

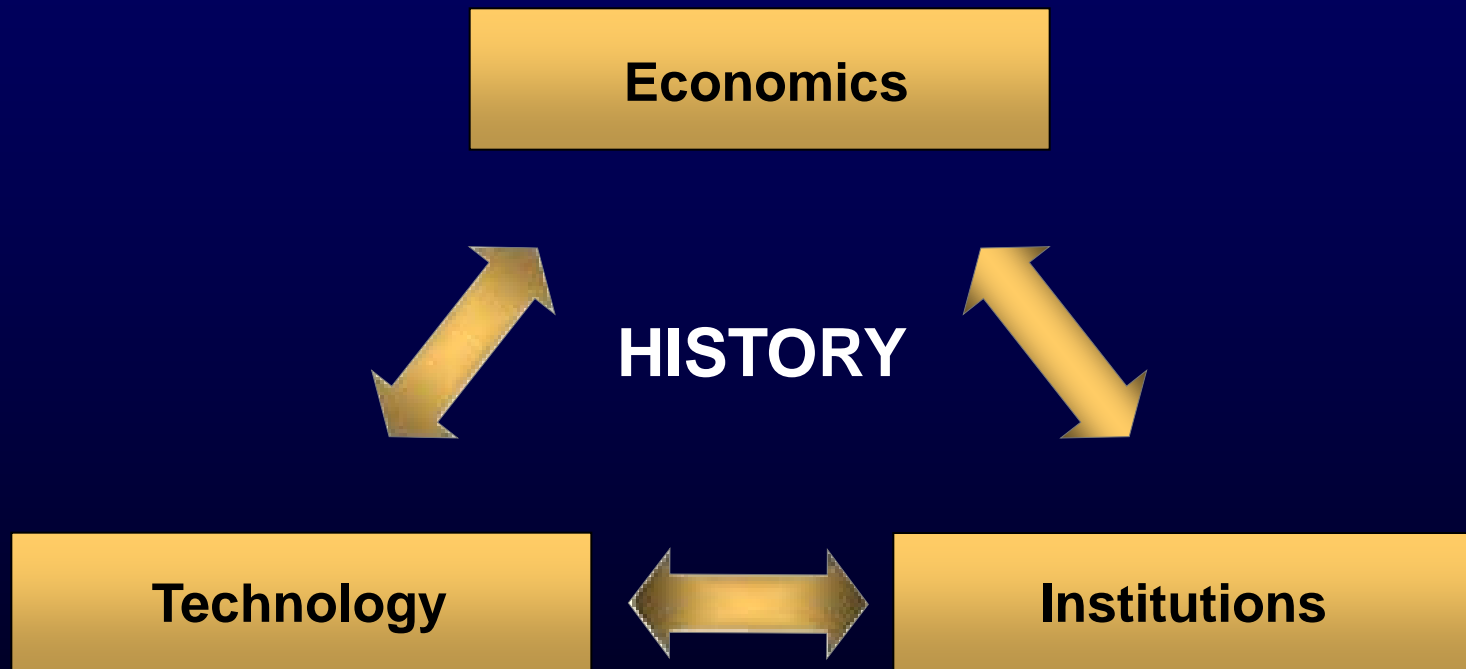
**The direction of innovation
after the financial collapse
ICT for green growth
and global development**

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Perhaps the most important lesson that Chris Freeman taught us is:

**THAT ECONOMICS IS INCAPABLE OF UNDERSTANDING GROWTH
WITHOUT INTERDISCIPLINARITY**



That wider framework helps us identify long-term regularities

AND ALLOWS US TO GLEAN POSSIBLE FUTURES

FIVE TECHNOLOGICAL REVOLUTIONS IN 240 YEARS

1771

The 'Industrial Revolution' (machines, factories and canals)

1829

Age of Steam, Coal, Iron and Railways

1875

Age of Steel and Heavy Engineering (electrical, chemical, civil, naval)

1908

Age of the Automobile, Oil, Petrochemicals and Mass Production

1971

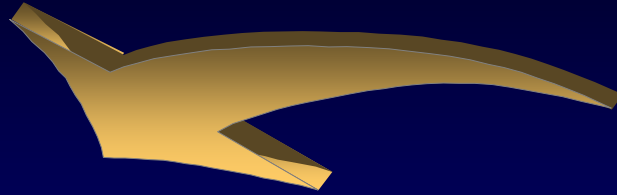
Age of Information Technology and Telecommunications

20??

Age of Biotech, Nanotech, Bioelectronics and New Materials?

