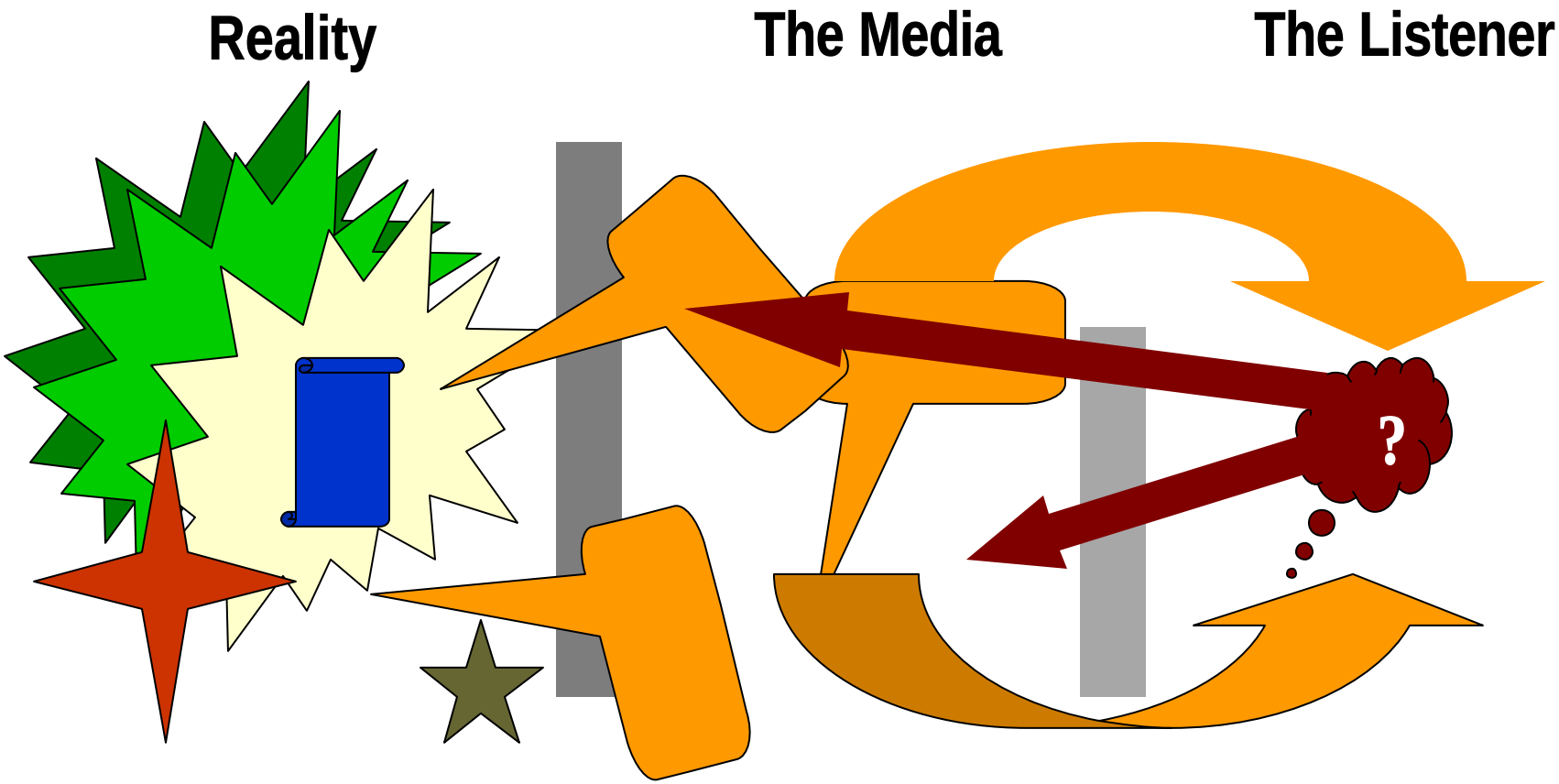


Without Freedom Communication Atrophies



"Samizdat" – Chronicle of Current Events, U.S.S.R, May 25,1977

Extensive Barriers to Understanding and to Communicating



The Economics of a National Industrial Society

- **Rent: for Financial Capital**
- **Sustaining: Cost of Production**
- **Informing: Administrative Overhead, Government Bureaucracy**
- **Surplus: Largely Concentrated and Taxed**

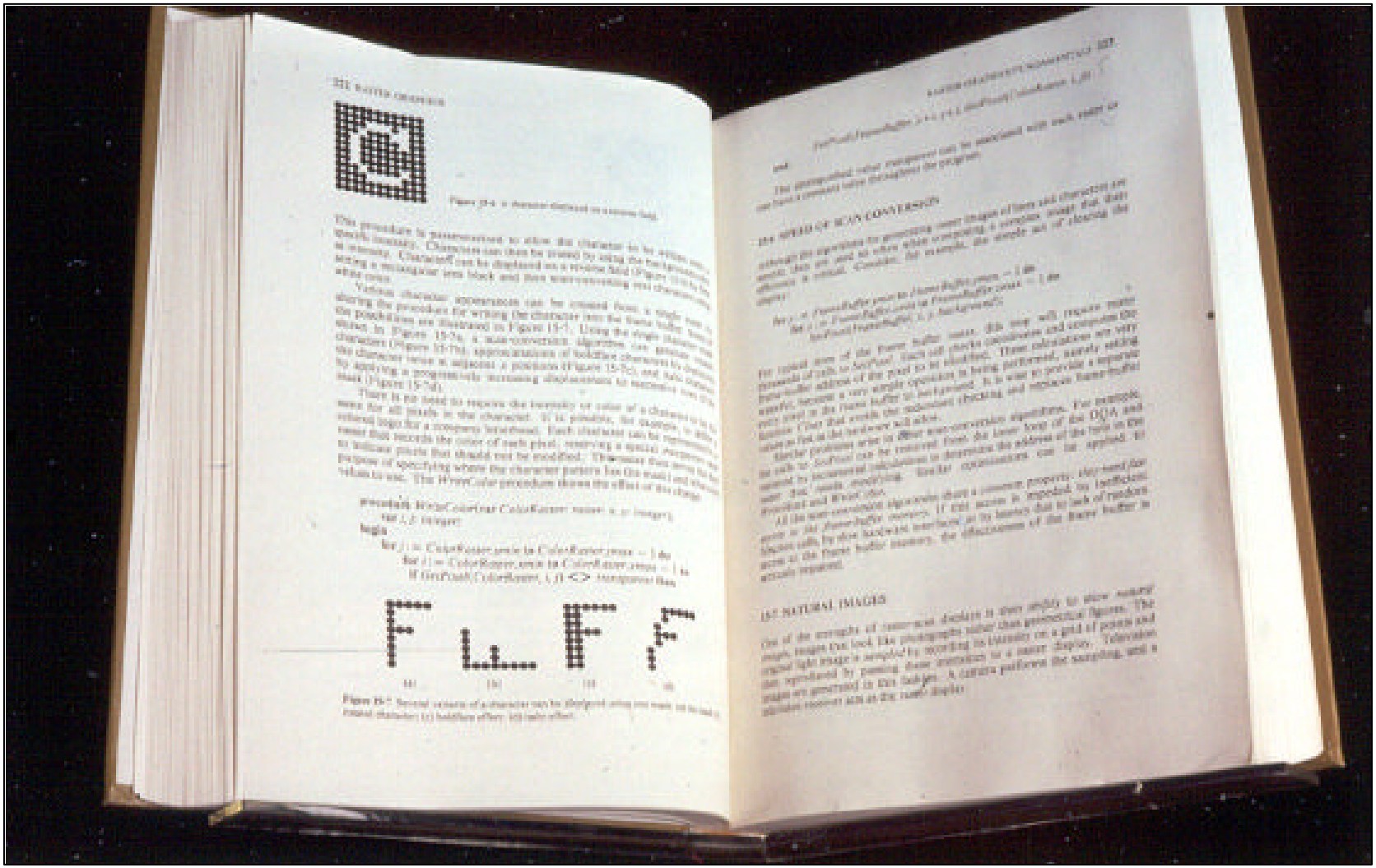
- **Knowledge Capital: In trained workforce and machinery**

