



**TECHNOLOGICAL  
REVOLUTIONS  
and changing  
strategic opportunities  
for growth**

**Carlota Perez**

**Economic Forum, Krynica, September 2005**

# Some predictions nobody would believe... AT THE TIME!

In the midst of the  
**STAGFLATION**  
of the 1970s-80s

“In the 1990s there will be  
a booming ‘new economy’  
and the greatest bull market in US history”

At the depth of the  
1930s  
**DEPRESSION**

“We are heading towards  
two prosperous decades of full employment  
with massive worker ownership  
of houses and cars”

In the Reagan years,  
when the Cold War  
seemed to be intensifying

“The Soviet System will collapse,  
one country after another,  
and in a couple of decades, many of them  
will be part of the European Union”

In the 1990s at the  
“new economy climax”  
in the US

“In the 2000s China will become  
the engine of growth of the world economy,  
ready to overtake Japan and threaten the US”

**The easiest way to make a mistake  
about the near future?**

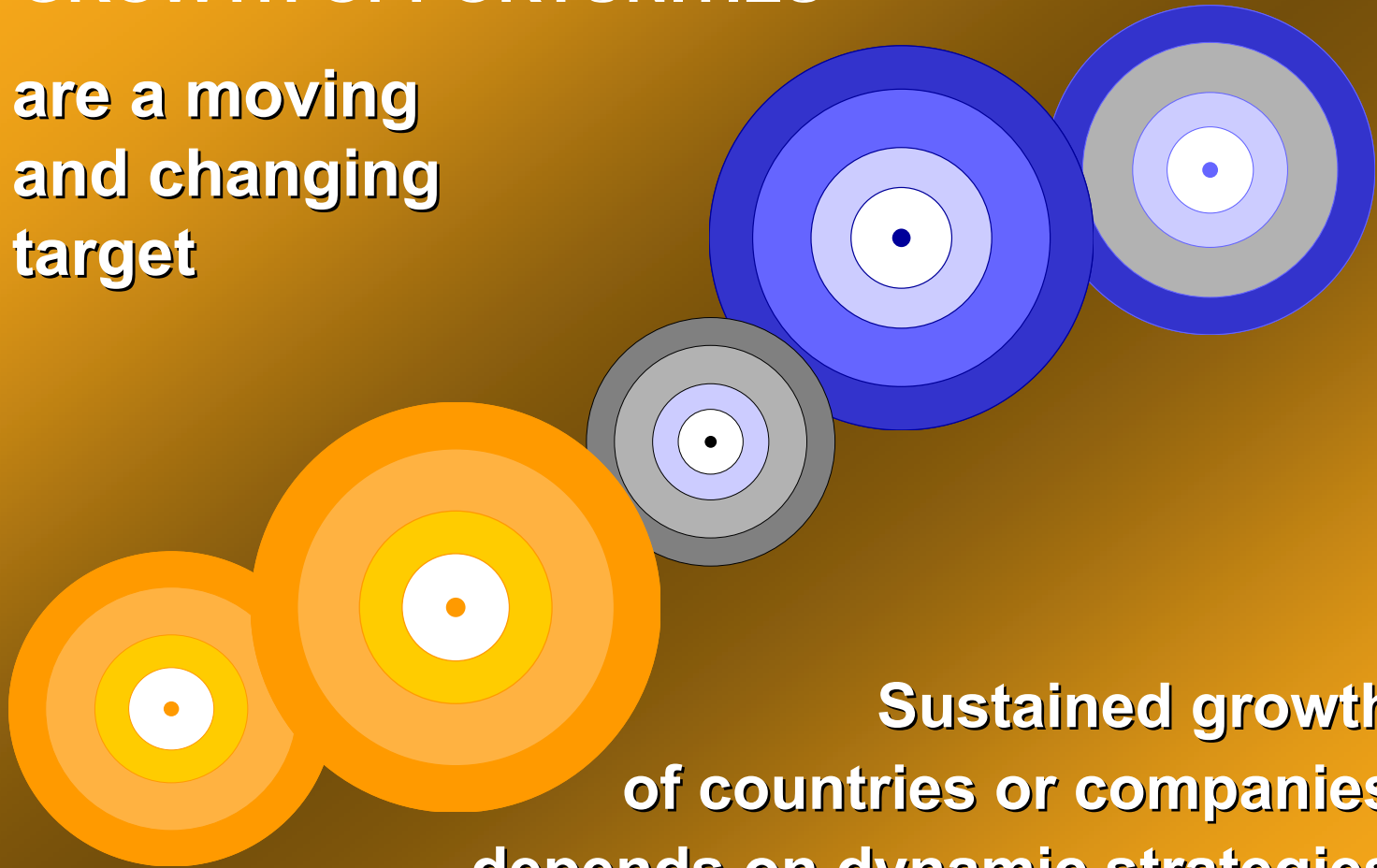
**... to think it will be  
like the recent past!**

***'History repeats itself...'***

**YES! ...but not immediately and not identically**

# **GROWTH OPPORTUNITIES**

are a moving  
and changing  
target



Sustained growth  
of countries or companies  
depends on dynamic strategies

**ANTICIPATING THE FUTURE**

**HOW  
CAN WE  
ANTICIPATE  
THE FUTURE**



**PERHAPS HISTORY CAN PROVIDE SOME LESSONS**

# THE LONG TERM ANALYSIS OF TECHNOLOGICAL REVOLUTIONS provides an interpretation and powerful guidelines

## HISTORICAL REGULARITIES

- Successive revolutions every 40-60 years
- A financial bubble collapses at about mid-diffusion
- A diffusion sequence of 8-12 year phases (with a marked change in business climate)

## EPOCHAL SPECIFICITY

Economic success  
for the whole 40-60 years  
of diffusion:

**DEPENDS ON  
A UNIQUE  
AND SPECIFIC  
TECHNO-ECONOMIC  
PARADIGM**

which defines  
the principles  
for best competitive practice

Understanding that ‘big picture’ and its use for strategic thinking  
is the object of this talk