**EACH ONE DRIVES A GREAT SURGE OF DEVELOPMENT
AND CHANGES THE TECHNO-ECONOMIC PARADIGM GUIDING INNOVATION**

Due to the massive “creative destruction” required
DIFFUSION TAKES PLACE IN TWO DISTINCT PERIODS

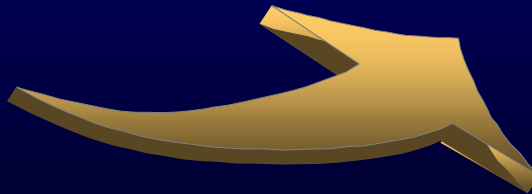


The first half is the
INSTALLATION PERIOD

led by finance and free markets
when innovation concentrates
to set up the new infrastructure,
to let markets pick the new winners
and to modernize the old economy

The second half is the
DEPLOYMENT PERIOD

led by production aided by the State
when innovation
spreads across the board
to reap the full
economic and social benefits



**THE MAJOR BUBBLE COLLAPSE
MARKS THE SWING OF THE PENDULUM**

THE HISTORICAL RECORD

Bubble prosperities, recessions and golden ages

GREAT SURGE	Year country	INSTALLATION PERIOD	TURNING POINT	DEPLOYMENT PERIOD	
		Bubble prosperity	Collapse & Recessions	"Golden Age" prosperity	Maturity
1 st	1771 Britain	Canal mania	1793-97	The Great British leap	
2 nd	1829 Britain	Railway mania	1848-50	The Victorian Boom	
3 rd	1875 Britain / USA Germany	Infrastructure bubbles of first globalisation (Argentina, Australia, USA)	1890-95	Belle Époque (Europe) "Progressive Era" (USA)	
4 th	1908 USA	The roaring twenties	Europe 1929-33 USA 1929-43	Post-war Golden age	
5 th	1971 USA	Internet mania and financial casino	2000 & 2007/8 -????	Global Sustainable "Golden Age"?	

The shift from financial mania and collapse to Golden Ages occurs when enabled by regulation and policies to shape and widen markets

WHY TWO PERIODS? WHY THE BUBBLE?

RESISTANCE
TO THE NEW

Old industries
old habits
old methods

Need a period of
CREATIVE DESTRUCTION
to force modernization

UNCERTAINTY

Which products?
Which technologies?
Which companies?
Which markets?

Need to experiment
in ferocious “free market”
COMPETITION

NATURE OF
INFRASTRUCTURES

All or nothing
Invest up-front
Revenues come later

Need credit creation
through bubble boom and
short-term **CAPITAL GAINS**

Once the bubbles collapse, the job is done

THE NEW PARADIGM IS INSTALLED AND CAN BE DEPLOYED

But that requires a structural shift away from the casino economy

HOW WAS
THE MASS PRODUCTION
GOLDEN AGE
UNLEASHED?



- **Through very strict financial regulation in each country**
Glass Steagall, "Chinese walls", deposit insurance, capital export controls, etc.
- **International stability through the Bretton Woods agreements**
US dollar as "gold", IMF, GATT, World Bank (then IBRD), etc.
- **Keynesian policies for stable growth within national borders**
Counter-cyclical measures, stimulus spending, etc. and a set of policies...

...INDUCING STRUCTURAL CHANGE IN FAVOR OF MASS CONSUMPTION!