RESULT: 500 years to reach $10,000/person

The Power of Documents, Knowledge Capital & Information Systems

In Services Society

The World's First Laser-Generated Textbook



Sproull & Newman, Principles of Interactive Graphics, March 1979

8,000 Years Later: The Information Glut

Outline of this Presentation – Part II

- **A Historical Context**
- **The Economics of E-Commerce**
- **Measuring Knowledge Capital**
- **Internet and Knowledge Capital**

E-Publishing Changes the Authoring, Production and Delivery Processes

Digital Publications from The Information Economics Press

D001: Information Productivity Indicators of U.S. Corporations
By Paul A. Strassmann
25 Pages Online Price: $9.98 eMatter (PDF)
Date Published: 05/2000 Product#: EB00014737

D002: Revenues and Profits of Global Information Technology Suppliers
By Paul A. Strassmann
53 Pages Online Price: $9.98 eMatter (PDF)
Date Published: 06/2000 Product#: EB00016325

D003: Governance of Information Management: Principles and Concepts
By Paul A. Strassmann
57 Pages Online Price: $9.98 eMatter (PDF)
Date Published: 07/2000 Product#: EB00016431

D004: Assessment of Productivity, Technology and Knowledge Capital
By Paul A. Strassmann
93 Pages Online Price: $14.98 eMatter (PDF)
Date Published: 07/2000 Product#: EB00016531

D005: The Digital Economy and Information Technology – A Critique of Department of Commerce Spending Statistics
By Paul A. Strassmann
25 Pages Online Price: $4.98 eMatter (PDF)
Date Published: 10/2000 Product#: EB00018958

What E-Publishing Displaces

Now Available!

Information Productivity
by Paul Strassmann
Assessing the Information Management Costs of U.S. Industrial Corporations.
How the costs of information management relate to all other costs of doing business.

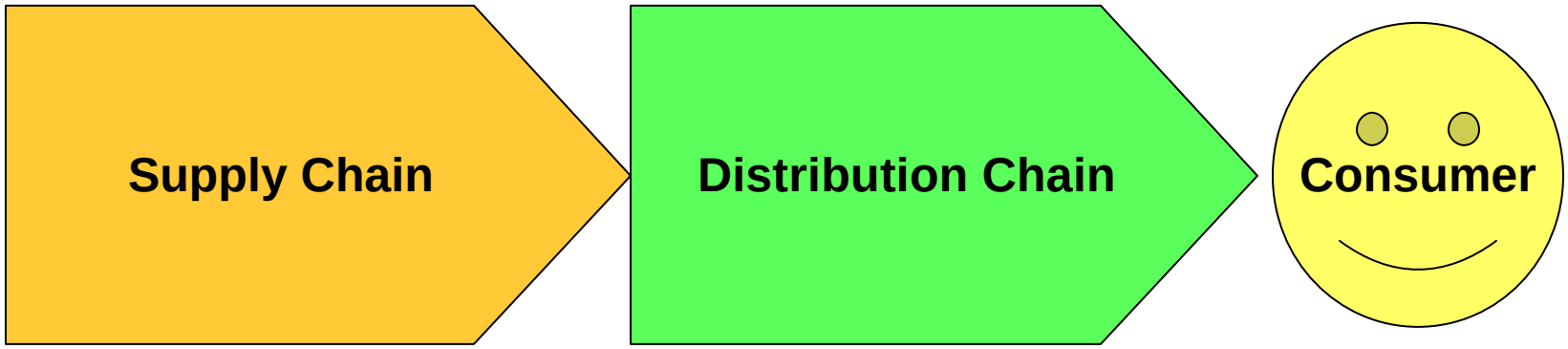
1999. Hardcover, 168 pages, 89 illustrations
Price: $49 + $4.50 for UPS shipping and handling (within continental US).