# PERSPECTIVE

**Space:**

**The core countries  
in the world economy**

**Time:**

**Since the  
“industrial revolution”**

**1**

## **THE SECULAR OVERVIEW**

**Technological revolutions and paradigm shifts**

**2**

## **THE SHORT TERM**

**The present world at the turning point**

**3**

## **SHAPING THE FUTURE**

**Different context: different strategies**

**4**

## **A CONCERTED EFFORT**

**Shared dynamic vision and convergent actions**



**1**

## **THE SECULAR OVERVIEW**

**Technological revolutions and paradigm shifts**

**2**

### **THE SHORT TERM**

**The present world at the turning point**

**3**

### **SHAPING THE FUTURE**

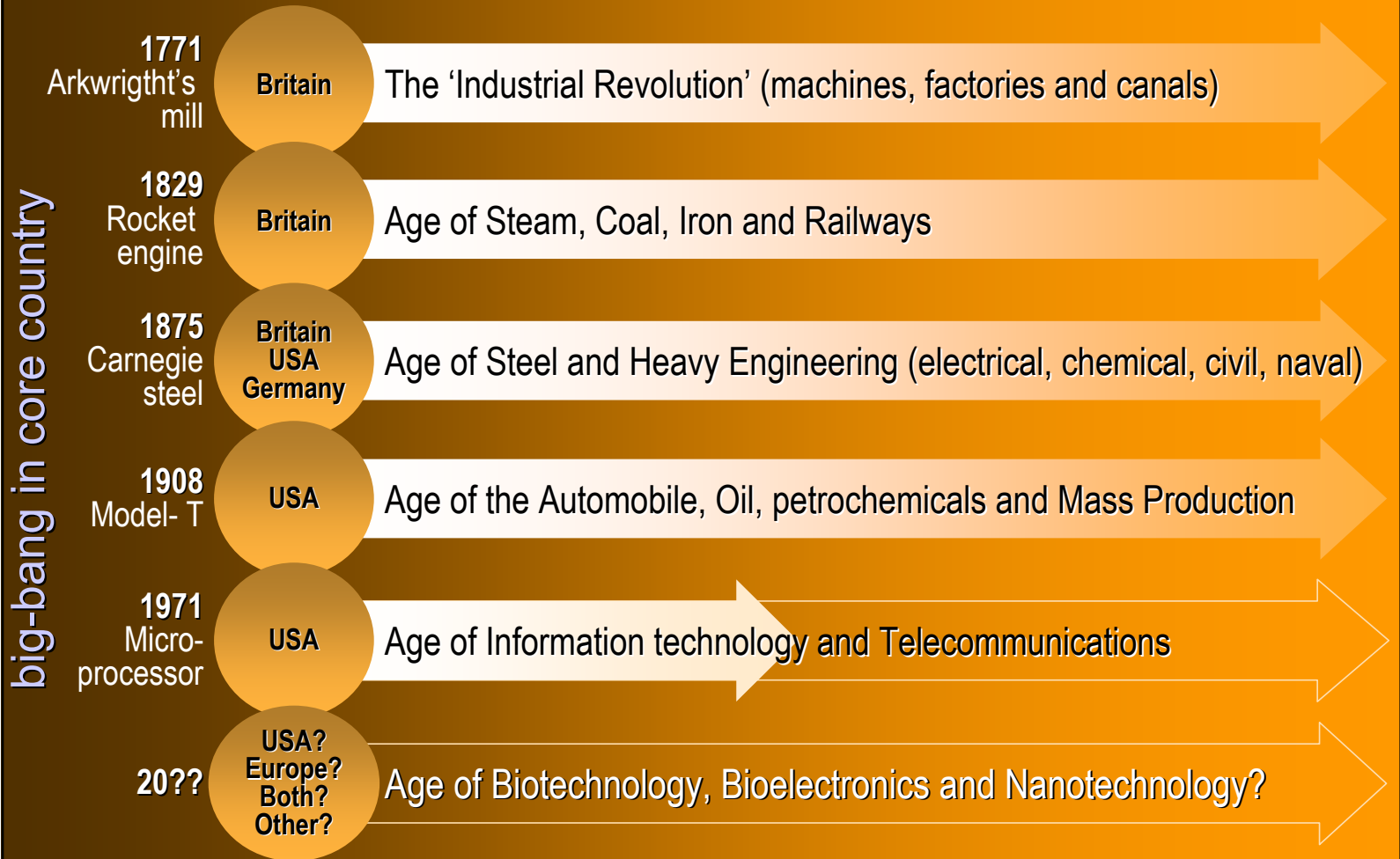
**Different context: different strategies**

**4**

### **A CONCERTED EFFORT**

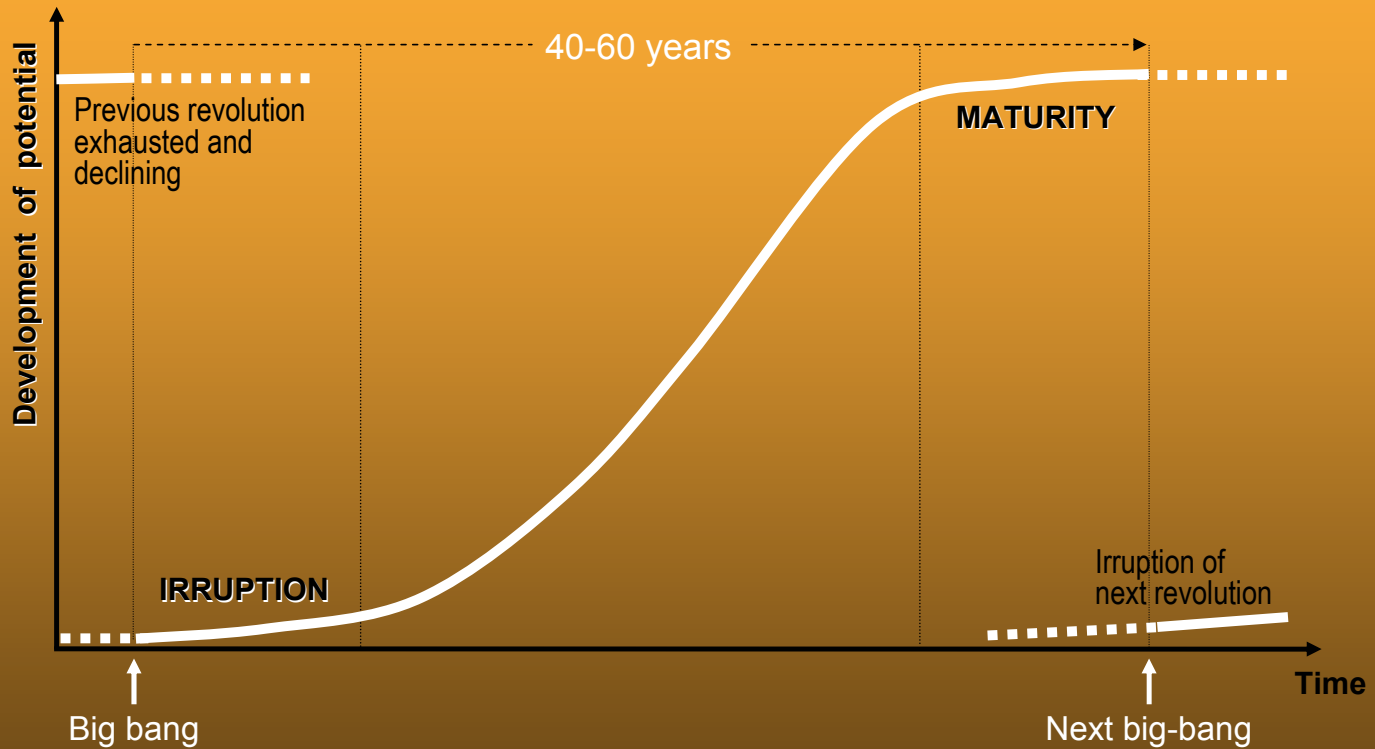
**Shared dynamic vision and convergent actions**

