
Τεχνολογική Στρατηγική - Ανασκόπηση

Τεχνολογική Στρατηγική

▷ **ΔΠΜΣ «Επιχειρηματικότητα»**

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Τμήμα Οικονομικών Επιστημών



ΠΑΝΕΠΙΣΤΗΜΙΟ
ΘΕΣΣΑΛΙΑΣ

▶

Μια νέα οπτική

- ▶ Τεχνολογική **αλλαγή**
- ▶ Καινοτομία
 - ▶ Διαδικασία
 - ▶ Πολυδιάστατο αποτέλεσμα
 - ▶ ως προϊόν ή/και υπηρεσία
 - ▶ ως διαδικασία
 - ▶ ως εισροή
 - ▶ ως αγορά
 - ▶ Οργανωτικά
 - ▶ Πολύ-επίπεδη αλλαγή
 - ▶ Προϊόν
 - ▶ Τεχνολογία
 - ▶ Σύστημα
 - ▶ Κλάδος
 - ▶ Όφελος – πλεονέκτημα, απόδοση

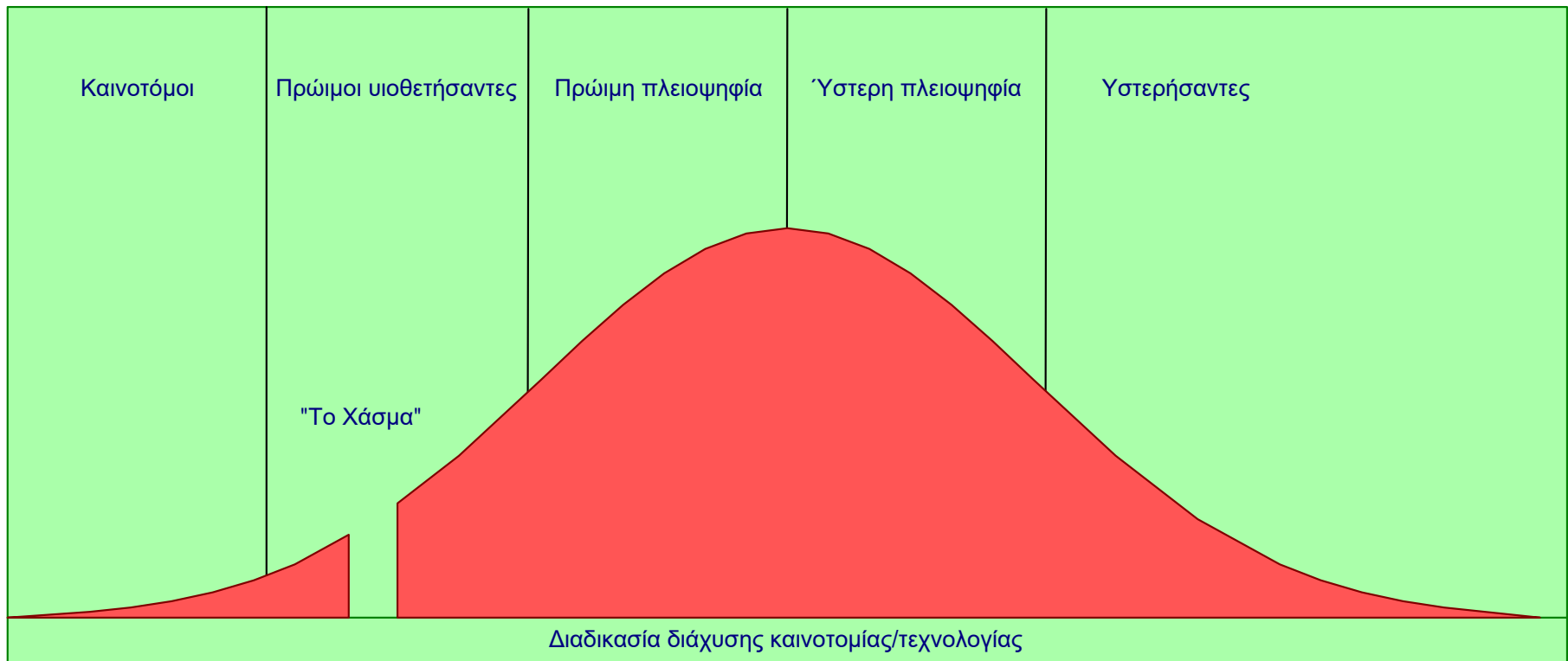


Η γνώση μας έχει πλουτίσει

TABLE 2.2 Rothwell's five generations of innovation models

<i>Generation</i>	<i>Key features</i>
First and second	Simple linear models – need pull, technology push
Third	Coupling model, recognizing interaction between different elements and feedback loops between them
Fourth	Parallel model, integration within the firm, upstream with key suppliers and downstream with demanding and active customers, emphasis on linkages and alliances
Fifth	Systems integration and extensive networking, flexible and customized response, continuous innovation