#1 Bestseller at Amazon.com

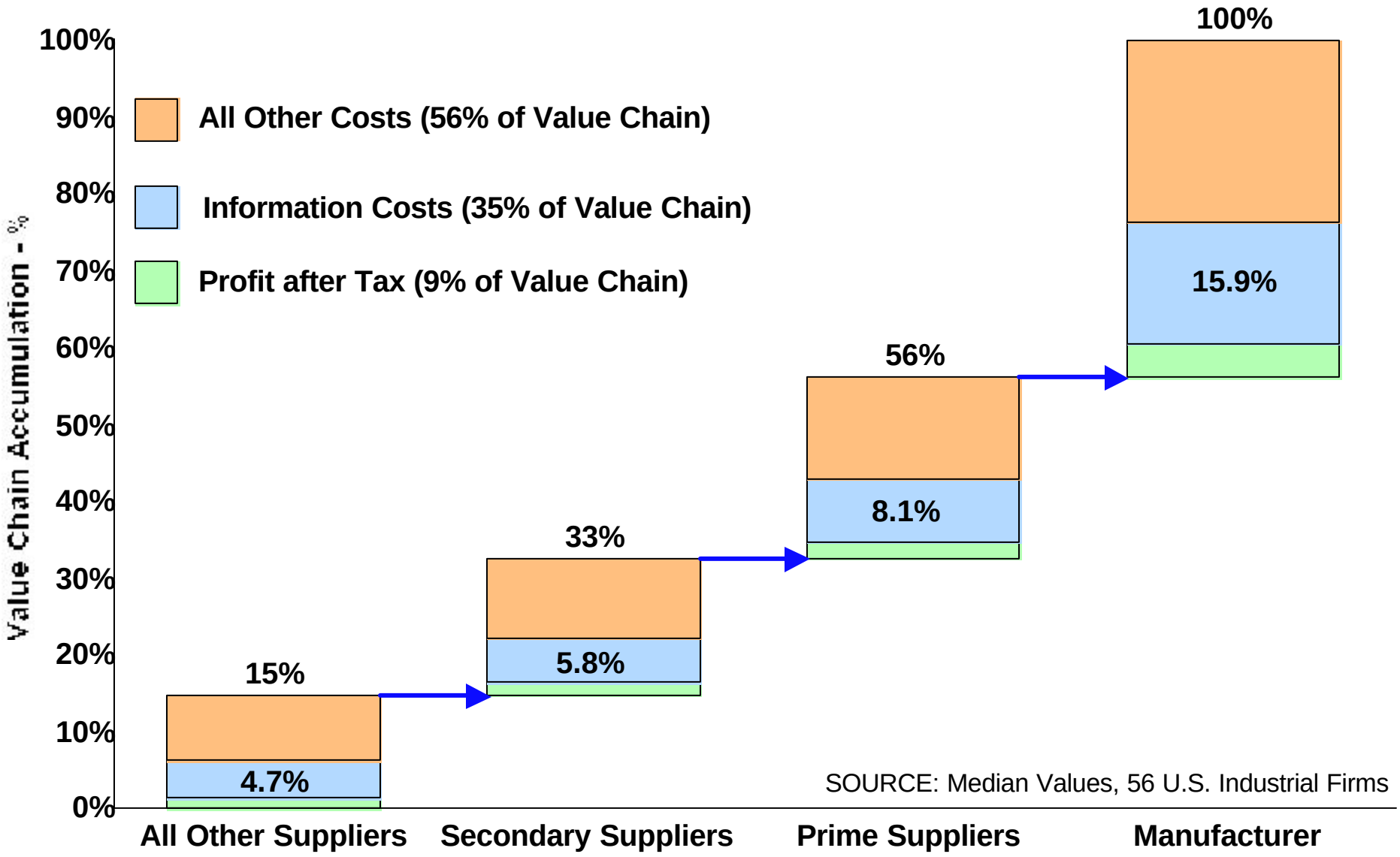
The Squandered Computer
by Paul Strassmann
This is the definitive book on the economics of computerization.
executives the tools they need to make rational investments in in

1997. Hardcover, 426 pages, 66 illustrations.
Price: $49 + $4.50 for UPS shipping and handling (within contine

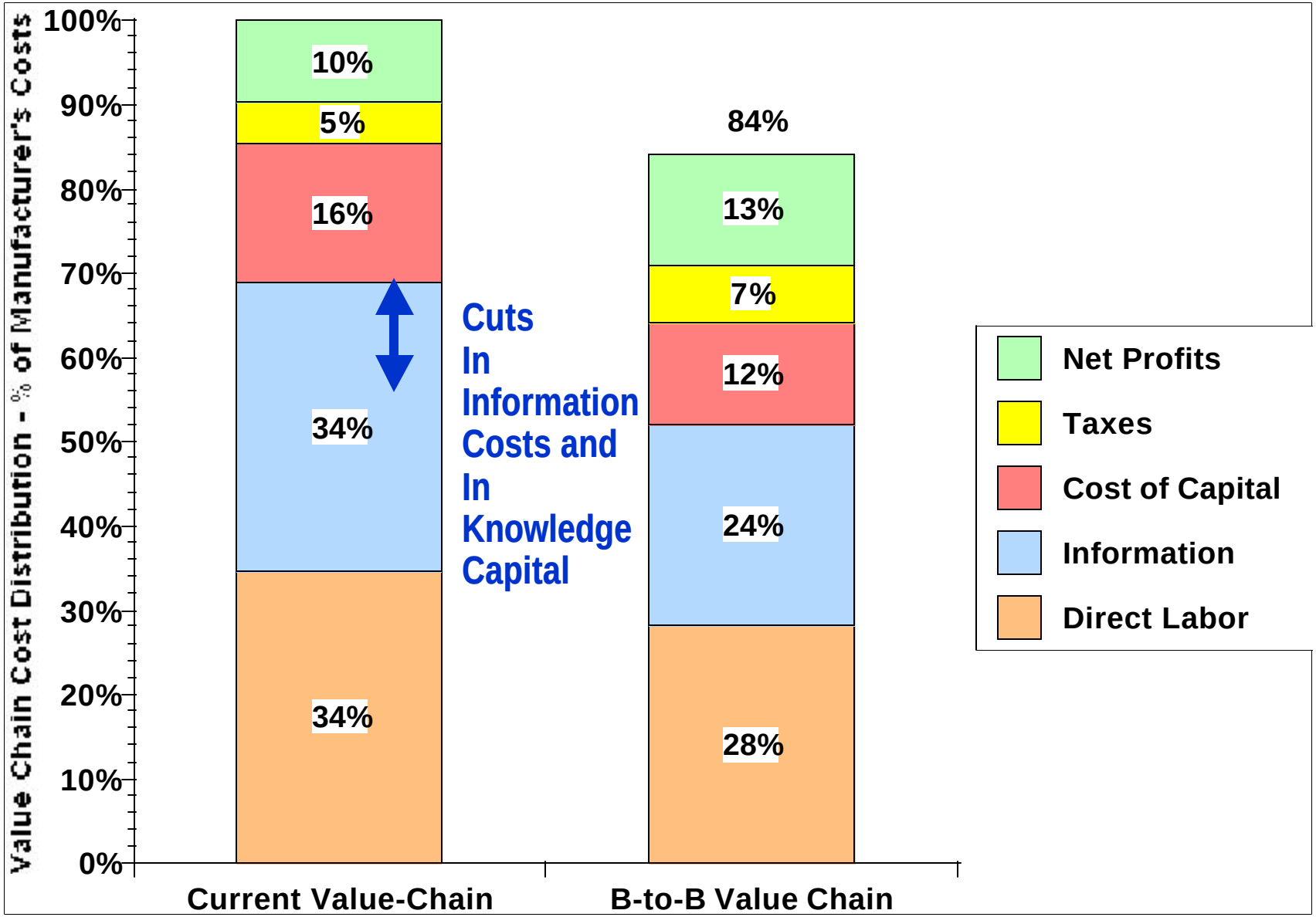
E-Commerce Shifts the Services Value Chain



