Technological Revolutions and Techno-economic Paradigms as Framework for Designing Industrial Policy

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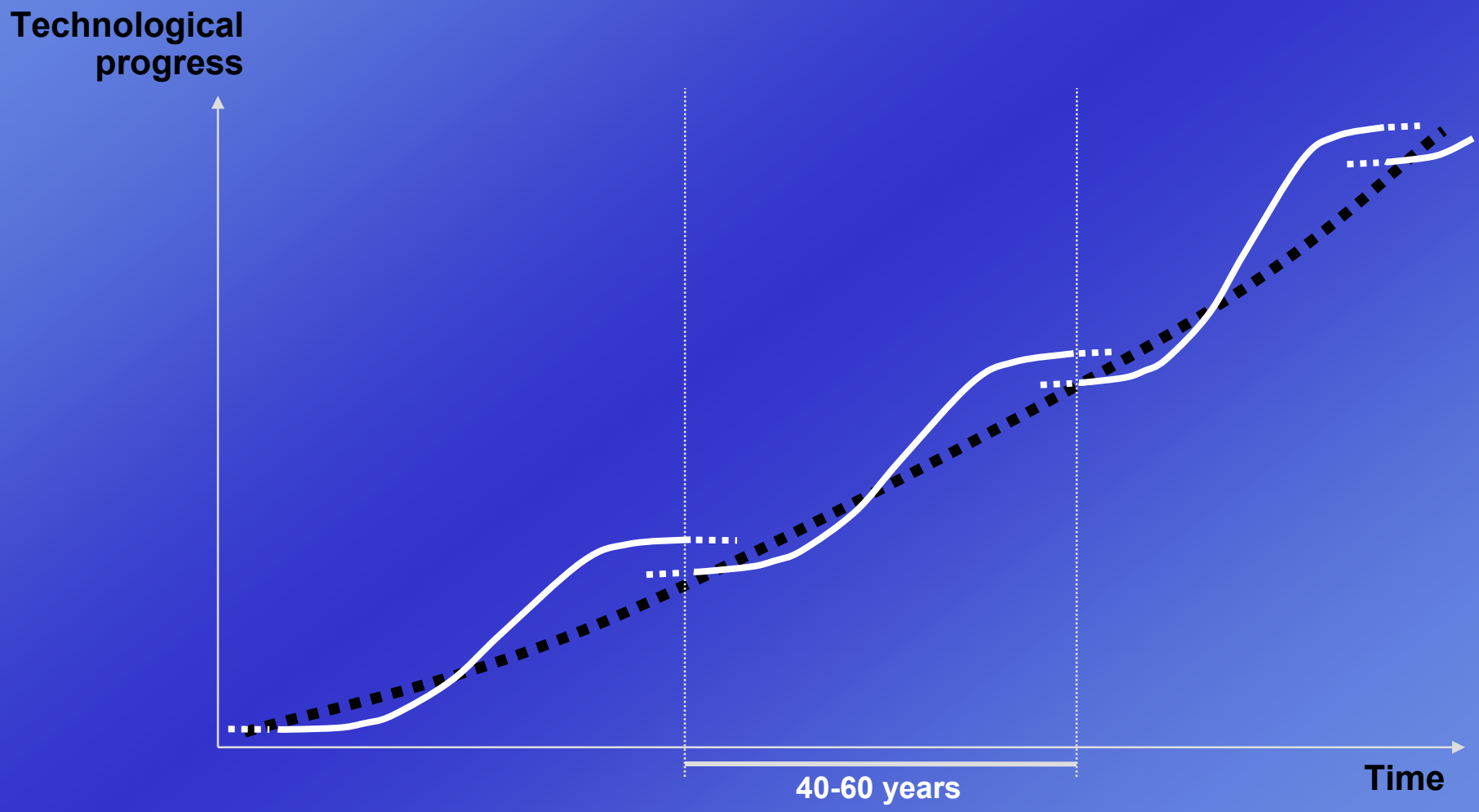
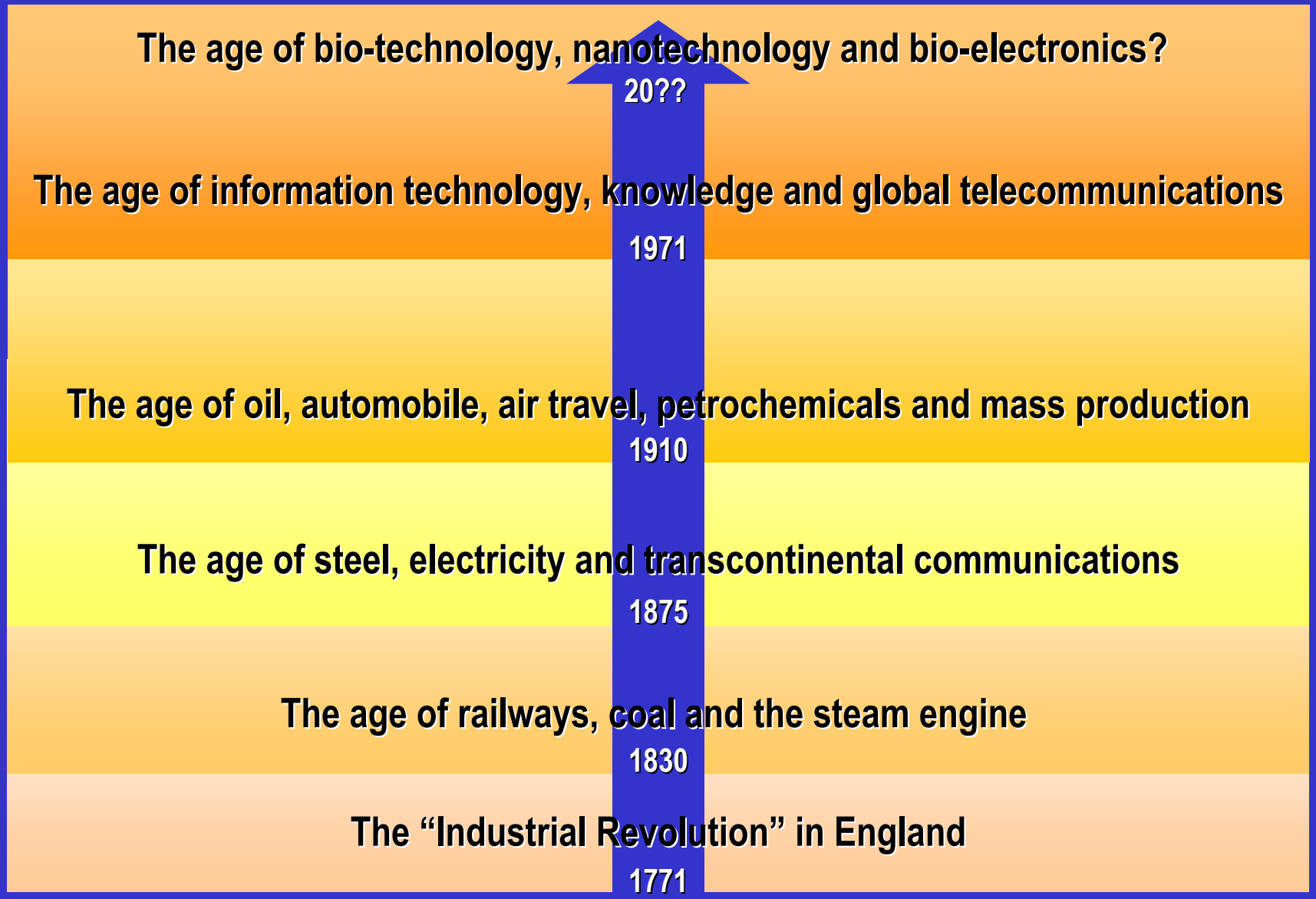
LONG-TERM DEVELOPMENT
LOOKS LIKE
THE RELENTLESS ADVANCE OF TECHNOLOGY…