# FIVE TECHNOLOGICAL REVOLUTIONS IN 200 YEARS



**Each takes around half a century to spread across the world**

# Diffusion of technological revolutions takes place in successive GREAT SURGES OF DEVELOPMENT



presenting an epidemic pattern, from irruption to maturity

in an overlapping succession, as each set of technologies is exhausted

**BUT**  
**Technological revolutions**  
**DO NOT JUST ADD**  
**new interrelated industries...**

**THEY PRODUCE:**

- **The rejuvenation of the whole economy**
- **A distinct change in social behavior**
- **A radical change in investment patterns**
- **Major institutional changes**

# Because each revolution has a double character

## NEW INDUSTRIES

A powerful cluster  
of new and dynamic  
industries  
and infrastructures

## NEW PARADIGM

New generic technologies and  
organizational principles  
capable of modernizing  
the existing industries too

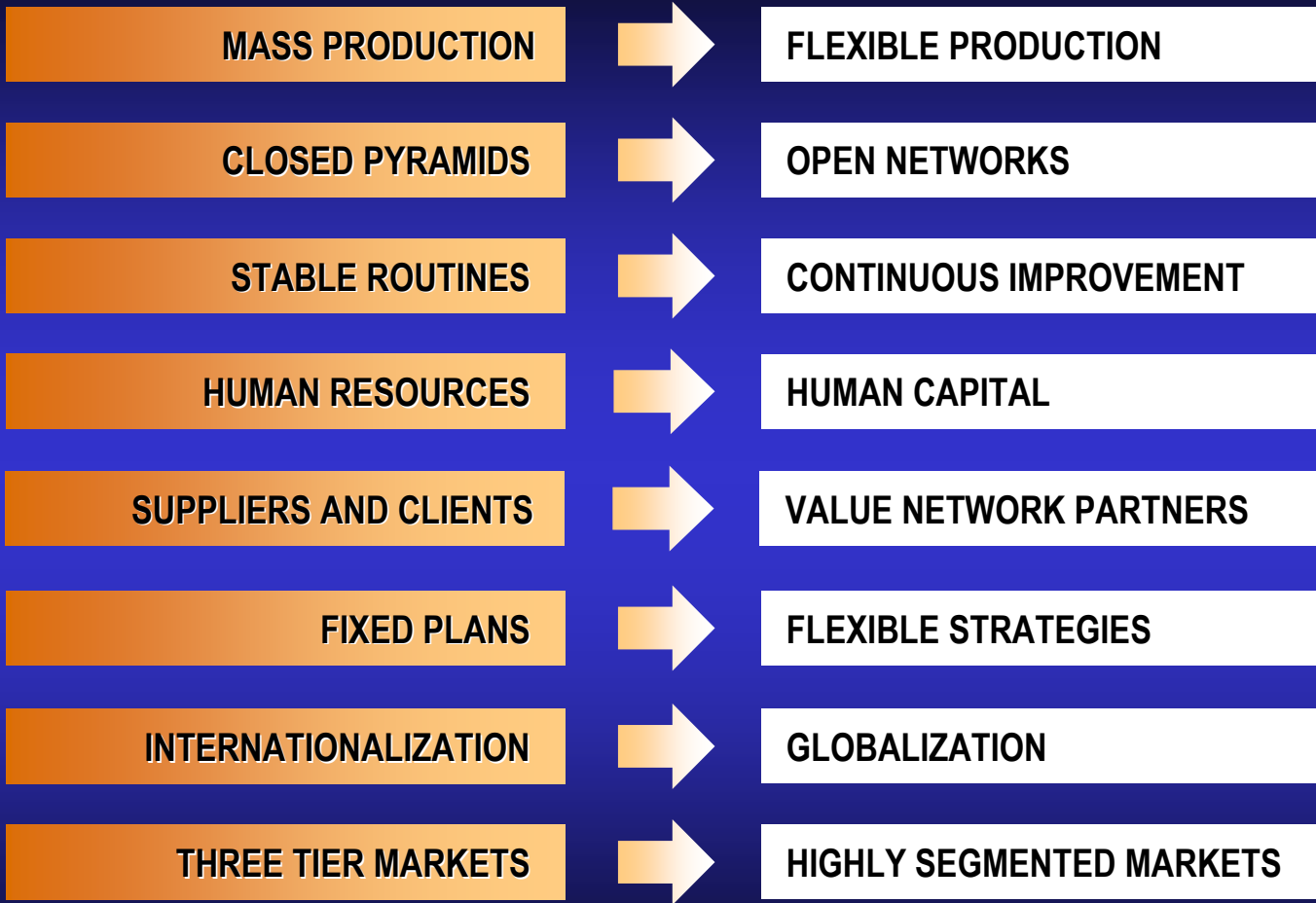
Explosive  
growth  
and structural  
change

Quantum  
jump in  
potential  
productivity  
for all

**A massive techno-economic paradigm shift**

**TRANSFORMING THE ECONOMY AND RESHAPING SOCIETY**

# The shift to the ICT paradigm taking place since the 1970s



Truly a complete change in best practice 'common sense'