THE SYNERGISTIC CONDITIONS THAT SHAPED THE POST WAR GOLDEN AGE

INNOVATION ENABLERS
FOR MASS PRODUCTION

Cheap oil
and materials
Universal electricity
Road and airway
networks

FACILITATORS
OF DEMAND GROWTH
FOR MASS
CONSUMPTION

FORCES SHAPING
THE DIRECTION
OF INNOVATION

Suburbanization
Post-war
reconstruction
R&D funding
Cold war

Welfare State
Public procurement
Labour unions
Personal credit
system

They were provided in different proportions in each "First World" country

A POSITIVE-SUM GAME

**THAT TURNED WORKERS
INTO MIDDLE INCOME
CONSUMERS**

**AND BROUGHT
THE GREATEST BOOM
IN HISTORY**

THE NEW TECHNOLOGICAL POTENTIAL

A MAJOR TECHNO-ECONOMIC PARADIGM SHIFT

A change in relative cost structures changes the direction of innovation

**FROM THE LOGIC
OF CHEAP ENERGY (oil)
for transport, electricity,
synthetic materials, etc.**



**TO THE LOGIC
OF CHEAP INFORMATION
its processing, transmission
and productive use**

**Preference
for tangible products
and disposability**

**Unthinking use
of energy and materials**

**Unavoidable
environmental destruction**

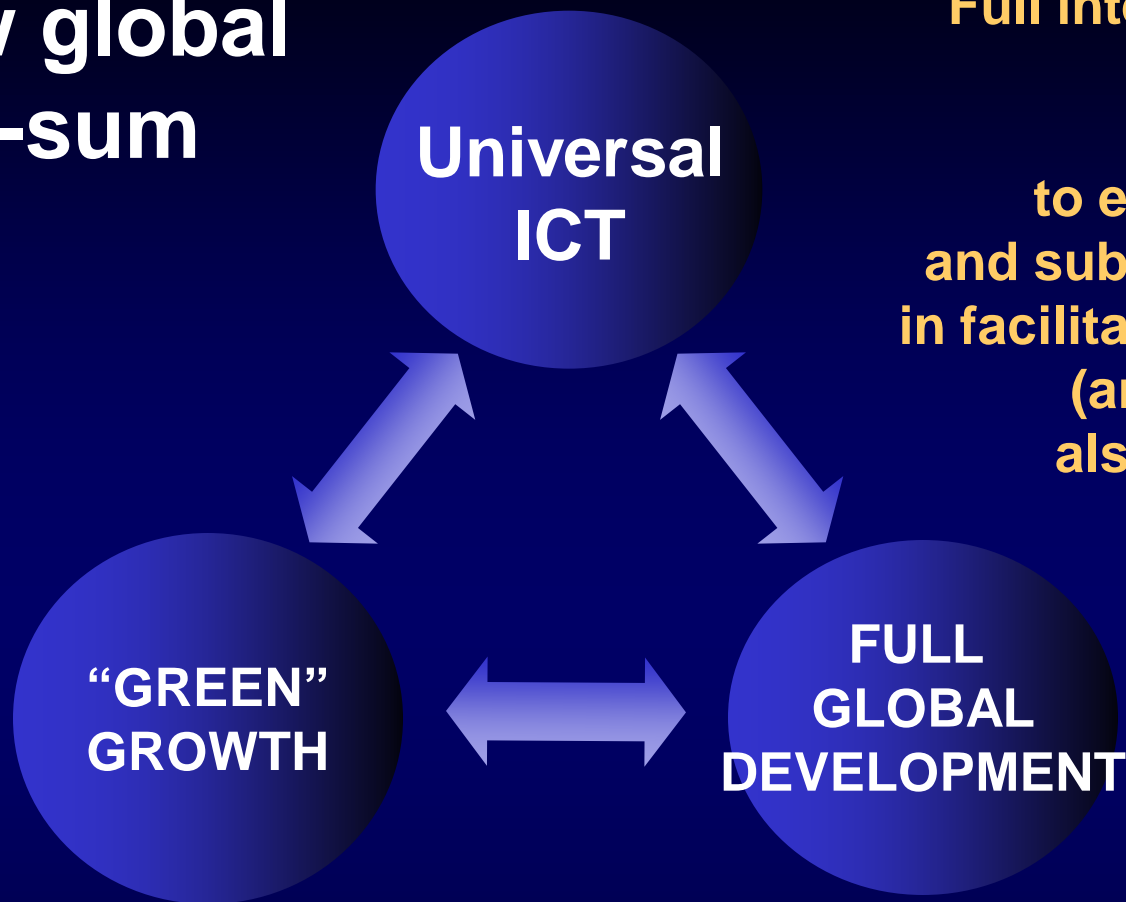
**Preference
for services
and intangible value**