…but progress takes place by overlapping surges

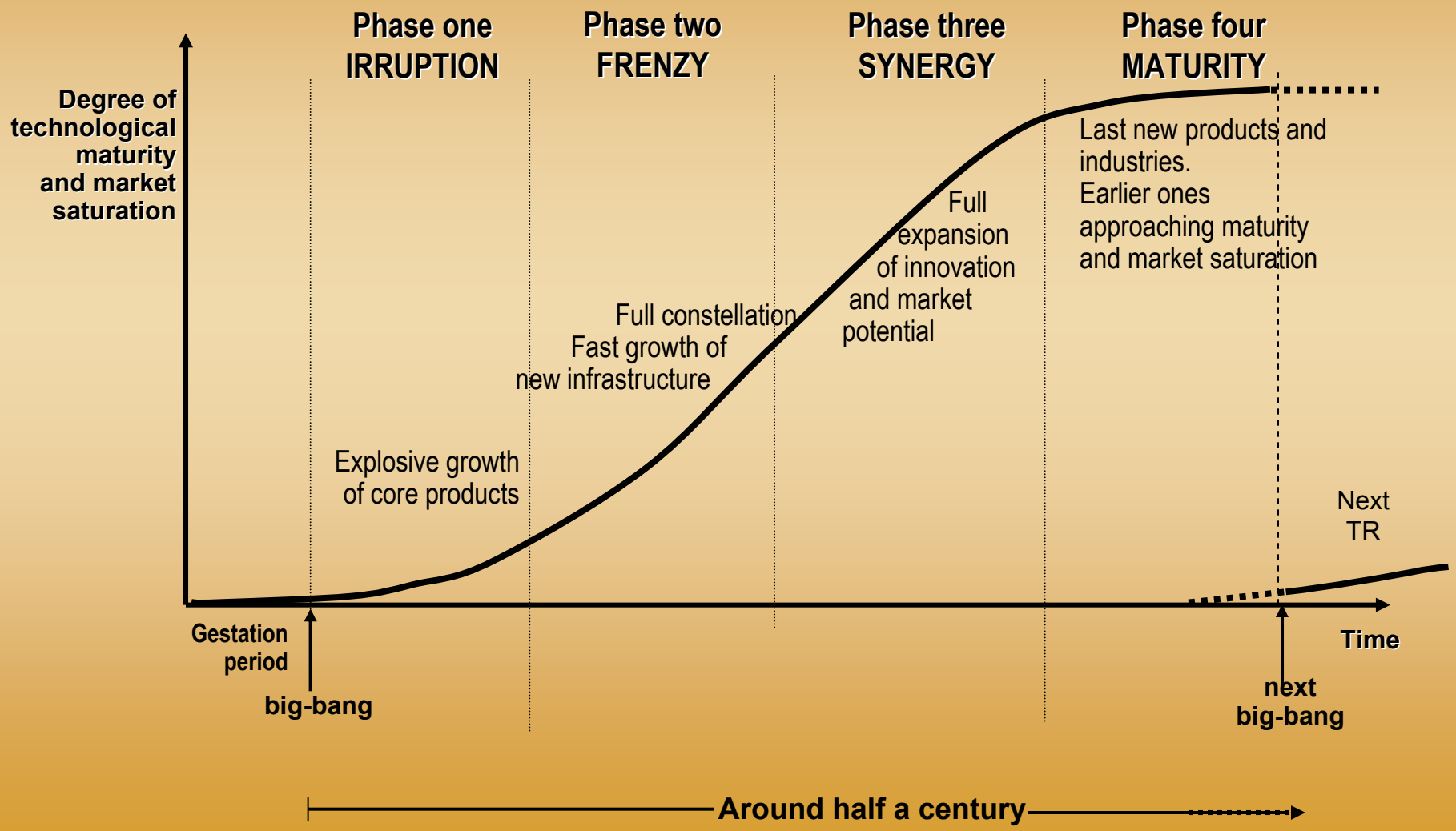
Five succesive technological revolutions in 200 years