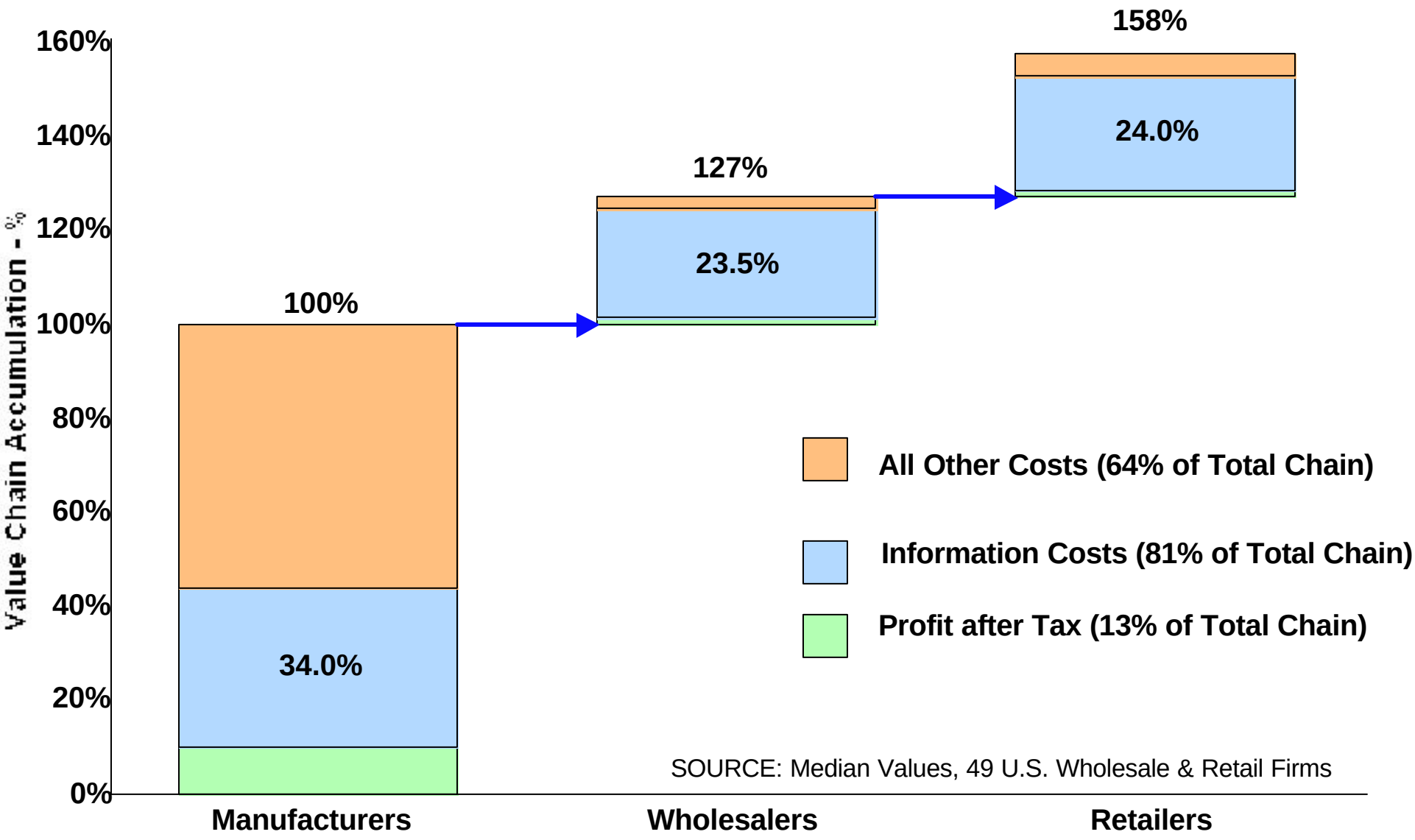
Costs, Information and Profit in a Supply Value Chain



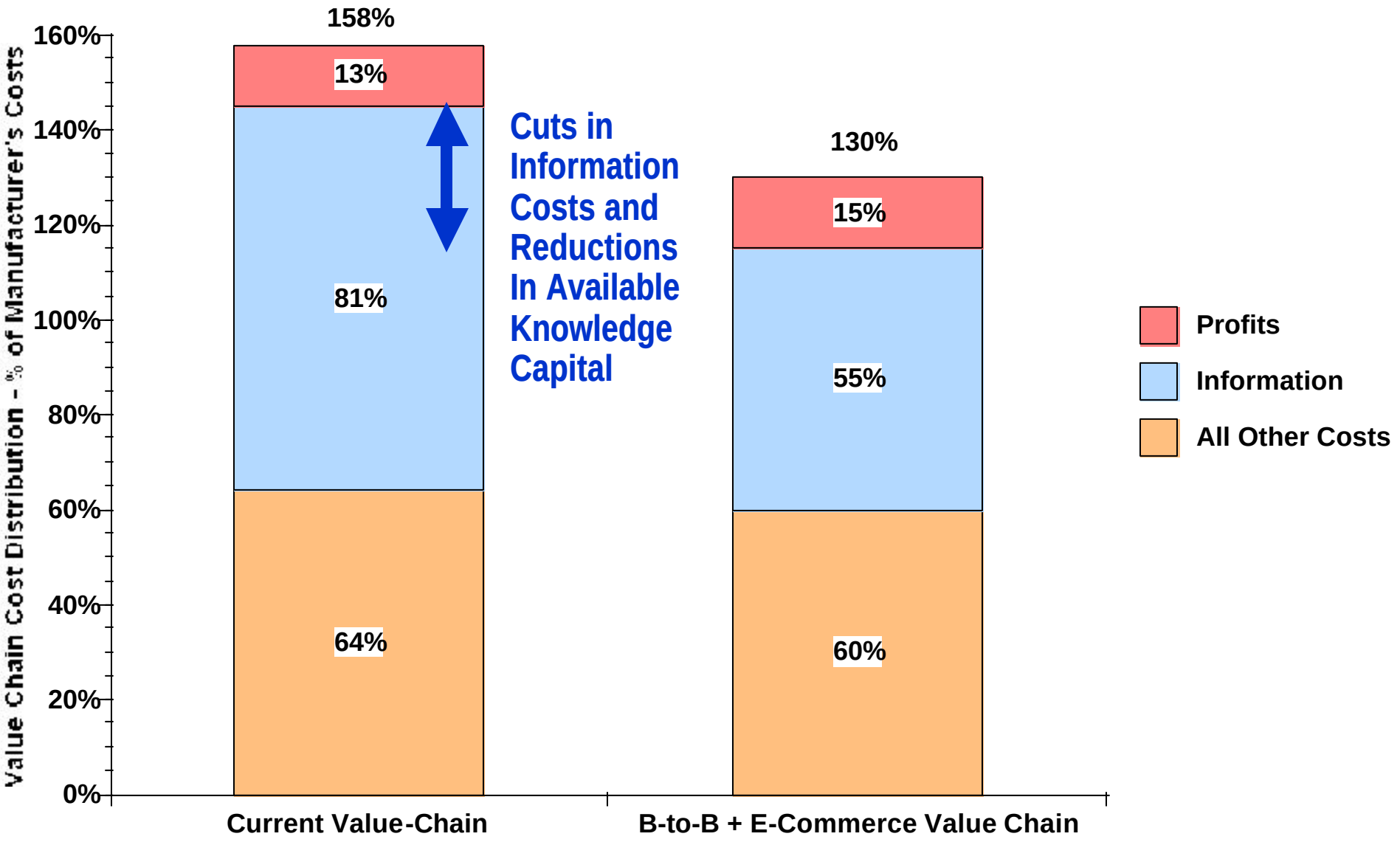
Estimate of Supply Chain Costs



The Supply and Distribution Value Chain



Changes in the Supply and Distribution Value Chain



Summary Observation

- The information-distribution industries will be subject to rapidly changing economics in the supply and distribution of its products.