**SUCH  
A RADICAL  
SHIFT**

**...confronts enormous**

**RESISTANCE**

- from institutions
- from people
- from established firms

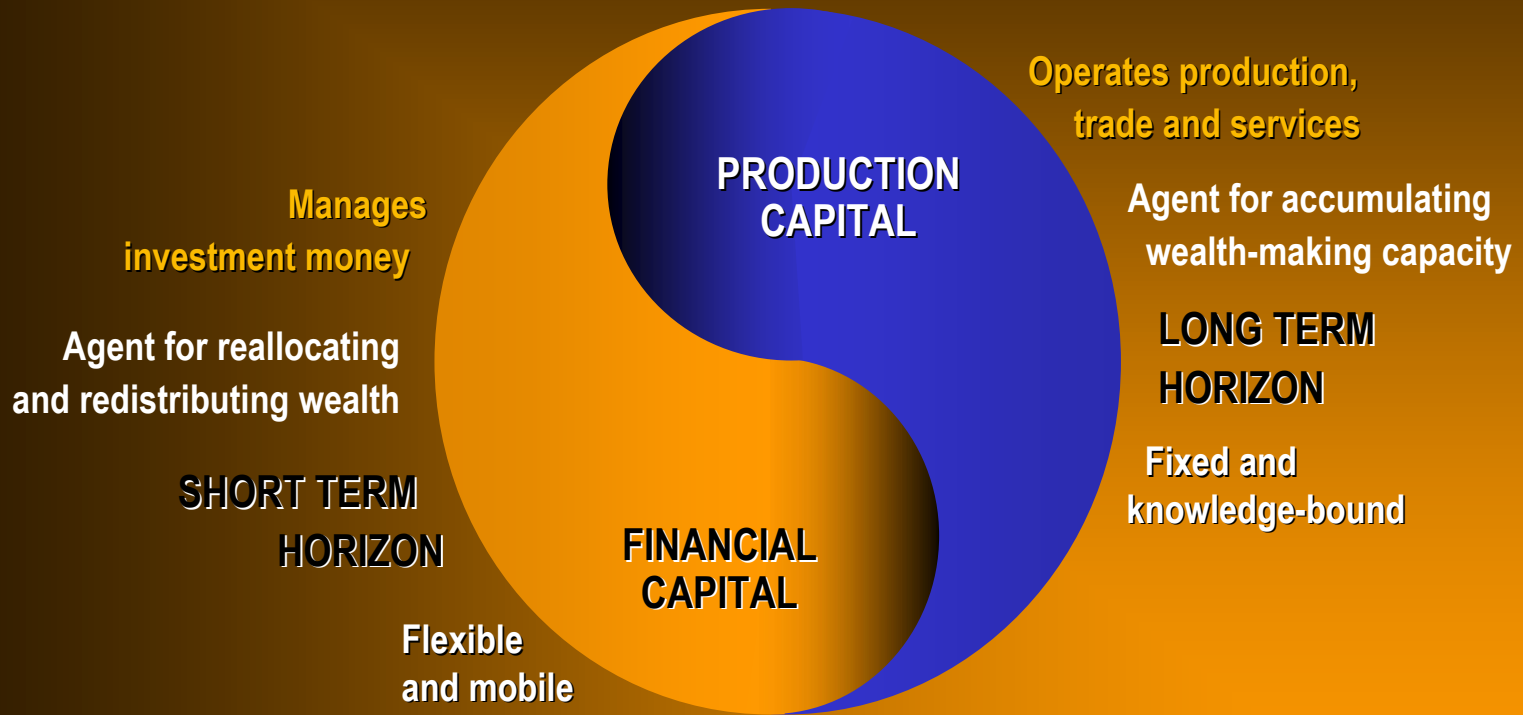
**All deeply adapted to the previous paradigm**

What mechanism  
can break the resistance  
and  
MASSIVELY  
REDIRECT INVESTMENT





# THE MARKET ECONOMY IS SHAPED BY TWO COMPLEMENTARY AGENTS



**Their functional separation  
guarantees the dynamism of the market system**

## When a paradigm reaches maturity



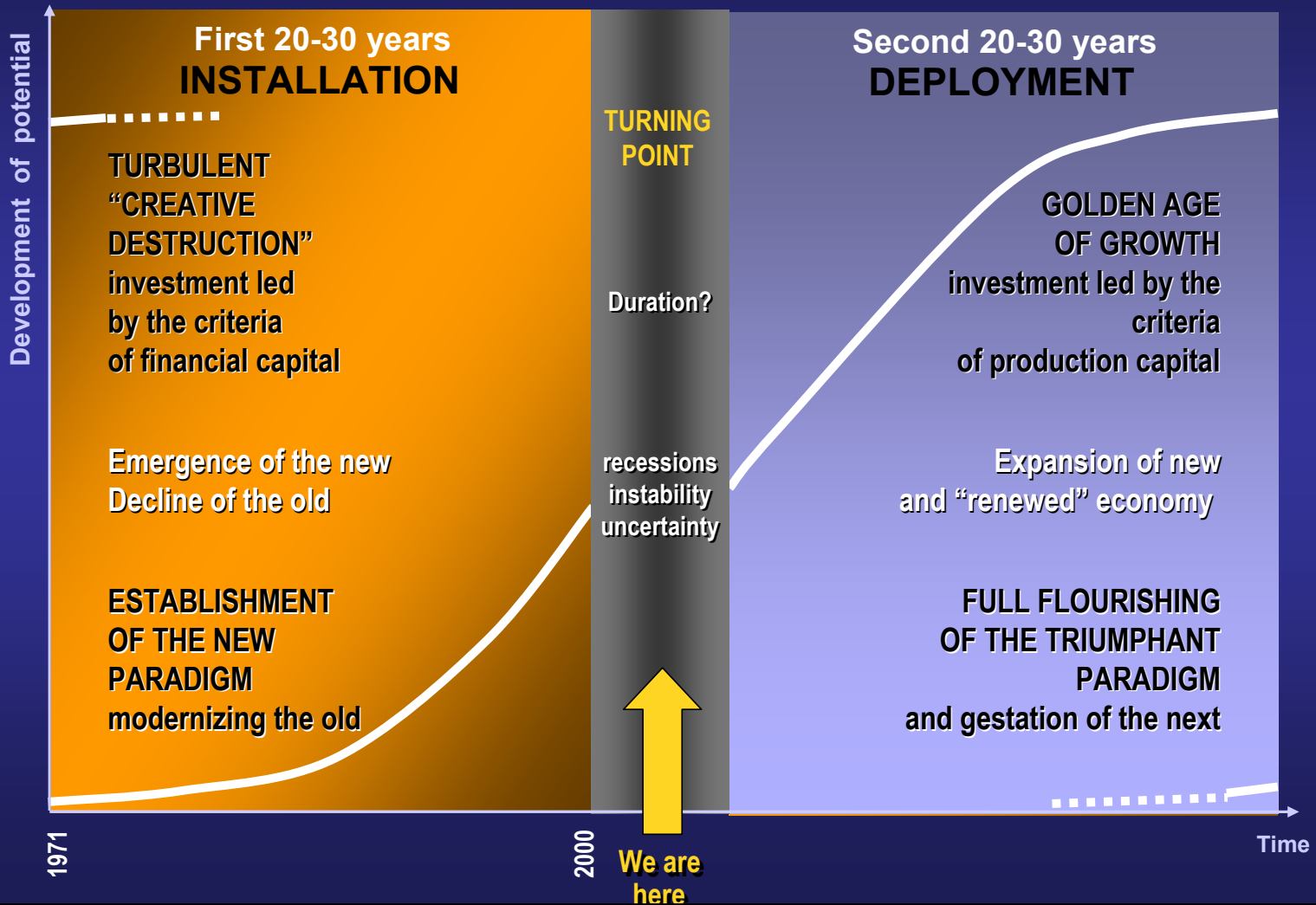
FINANCIAL CAPITAL  
BREAKS AWAY FROM ESTABLISHED  
(now conservative) PRODUCTION CAPITAL