Each brings a different growth potential and provokes a difficult transition

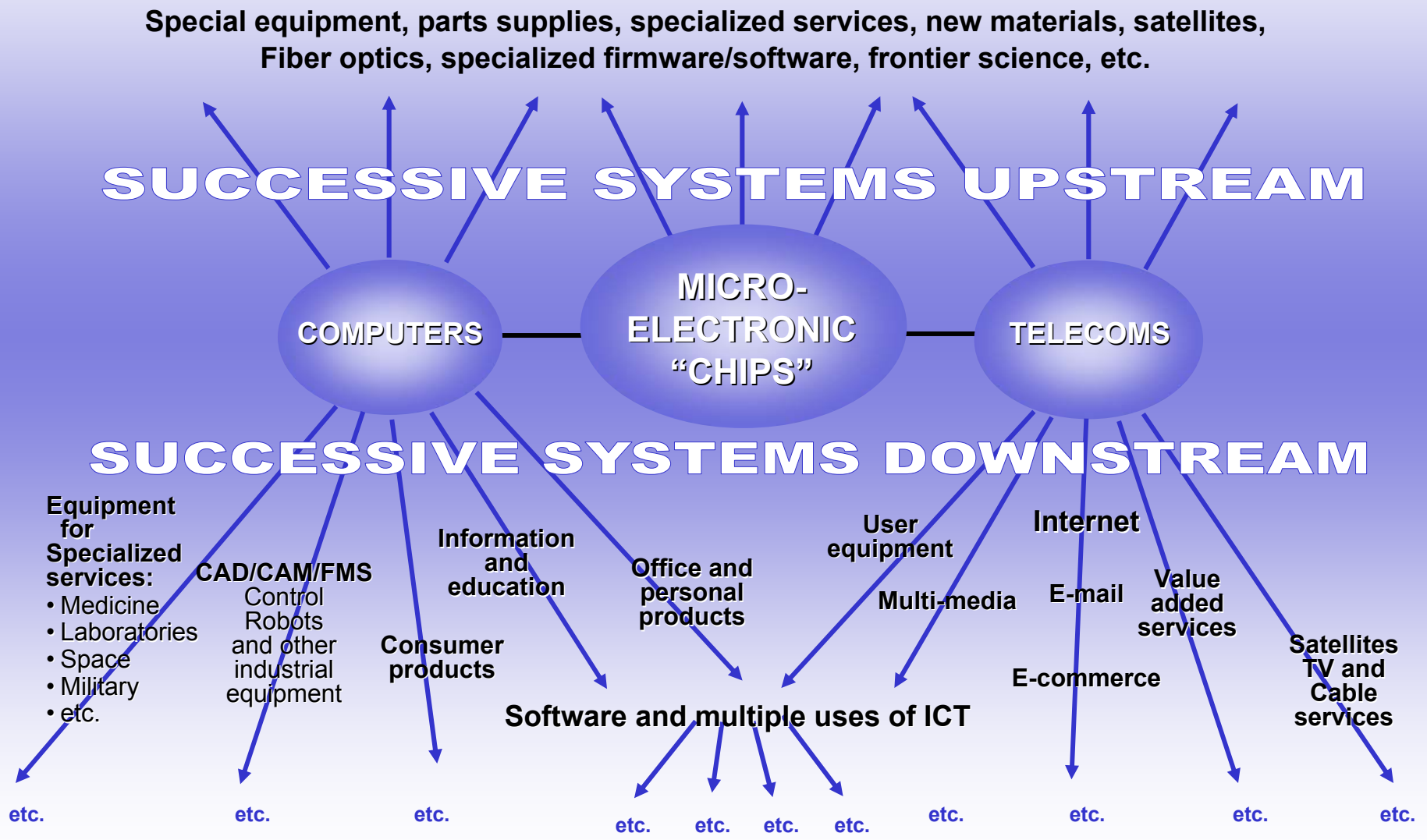
Irruption, deployment and exhaustion

THE LIFE CYCLE OF A TECHNOLOGICAL REVOLUTION



An opportunity explosion

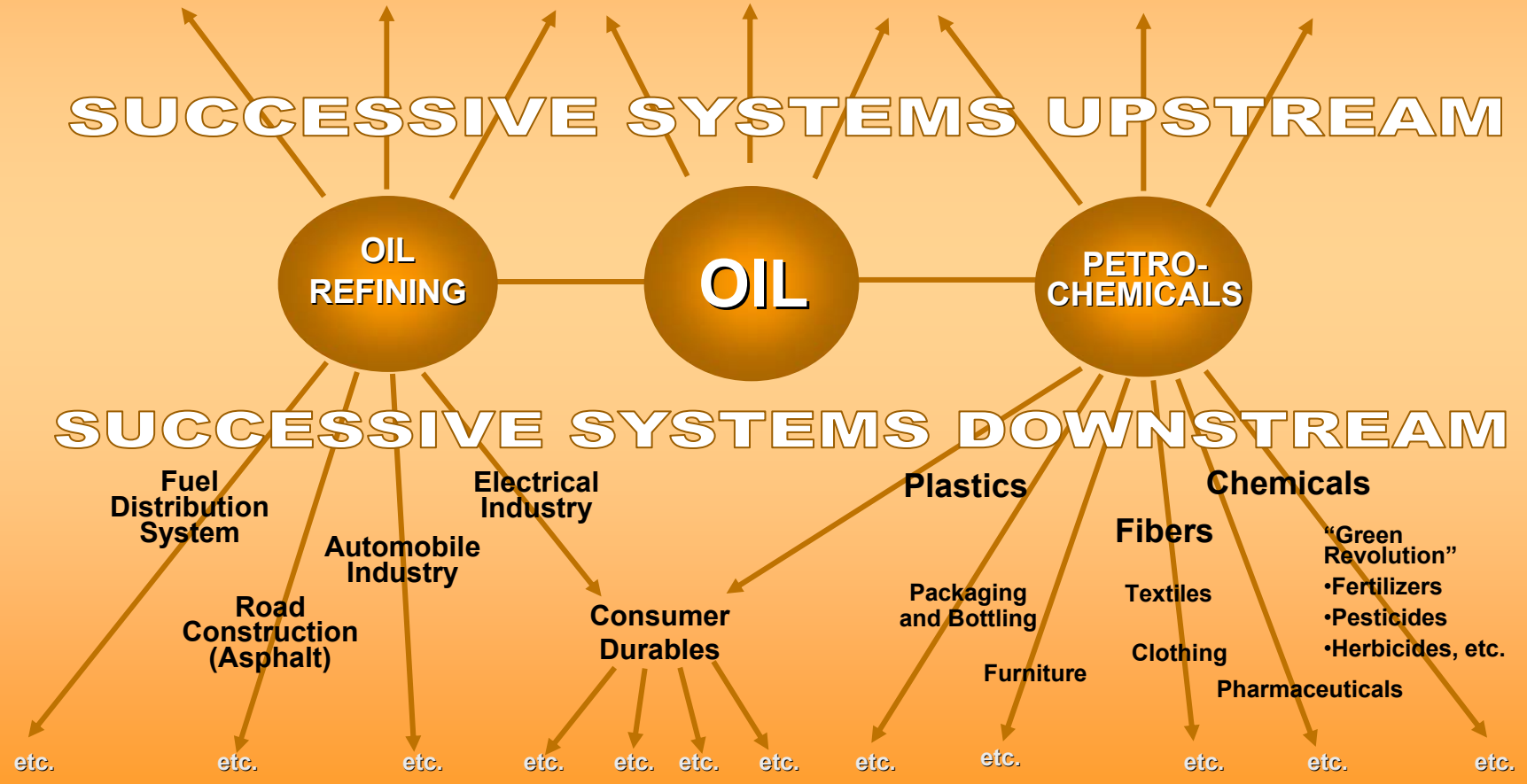
THE INFORMATION TECHNOLOGY REVOLUTION FROM THE 1970s



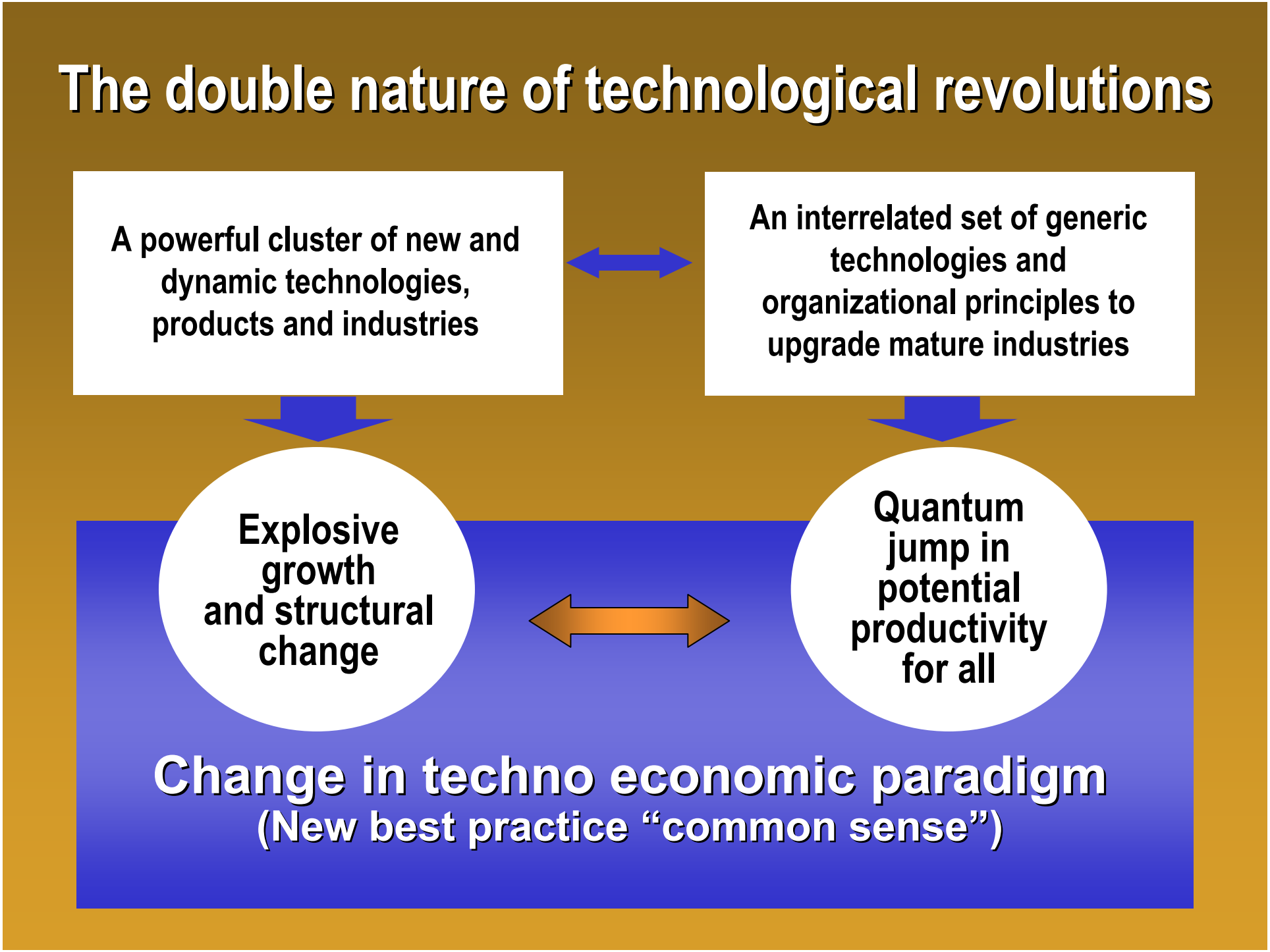
An opportunity explosion

THE MASS PRODUCTION REVOLUTION FROM THE 1910S