Conclusion

- Verifiable and repeatable metrics are now needed to guide the making of investment decisions that will produce a sustainable growth in Knowledge Capital.

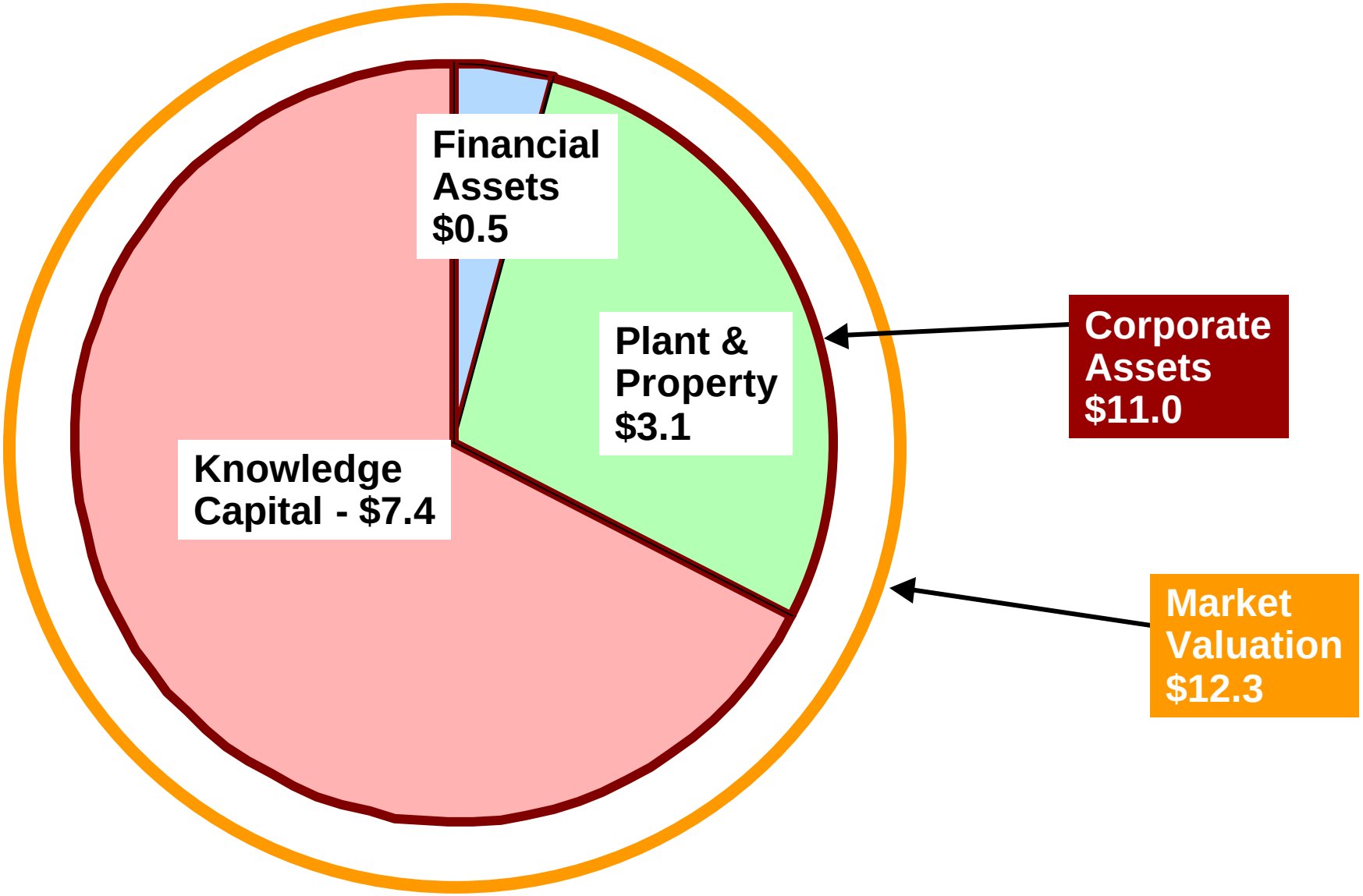
Outline of this Presentation – Part III

- **A Historical Context**
- **The Economics of E-Commerce**
- **Measuring Knowledge Capital**
- **Internet and Knowledge Capital**

Ideas Emerging at End of 20th Century

- **Knowledge Capital**
- **Knowledge Assets**
- **Knowledge Management**
- **Intellectual Capital**
- **Information Assets**
- **Information Warfare**
- **Information Security**

Knowledge Capital Now the Key U.S. Asset ($ trillions)



SOURCE: Strassmann, Inc. database of 5,763 US firms, 1998

Theme

“ Only if you Can Measure It

Can You Understand and Invest in It.”

Current Measures Disregard Information

$$\text{Productivity} = \frac{\text{Output}}{\text{Input}}$$

$$\text{Return On Assets} = \frac{\text{Profit}}{\text{Finance Capital}}$$

SOURCE OF WEALTH

Focus on Information as the Key Input

$$\text{Information Productivity} = \frac{\text{Output}}{\text{Input}}$$

$$\text{Info. Productivity} = \frac{\text{Economic Profit}}{\text{Cost of Information}}$$

SOURCE OF WEALTH

Fundamental Proposition

Today's *Economic Profit* is the return realized from an accumulation of efficient *Knowledge Capital*.

It is Knowledge Capital that Generates Information Productivity

Economic Profit (EVA) =

Knowledge Capital * Cost of Capital

® Knowledge Capital is a Registered Trademark of Strassmann, Inc.