- backs the new entrepreneurs
- creates a high profit whirlpool, and
- attracts all available money

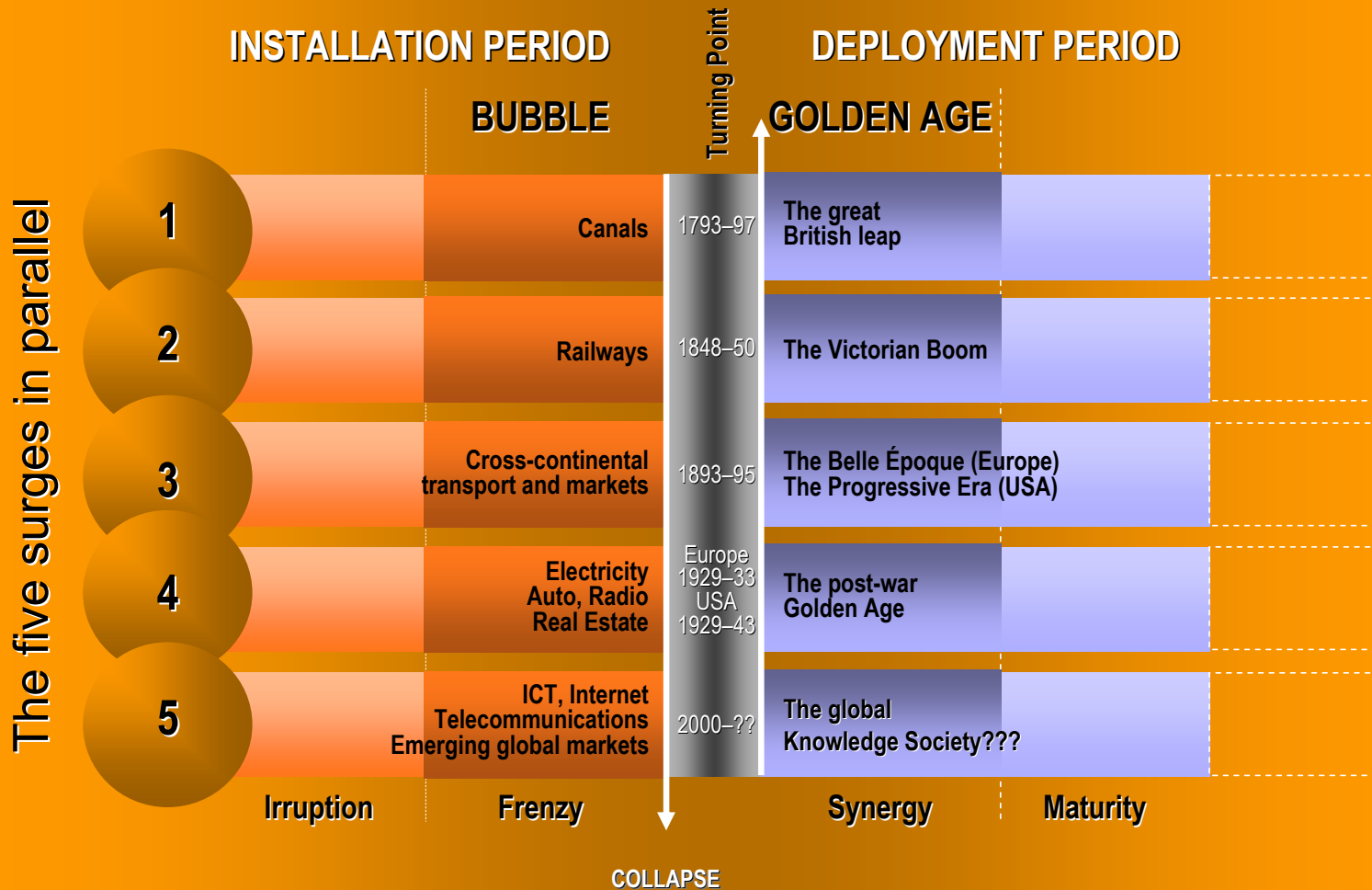
Each time the result is:

**A BUBBLE AND A CRASH!**

For that reason... the diffusion process is broken in two  
**EACH GREAT SURGE GOES THROUGH TWO DIFFERENT PERIODS**



# After each “bubble prosperity” there has been a Golden Age in the core countries



## But the two prosperities have had very different features

	<b>INSTALLATION: “Bubble economy”</b>		<b>DEPLOYMENT: “Golden Age”</b>
<b>Industry structures</b>	Fluid, changing, unstable	<b>Recession and changeover</b>	Increasingly defined and stable
<b>Competition</b>	Fierce, for survival		Strong for growing markets
<b>Criteria for investment</b>	Financial; short-term		Long-term; growth and expansion
<b>Productivity</b>	Divergent between and within sectors		Converging onto a higher plateau
<b>Innovation</b>	Intense exploratory		Constant; constructive
<b>Target markets</b>	Top of the income range		Whole (and expanding) range
<b>Income distribution</b>	Increasingly polarized		Progressive; extensive
<b>Social climate</b>	Individualism; happy rich; resentful poor		Increasing social awareness General “good feeling”

When guided by historical regularity  
**WE CAN EXPECT  
IN THE FUTURE:**

- **Two to three more decades  
for the full deployment of the Information Revolution**
- **A probable “GOLDEN AGE” prosperity,  
very different from the 1990s**
- **The transformation of all economic sectors  
and business models by the ICT paradigm**
- **And the gradual gestation of the next technological revolution  
(shaped by the logic of the present paradigm)**

**But, we are still at the Turning Point...**

**1**

## **THE SECULAR OVERVIEW**

**Technological revolutions and paradigm shifts**

**2**

## **THE SHORT TERM**

**The present world at the turning point**

**3**

## **SHAPING THE FUTURE**

**Different context: different strategies**

**4**

## **A CONCERTED EFFORT**

**Shared dynamic vision and convergent actions**

# THE NEGATIVE LEGACY

## of the financial bubble at the end of the Installation period

The dark  
side  
of the  
investment  
boom

- **Huge losses** of paper wealth (created by asset inflation)
- **Concentration of income** in the upper end of the spectrum: the rich getting richer and the poor poorer
- **Ethical softening**: fraudulent and illegitimate practices; corruption
- Celebration of greed and **individualism**