Η καμπύλη του ρυθμού διάχυσης



Κύκλος προϊόντος, σχεδιαστική τροχιά και κλαδική δυναμική

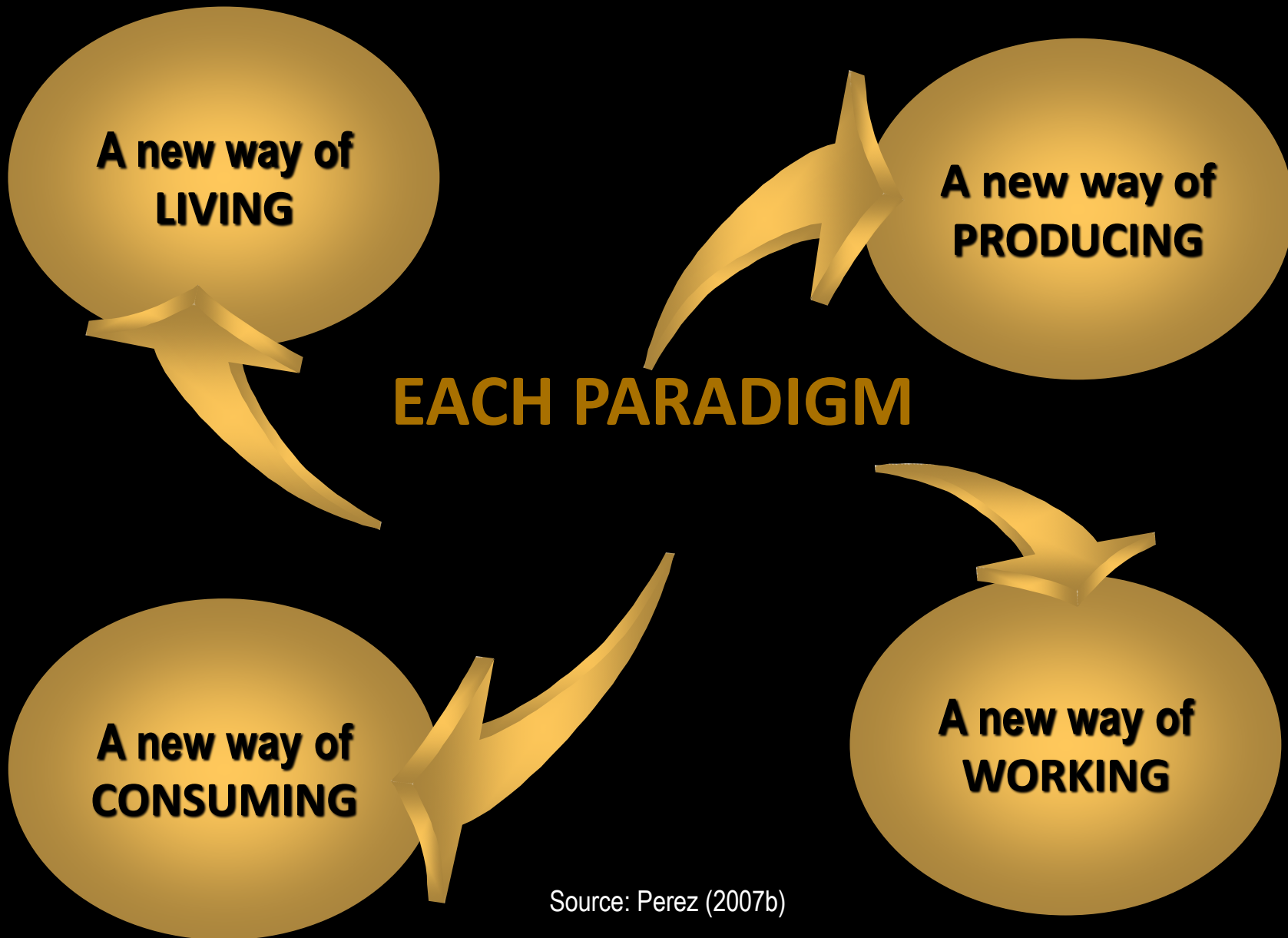
TABLE 1.2 Stages in innovation life cycle

<i>Innovation characteristic</i>	<i>Fluid pattern</i>	<i>Transitional phase</i>	<i>Specific phase</i>
<i>Competitive emphasis placed on . . .</i>	Functional product performance	Product variation	Cost reduction
<i>Innovation stimulated by . . .</i>	Information on user needs, technical inputs	Opportunities created by expanding internal technical capability	Pressure to reduce cost, improve quality, etc.
<i>Predominant type of innovation</i>	Frequent major changes in products	Major process innovations required by rising volume	Incremental product and process innovation
<i>Product line</i>	Diverse, often including custom designs	Includes at least one stable or dominant design	Mostly undifferentiated standard products
<i>Production processes</i>	Flexible and inefficient – aim is to experiment and make frequent changes	Becoming more rigid and defined	Efficient, often capital intensive and relatively rigid