How to Calculate Knowledge Capital

SOURCE OF WEALTH

$$\textbf{Knowledge Capital} = \frac{\textbf{Economic Profit}}{\textbf{Cost of Capital}}$$

Example of Knowledge Capital Calculations

Pharmaceuticals Case

Calculate Economic Value-Added (1998, Thousands $)

Company	Economic Profit
MERCK & CO.	$4,365,086
GLAXO WELLCOME	$2,757,647
JOHNSON & JOHNSON	$2,446,091
ABBOTT	$2,038,406
WARNER-LAMBERT	$938,302

Calculate Knowledge Capital (1998, Thousands $)

Company	Knowledge Capital
MERCK & CO.	$81,590,396
JOHNSON & JOHNSON	$54,237,051
GLAXO WELLCOME	$42,622,063
ABBOTT	$39,503,994
WARNER-LAMBERT	$10,735,726

Calculate Knowledge Capital/Employee

Company	Employees	Knowledge Capital/Employee
MERCK & CO.	57,300	$1,423,916
GLAXO WELLCOME	54,350	$784,215
ABBOTT	56,236	$702,468
JOHNSON & JOHNSON	93,100	$582,568
WARNER-LAMBERT	41,000	$261,847

Summary Observation

- Knowledge Capital is the largest asset for most corporations;
- Knowledge Capital can be measured.

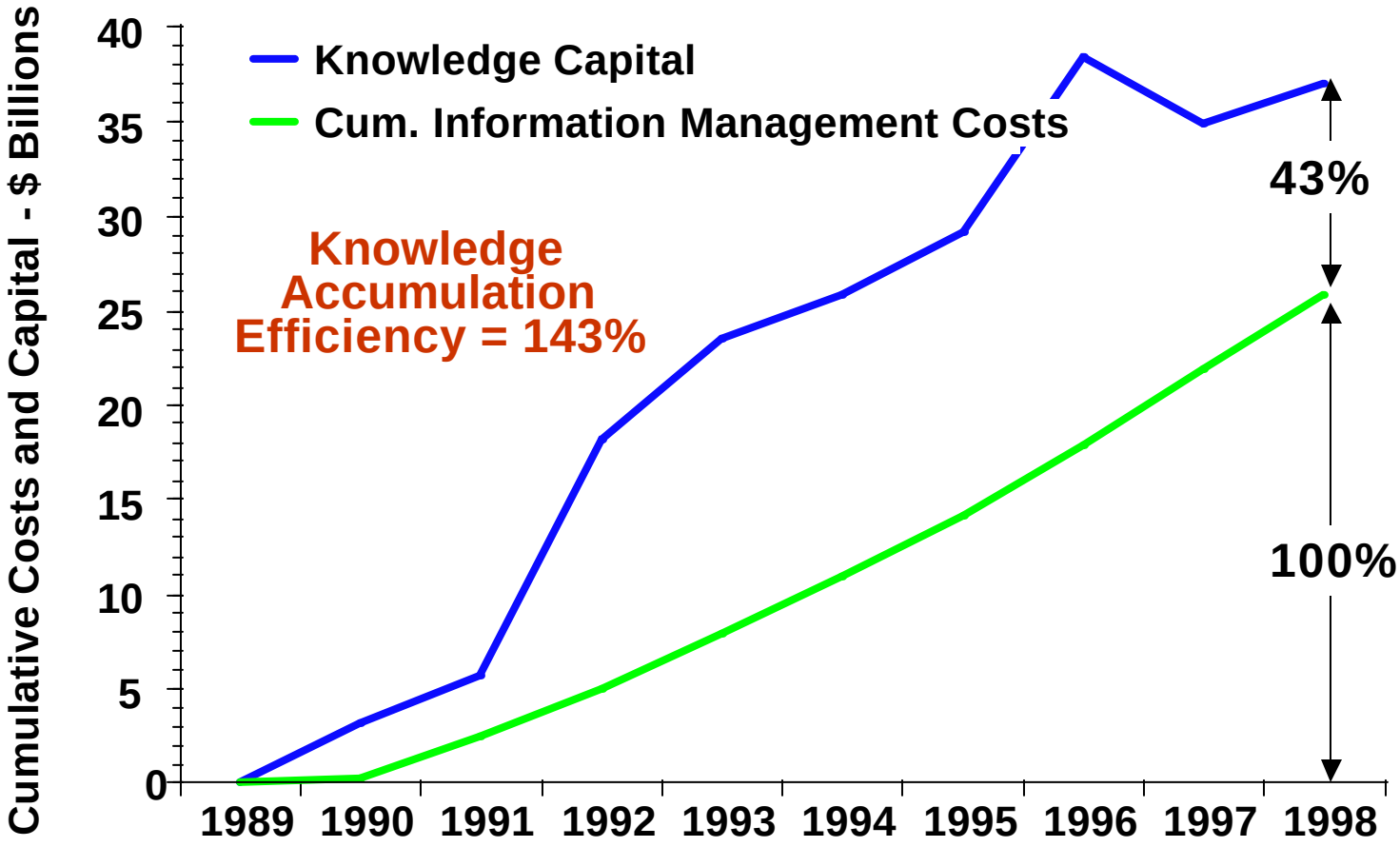
Gaining Knowledge Capital

Source of Knowledge Capital Generation

	1998- $000s	% of Sales
Sales	$12,477,845	100.0%
Cost of Goods	$4,610,198	36.9%
Depreciation	$784,243	6.3%
Selling, General, Administrative, R&D	$3,965,481	31.8%
Other	$-122,676	-1.0%
Taxes	$907,368	7.3%

Source of Knowledge Capital

How to Measure Knowledge Accumulation Efficiency



Outline of this Presentation – Part IV

- **A Historical Context**
- **The Economics of E-Commerce**
- **Measuring Knowledge Capital**