Specialized equipment and technical services for:
Exploration, Production and Transport; Plant design and construction
Measuring and control instruments Special materials (Perforation muds, lubricants, catalysts, etc.)



The double nature of technological revolutions



A radical change in best practice common sense

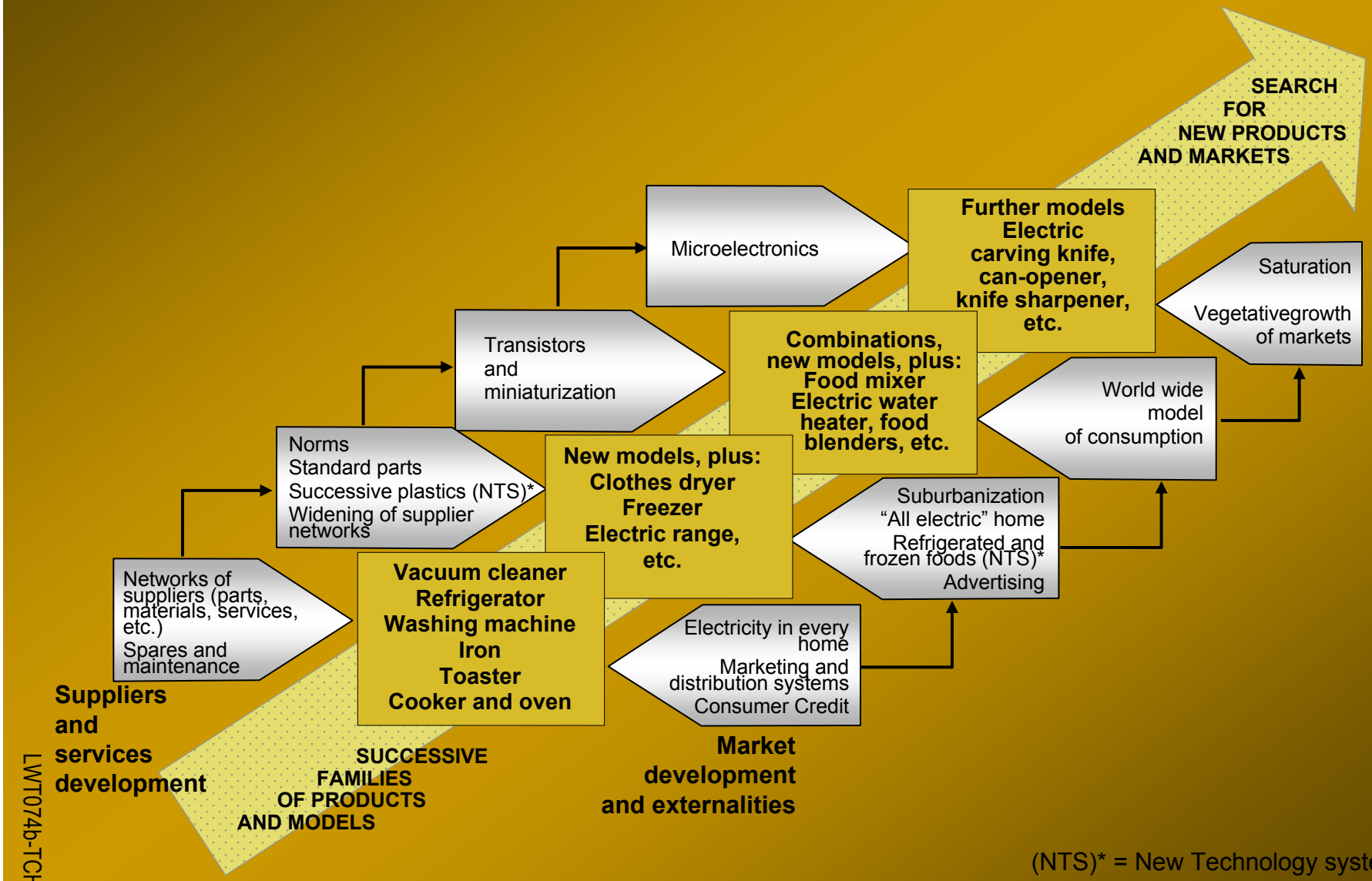
STRUCTURE	• From pyramids to networks within the firm and with the outside world
OPERATION	• From standardized routines to continuous improvement and change as the main routines
PERSONNEL	• From salaries as a cost to be minimized to serious investment in human capital
STRATEGY	• From stable to flexible and adaptable strategies
BUSINESS	• From closed static frontiers to constantly changing interactive frontiers
MARKETS	• From three tiered international markets to highly segmented global markets