The  
“destruction”  
half of  
creative  
destruction

- **Deindustrialization** and deterioration of whole regions and even countries
- **Obsolescence** and complete devaluing of enormous amounts of investment and skills
- Loss of hope among the impoverished, leading to **resentment, violence and migrations**



The great bubbles also leave a positive legacy

## THE INSTALLATION OF THE BASES FOR THE FUTURE

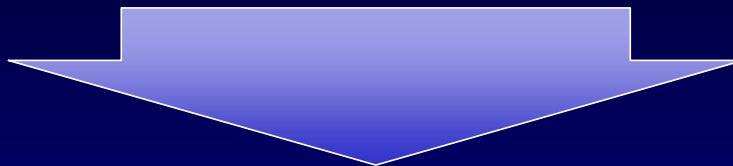
Enough infrastructure for a decade or more

The new paradigm accepted as 'common sense'

New production, consumption and business models established

New entrepreneurial giants: New engines of growth

Old giants rejuvenated



**THE CORE ECONOMIES ARE READY FOR FULL EXPANSION**

# **FINANCIAL CAPITAL HAS DONE ITS JOB**

**Its short-term horizon is now an obstacle  
to redirect investment for maximum growth...**

[housing bubbles, derivative mountains, quarterly pressure on firms]

**... it is time  
to put production capital  
at the helm**

**And that is done by adequate institutional change!**

**HOW WAS  
DEPLOYMENT  
UNLEASHED  
IN THE PREVIOUS  
SURGE**



**With a complex set of policies  
TO EXPAND DEMAND FOR MASS PRODUCTION  
AND FOR STABILIZING THE ECONOMY**

## POLICIES TO EXPAND DEMAND FOR MASS PRODUCTION

**Welfare State:** redistributive model based on progressive income tax, unemployment insurance, pensions, etc.

**Facilitating “mass consumerism”:** consumer credit systems, reduction of the labor day, week and year, institutionalized labor unions (for salary increases with productivity), “single language” policies for homogenizing demand, etc.

**Widening public demand:** Increasing taxes for State expenditure in defense, mass education and health systems, infrastructure, public services, etc.

**Marshall Plan** for reconstructing European production and consumption capacity

**The national state was the locus and the focus of the mass production paradigm**

## POLICIES FOR STABILIZING THE ECONOMY



**Highly regulated national economies:** Keynesian State involvement, demand management, fiscal and financial policies, monitoring of balance of payments and restriction of capital flows, regular statistics, regulation and strict compartments for financial activities, etc.

**Loosely supervised international economy:** Bretton Woods, IMF, GATT, World Bank, etc.

**Geopolitical balance:** United Nations, NATO, “Cold War”, decolonization, etc.

When that paradigm reached maturity in the 1970s  
**MOST OF THIS FRAMEWORK BROKE DOWN OR CAME UNDER ATTACK**

That institutional framework  
was adequate  
(though not consciously tailored)  
for the features of the  
**MASS PRODUCTION  
PARADIGM**

Unleashing global synergy today  
will require  
**AN EQUIVALENT (but quite different) SET OF CHANGES**  
adapted to global demand expansion and  
**SHAPED BY THE FEATURES OF THE ICT PARADIGM**

## What would be appropriate in this paradigm?

### → POLICIES TO EXPAND DEMAND IN A GLOBALIZING WORLD

**Conditions for further globalization  
of production (not just trade and finance)**

“What’s good for the ICT industries  
is good for the world and vice versa)

**Decided drive towards favoring and facilitating  
the re-specialization of the advanced countries  
and the adequate repositioning of all**

### → POLICIES TO REGULATE THE ECONOMY AT THE APPROPRIATE LEVEL

**If the economy functions at the global level,  
enforceable regulation  
cannot be restricted to the national level  
(at least in finance, environment, trade and major crime)**