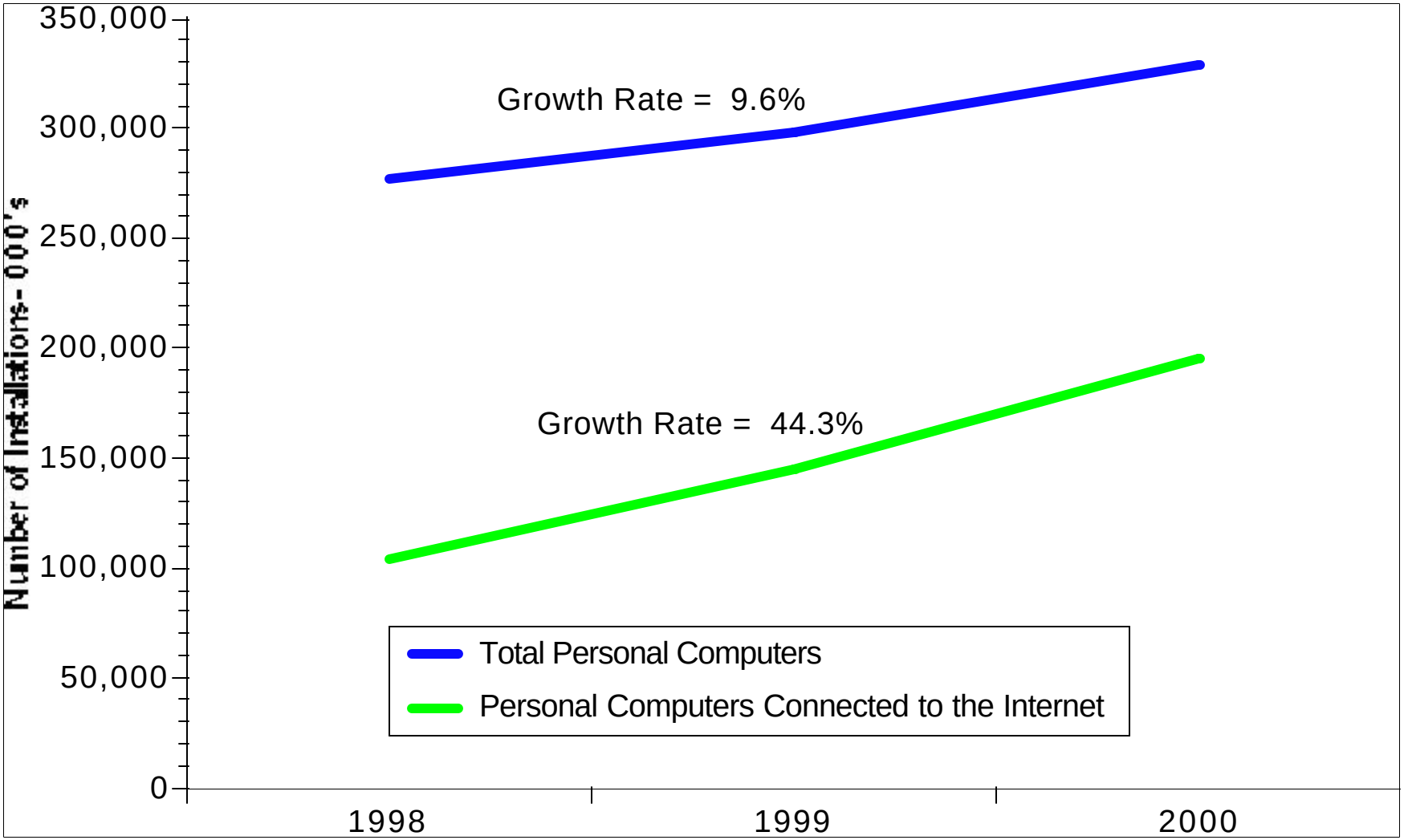
- **Internet and Knowledge Capital**

Scope of the Internet

- **The Archive now contains more than 1.2 billion pages. Contains only a fraction of total content, estimated at 5 billion + pages.**
- **Archive grows at a rate of 120 million pages per week, growing exponentially.**
- **The largest existing search engine contains only 300 million searchable pages and indexes only a small share of that total.**
- **The average life of a web page is only 75 days. None of the existing collections are definitively archival.**

SOURCE: http://www.archive.org/content/about.html = The Most Comprehensive Internet Library 20 terabytes.

High Growth Rates Pace Internet Utility



Market Penetration Rates as Yet Very Low

Percentage of Population Using the Internet	
Canada	38%
Australia	25%
Singapore	25%
USA	25%
New Zealand	24%
UK	15%
Germany	14%
Hong Kong	14%
Taiwan	12%
France	11%
Philipines	8%
Malaysia	7%
China	4%
South Africa	2%
Thailand	2%
Indonesia	1%
Source: ACNielsen NetWatch	

Technology Choices Must Recognize Bandwidth Limitations

Bandwidth in the US November 1999				
Speed	**Unique Audience**	**Pages/ Person**	**Visits/ Person**	**Percent of Net Users**
14.4	6,050,900	282	11	8.3%
28.8/33.6	32,991,289	451	15	45.2%
56	29,671,057	587	18	40.7%
High speed	4,266,023	1036	28	5.9%
Source: Nielsen//NetRatings				

Manage Software through Networks

Projected Fiber Capacity (cca 2005+)

Capacity of one waveform = 10 Gigabytes/second.
One fiber can multiplex up to 500 waveforms.
Number of fibers per cable = up to 200

Fiber Cable Capacity =
1,000,000,000,000,000 / second =
1 Petabyte/second =
1 billion floppy disks/second

Search Engines – The Keys to Locating Relevant Text

- **49 General Purpose Engines**
- **105 MetaSearch Engines**
- **112 Special Interest Search Engines**
- **Most engines do not perform their own indexing or abstracting, but act as customized indexes to compiled archives.**
- **None of the engines are comprehensive, do not deliver assured results and are difficult to use except for simple inquiries.**
- **Just about every engine is ancillary to an already existing portal and has only a very small market share.**
- **Rise in MetaSearch and Special Interest engines reflects inadequacies of the general purpose engines.**

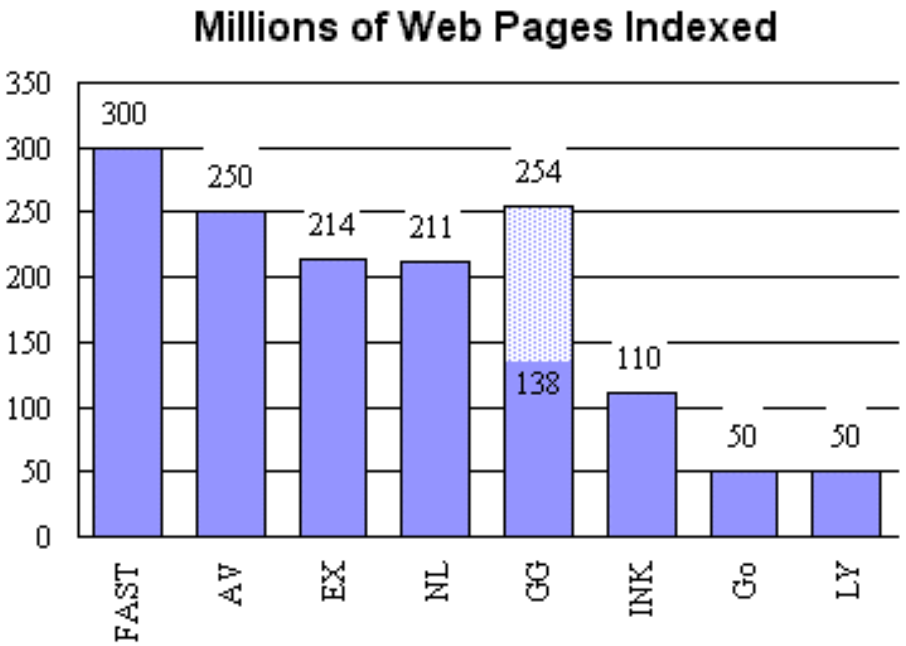
Multi-lingual Searches Become a Challenge

Languages on the Web	
Language	**Speakers** (millions)
English*	128
Japanese	19.7
German	14
Spanish	9.4
French	9.3
Chinese	7.0
Dutch	4.4
Korean	4.3
Swedish	3.6
Italian	3.3
Portuguese	2.9
Total non-English	88
*99 million of English speakers are in US Source: Global Reach	

Internet Usage According to Language				
	1999	**2001**	**2003**	**2005**
English Speaking (percentage)	91,969,151 54%	108,282,662 51%	124,265,453 46%	147,545,824 43%
Non-English Speaking (percentage)	79,094,449 46%	104,480,528 49%	143,733,527 54%	198,008,511 57%
Total Worldwide	171,168,600	212,889,190	268,150,180	345,735,835
Source: Computer Economics				

Scope of Existing Search Engines Limited

Sizes are as reported by each search engine and as of Feb. 3, 2000.