ADAPTATION OF THE SOCIO-ECONOMIC CONTEXT TO THE NEW TECHNOLOGY SYSTEMS

1. Development of the surrounding services, of the required infrastructure, specialized suppliers, distributors, maintenance services, etc.
2. “Cultural" adaptation to the logic of the interconnected technologies involved (among engineers, managers, financiers, sales and service people, consumers, etc.)
3. Setting up of the institutional facilitators (rules and regulations, specialized training and education, etc.)

Creating major territorial competitive advantages

CO-EVOLUTION OF A TECHNOLOGY SYSTEM AND ITS ENVIRONMENT:
Home electrical appliances in the fourth surge



(NTS)* = New Technology system

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Territorial embeddedness and the characteristics of the paradigm shift

INSTALLATION PERIOD:
Difficult adaptation

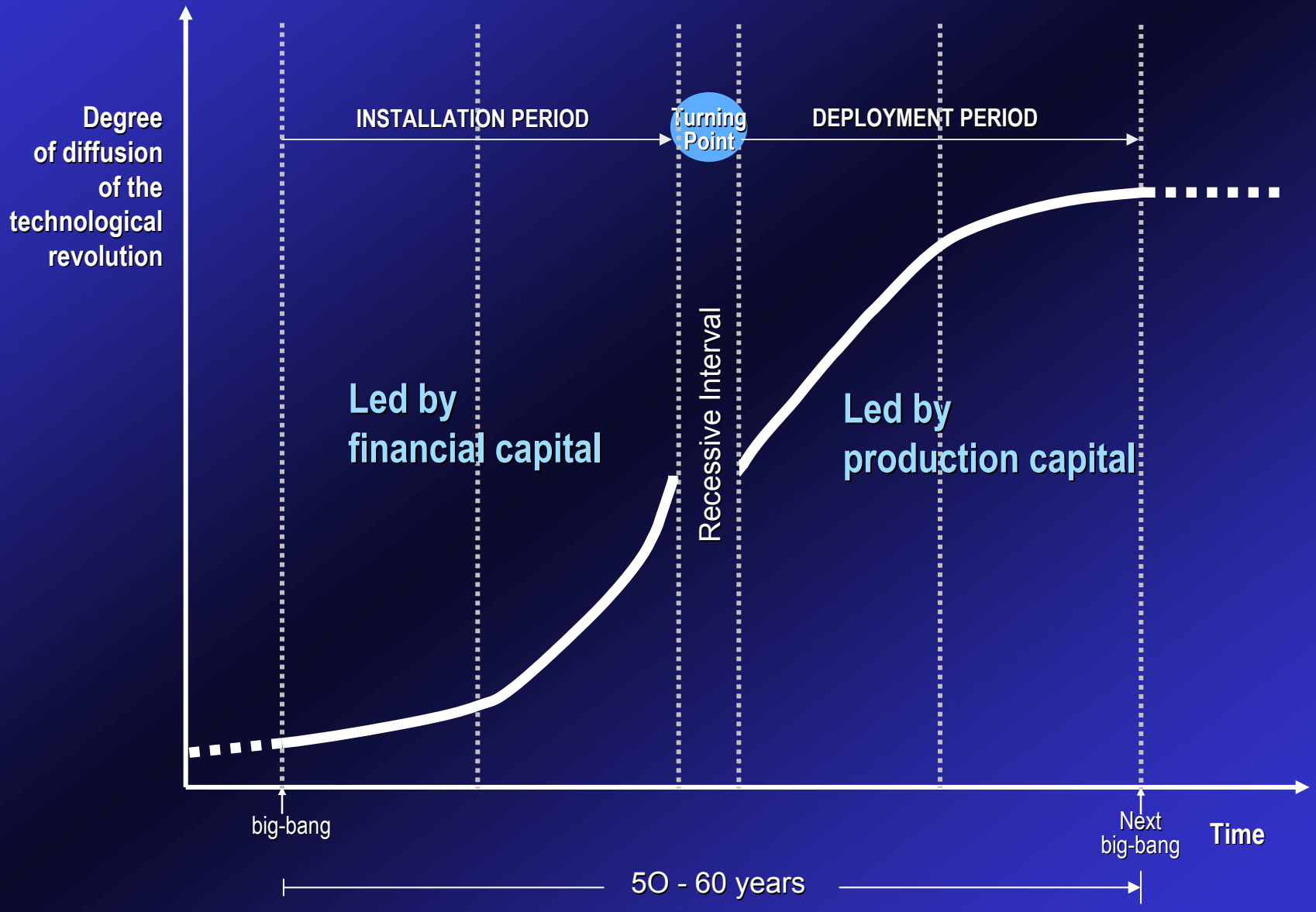
- Resistance from established firms and from the established institutions
- Turbulent paradigm shift led by financial capital