An particularly important feature to understand

## **THIS PARADIGM OVERCOMES THE OLD DICHOTOMIES**

**Global markets** ↔ **Local markets**

**Competition** ↔ **Cooperation**

**High tech** ↔ **Craft**

**Giant corporations** ↔ **Small firms**

**Foreign investment** ↔ **Local investment**

**State** ↔ **Markets**

**Neither one, nor the other, but rather...  
A POWERFUL COMBINATION OF BOTH**

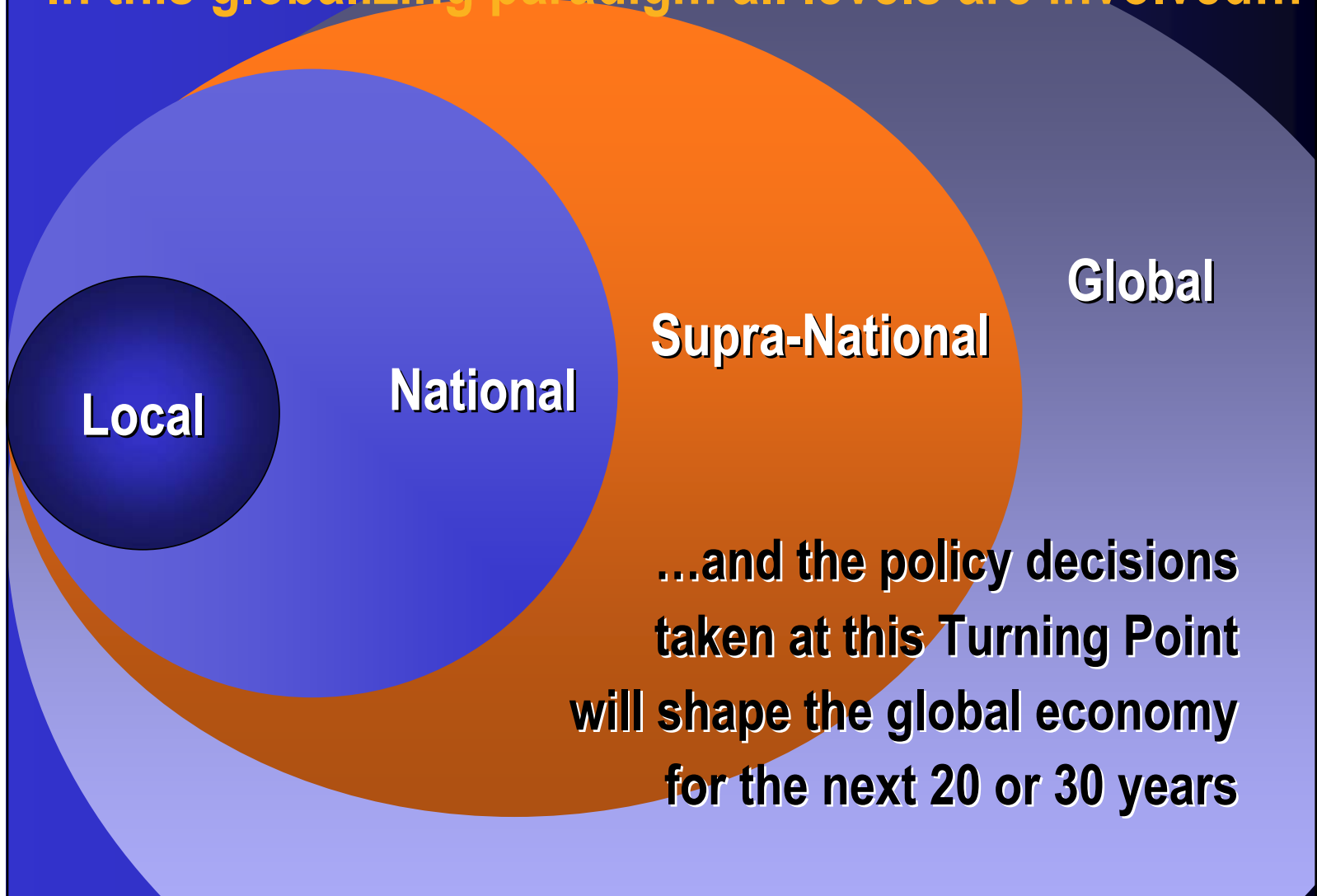


**“Market  
fundamentalism”  
is as big  
an obstacle  
for Deployment  
today**



**as “State Fundamentalism”  
was for Installation  
in the 1970s and 80s**

**In this globalizing paradigm all levels are involved...**



**Local**

**National**

**Supra-National**

**Global**

**...and the policy decisions  
taken at this Turning Point  
will shape the global economy  
for the next 20 or 30 years**

**1**

## **THE SECULAR OVERVIEW**

**Technological revolutions and paradigm shifts**

**2**

## **THE SHORT TERM**

**The present world at the turning point**

**3**

## **SHAPING THE FUTURE**

**Different context: different strategies**

**4**

## **A CONCERTED EFFORT**

**Shared dynamic vision and convergent actions**

# THREE IMPORTANT PROCESSES TO WATCH

## in the shift from Installation to Deployment

### Each industry's restructuring

What mergers, acquisitions, alliances or divestitures are shaping it?  
How is it overcoming excess price competition?

### Each value chain's decomposition and integration

What is being outsourced and what is being kept as core?  
How finely are they breaking up activities?  
What type of advantages are attracting which parts of the chain?

### Each market's segmentation

Which product segments are being standardised and which customised?  
Which qualities are being sought in the most profitable segments?

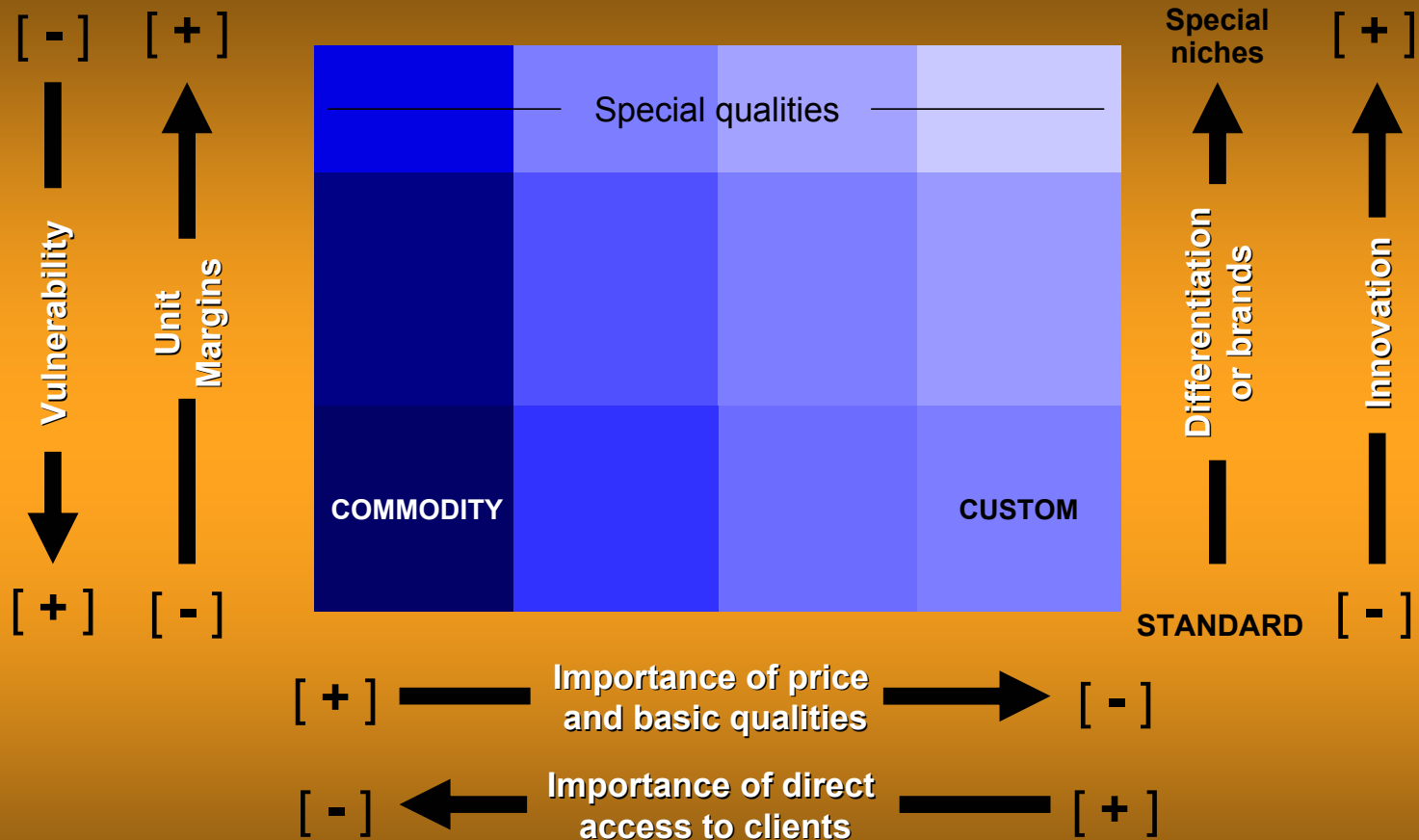
**These processes will define the viable positioning space  
for companies and countries**