KEY: FAST=FAST, AV=AltaVista, EX=Excite, NL=Northern Light,
GG=Google, INK=Inktomi, Go=Go (Infoseek), LY=Lycos.

SOURCE: SearchEngineWatch

Research will Continue Stimulating Search Engine Use

Uses for Online Services	
Activity	**Percent of Households Using**
E-mail	85%
Research	78%
Education	71%
General surfing	67%
News	67%
Products/services	58%
Health information	52%
Investment information	49%
Games	48%
Shopping	48%
Includes Internet, WWW, and commercial online services Source: Odyssey, L.P.	

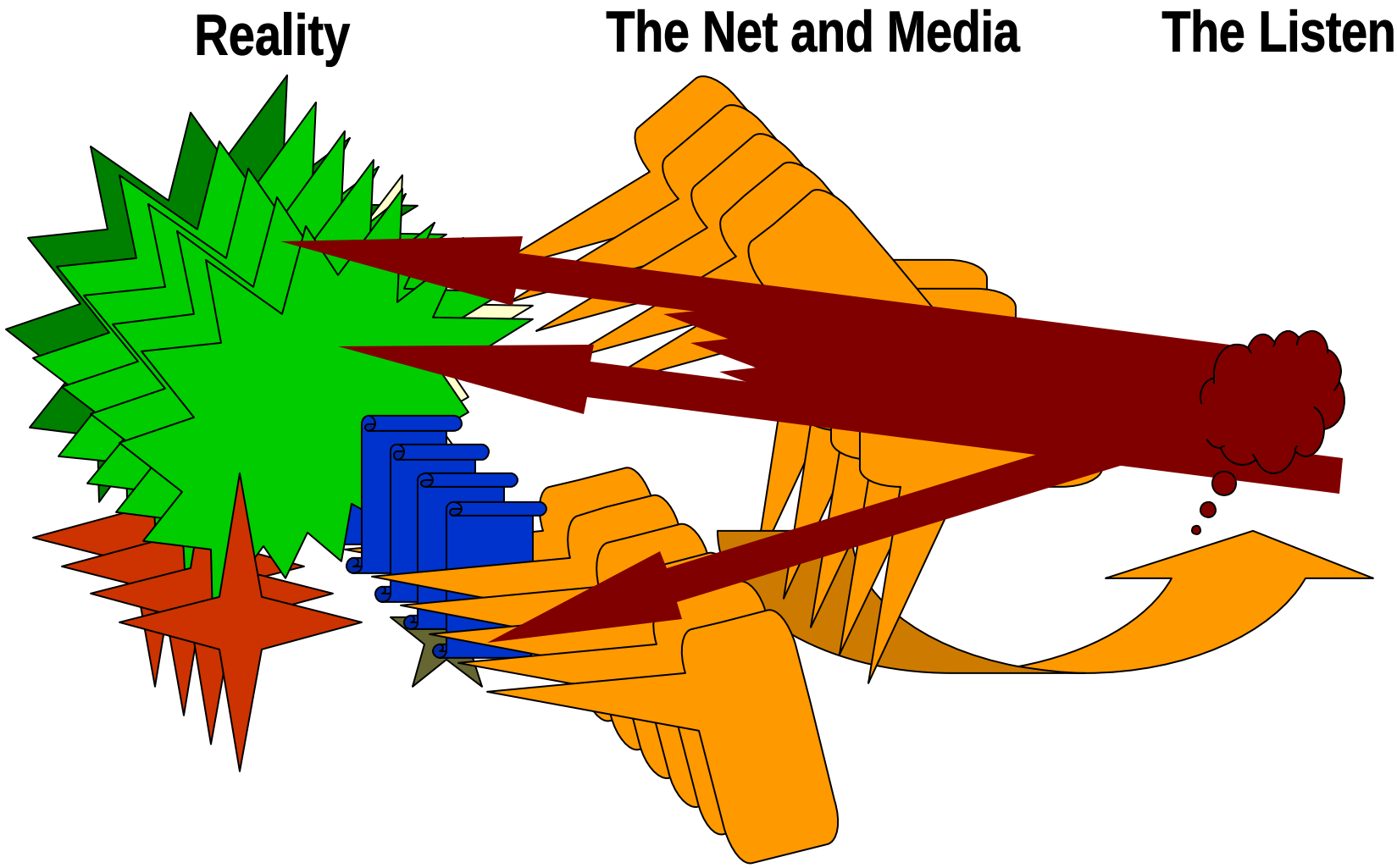
SOURCE: http://cyberatlas.internet.com/

Future Prospects

- **Terabyte (10^{12}) and Petabyte (10^{15}) files;**
- **Data Mining and Knowledge Management Advance;**
- **Search Engines become the next "killer application" *;**
  - 1981 - Spread Sheet and Word Processors
  - 1984 - Database software
  - 1987 - Operating System (e.g. Windows);
  - 1990 - Office Suites (Microsoft Office);
  - 1994 - Browsers (Netscape, Explorer);
  - 1998 - Website Search Engines;
  - 2002 – Personal Search Management methods (Socratic).

***** Killer application = Software that enables the next wave in industry expansion.

Barriers to Communicating Removed but not for Understanding



The Economics of a Global Services Society

- **Rent: for Financial Capital**
- **Sustaining: Cost of Production**
- **Informing: Administrative Overhead, Government Bureaucracy, Information Services**
- **Surplus: Devoted to Innovation, Largely Concentrated and Taxed**

- **Knowledge Capital: In trained workforce, information technology, software, databases and information utilities.**

RESULT: 50 years to reach $100,000/person

Summary

- **Historical Context Useful in Comprehending Present Acceleration of Evolution.**
- **The Shifts in the Value-Chain Will Dictate Future Directions in Text Creation and Text Distribution.**
- **Information Management Should be Understood as a Knowledge Capital Investment.**
- **Successors of Internet will Become the Means for Management and Distribution of Knowledge Capital.**