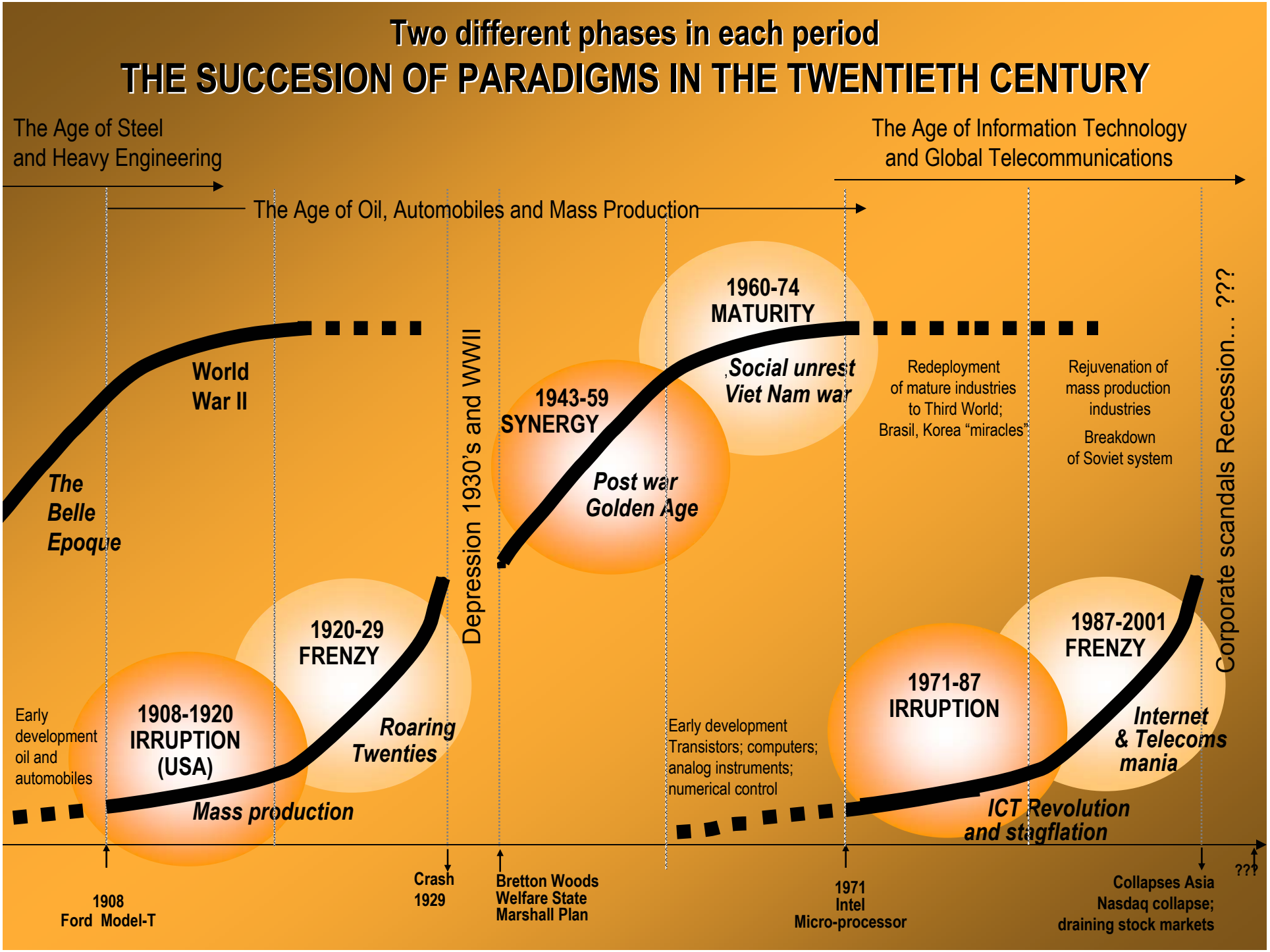
DEPLOYMENT PERIOD
"Hyperadaptation"

- Full propagation of the higher wealth creating potential led by production capital
- Innovations outside the paradigm are shaped "to fit", excluded or marginalized