## **Why is market positioning and repositioning so important?**

**Because conditions of profitability  
are very different  
according to market segments**

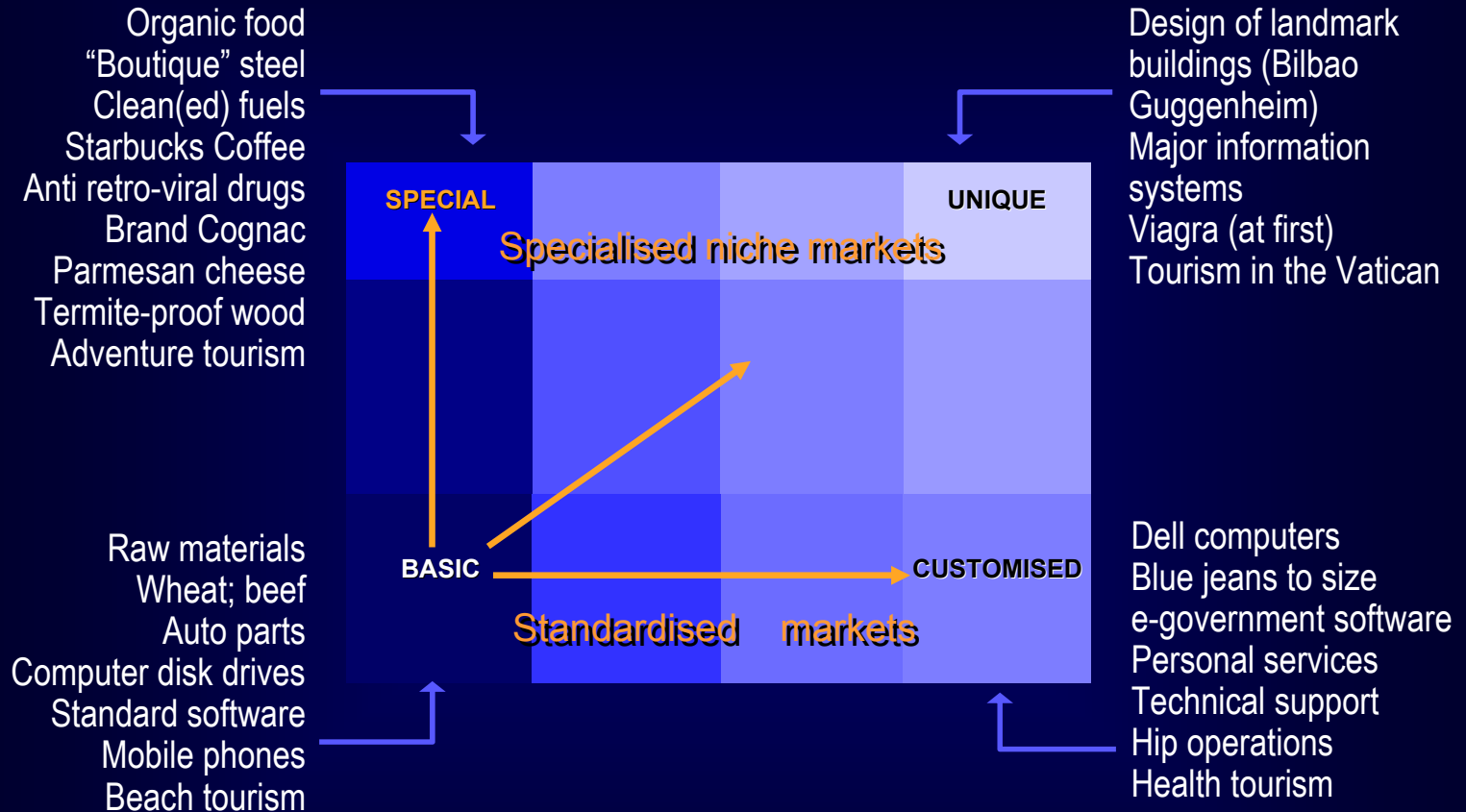
**The flexible nature  
of the ICT paradigm  
and its tools of information processing and coordination  
facilitate –and even induce –  
THE DISAGGREGATION OF THE VALUE CHAIN  
AND THE INCREASING SEGMENTATION OF ALL MARKETS**

# MARKET SEGMENTATION AND ITS DIFFERING CONDITIONS



And this applies from raw materials to all manufacturing and services

## Some examples of positioning



**Improvement is achieved by appropriate repositioning  
building from existing expertise and advantages**

**THE WIDTH OF THE DECISION SPACE  
OF EACH COUNTRY AND COMPANY  
WILL BE INFLUENCED BY:**

- The existing advantages and expertise**
- The ability to revalue them**
- The quality of the ICT infrastructure and capabilities**

**Different national patterns of  
INNOVATION and SPECIALIZATION**



## **DYNAMIC SPECIALIZATION AND GROWTH WILL DEPEND ON A FAVOURABLE NATIONAL CLIMATE**

- **Consensus for aiming at adequate market segments**
- **Providing top quality ICT infrastructure and services**
- **Promoting national and global networks**
- **Favouring innovation and entrepreneurship**
- **Facilitating access to finance**
- **Investing in human capital at all levels**
- **Investing in R&D (for present and future needs)**

**A collective vision  
with facilitating conditions**

1

## THE SECULAR OVERVIEW

Technological revolutions and paradigm shifts

2

## THE SHORT TERM

The present world at the turning point

3

## SHAPING THE FUTURE

Different context: different strategies

4

## A CONCERTED EFFORT

Shared dynamic vision and convergent actions



**From  
short-range  
policies**

**To long-range  
and wide-scope  
understanding  
and vision**

Setbacks occur when you hold on  
to a policy that worked  
and get stuck  
in the  
previous phase

**GROWTH TAKES PLACE IN A CHANGING CONTEXT  
DRIVEN BY TECHNOLOGICAL CHANGE**

Advances happen  
when you prepare  
for the next phase  
(consciously, by intuition or by luck)

# Three horizons for simultaneous action

**Short term horizon:  
TURNING POINT**

**Observe –and participate in– the shaping  
of the global context**

**Build a national consensus vision and create  
optimal institutional conditions**

**Medium term horizon:  
DEPLOYMENT PERIOD OF ICT**

**Help modernize and reposition the old sectors  
in less vulnerable market segments or  
in adequate global network roles**

**Strengthen ICT capabilities and infrastructure**

**Promote widespread ICT use and  
new business models across the economy**

**Intensify efforts in human capital formation**

**Facilitate entrepreneurship  
in providing business support services**

**Longer term horizon:  
NEXT TECHNOLOGICAL REVOLUTION**

**Conscious preparation:**

- **sustained investment in R&D**
- **support innovation**
- **alliances to strengthen position  
in bio, nanotech and others**

**Move from isolated  
decisions...**

**TO AGREEMENT  
ON A COMMON DIRECTION**