**Huge potential for savings
in energy and materials**

**Capacity for
environmental friendliness**

**Cheap Asian labor and the return of cheap oil
have hindered the use of this huge opportunity space**

The new global positive-sum game

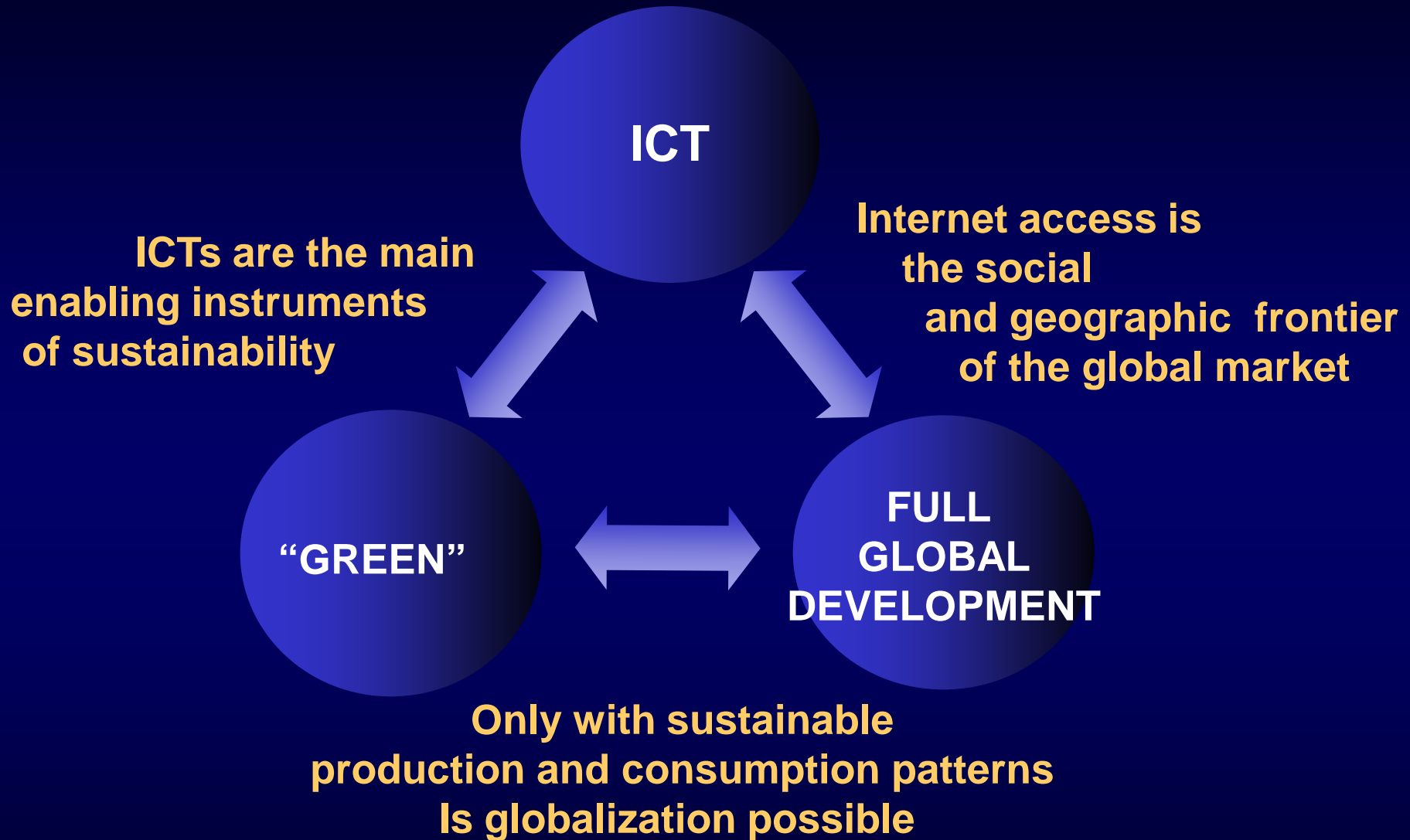


Full internet access at low cost is equivalent to electrification and suburbanization in facilitating demand (and, this time, also education)

Revamping transport, energy, products, production and consumption patterns to make them sustainable is equivalent to post-war reconstruction and the spread of suburbia

Incorporating successive new millions into sustainable consumption patterns is equivalent to the Welfare State and government procurement in terms of demand creation

And the elements are interconnected



**But we need policy consensus
involving government, business and society**

GLOBAL DEVELOPMENT

is not only

a humanitarian goal

**It is about healthy growth,
markets and employment
in the advanced, emerging and
developing worlds**

**“GREEN” is not only about
saving the planet**

**It is about saving the economy
and having a high (but different)
quality of life**

**But it cannot happen by guilt or fear
but by desire and aspiration**

“GREEN” MUST BECOME THE “LUXURY LIFE”

WHAT LOOKS IMPOSSIBLE NOW MAY SEEM OBVIOUS LATER

In mid-1930s DEPRESSION

it seemed impossible to imagine...

...that blue collar workers
would have lifetime jobs and
fully equipped suburban houses
with a car at the door

...or that most colonies
would gain independence

But later it was obvious that...

...increasing wages created
many more millions of consumers
for mass production and sustained growth

...the new middle classes
rising in the developing world
widened world markets for mass production
by adopting the "American Way of Life"

And it seemed impossible in the late 1960s...

...to expect some of the values
of the hippie movement
[back to natural materials,
organic food, etc.]
to become
the luxury norms

But now it is obvious that...

...innovations in natural textile fibers
have transformed the world of high fashion

... and innovations in distribution logistics
have made organic foods
the premium segment in supermarkets

Shifts in consumption patterns shift profit-making opportunities



**THE TECHNOLOGICAL STAGE
IS SET TODAY
FOR THE GLOBAL GOLDEN AGE
OF THE 21st CENTURY**

**It is up to business, government and society
to agree on the convergent actions
for making it a reality**

Another important lesson
that Chris Freeman taught us
is that:

Beyond the interdisciplinary understanding of the economy

**OUR ACADEMIC WORK HAS FULL MEANING
WHEN IT ENGAGES IN THE BETTERMENT OF SOCIETY**

Will we reach the golden age or waste this opportunity?

**WE SHALL ALL BE RESPONSIBLE
FOR THE OUTCOME**

For further reading:

Freeman and Louca (2001) *As Time Goes By*

Perez (2002) *Technological Revolutions and Financial Capital:
the Dynamics of Bubbles and Golden Ages*

and

www.freemanchris.com

www.carlotaperez.org