The diffusion of a technological revolution

TWO DIFFERENT PERIODS IN EACH GREAT SURGE




Two different phases in each period
THE SUCCESION OF PARADIGMS IN THE TWENTIETH CENTURY
The Age of Steel
and Heavy Engineering
The Age of Information Technology
and Global Telecommunications
The Age of Oil, Automobiles and Mass Production
World
War II
The
Belle
Epoque
1960-74
MATURITY
'Social unrest
Viet Nam war
1943-59
SYNERGY
Post war
Golden Age
Redeployment
of mature industries
to Third World;
Brasil, Korea "miracles"
Rejuvenation of
mass production
industries
Breakdown
of Soviet system
Depression 1930's and WWII
Corporate scandals Recession... ???
1920-29
FRENZY
Roaring
Twenties
1908-1920
IRRUPTION
(USA)
Mass production
Early
development
oil and
automobiles
1971-87
IRRUPTION
Early development
Transistors; computers;
analog instruments;
numerical control
1987-2001
FRENZY
Internet
& Telecoms
mania
ICT Revolution
and stagflation
1908
Ford Model-T
Crash
1929
Bretton Woods
Welfare State
Marshall Plan
1971
Intel
Micro-processor
Collapses Asia
Nasdaq collapse;
draining stock markets
???

THE INDUSTRIAL POLICY IMPLICATIONS

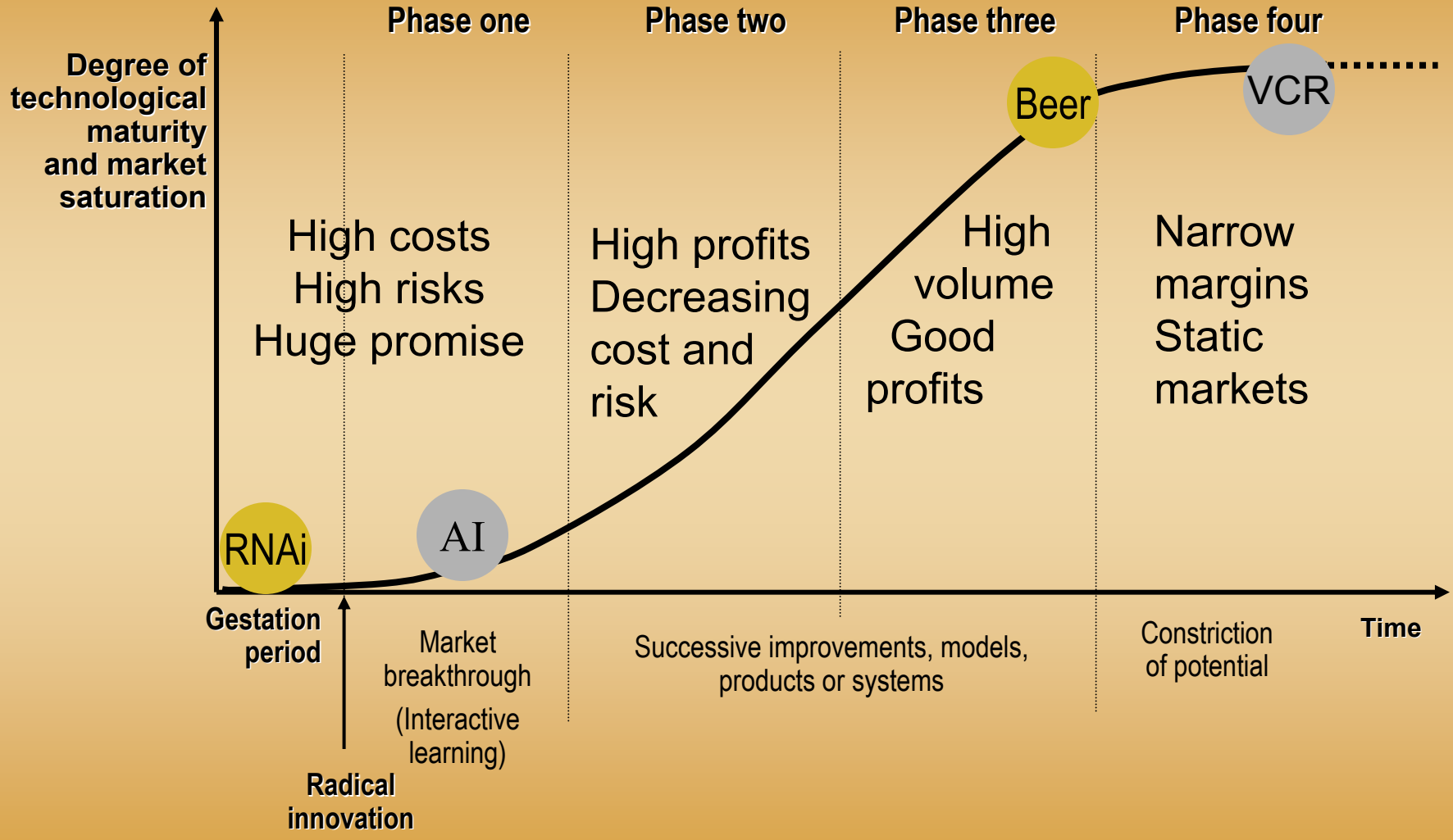
The approach needs to be fundamentally different depending on the stage of development of the technology

Joining the present revolution: ICT

Applying the ICT paradigm: MATERIALS

Preparing for the next revolution: BIOTECHNOLOGY

THE BASIC TECHNOLOGICAL LIFE CYCLE
Products, industries and systems



So policy targets must be adequately located in context

Small knowledge intensive countries can thrive in the current techno-economic paradigm

The best tool for a successful policy is a powerful interpretation

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