Δομικός μετασχηματισμός του τρόπου παραγωγής

- ▶ Τεχνολογική εξέλιξη = ανάπτυξη των παραγωγικών δυνάμεων και σχέσεων
 - ▶ Εξέλιξη των οικονομικών θεσμών (δομών): επιχειρηματικές δομές, χρηματοδοτικά εργαλεία και συμμετοχές κοκ
 - ▶ Ανάπτυξη του ανθρώπινου δυναμικού (μόρφωση, πληροφόρηση, επικοινωνία, δικτύωση, έκφραση κοκ)
 - ▶ Μετάβαση από τη χειρωνακτική εργασία (και την εκμηχάνιση) στη δημιουργική εργασία (και την υποστήριξή της)
 - ▶ Μετασχηματισμός της οικονομίας του χρόνου
 - ▶ Κοινωνία της μάθησης και της συμμετοχής

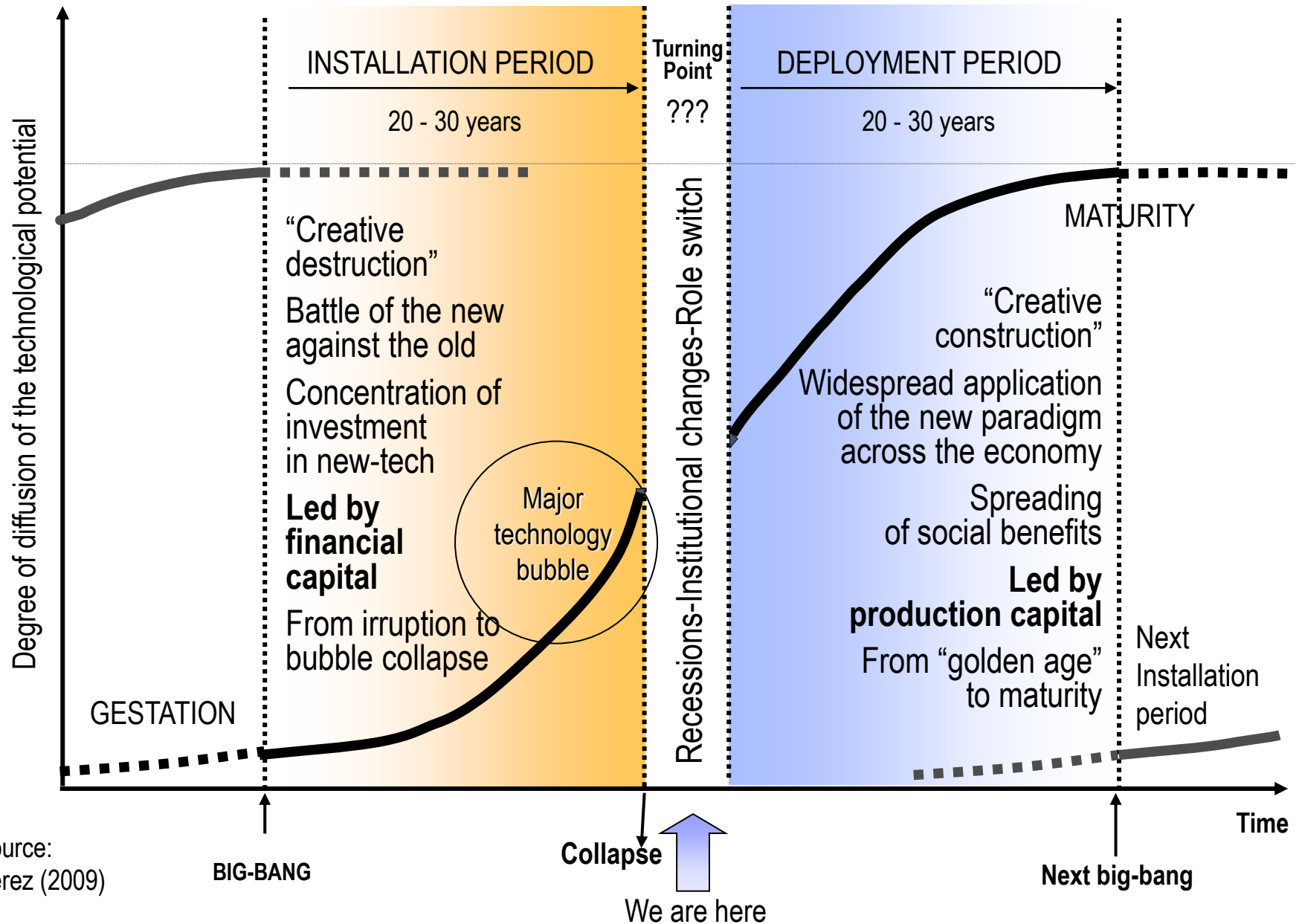




Source: Perez (2007b)

Due to the difficulty of social absorption of revolutions and new paradigms

EACH GREAT SURGE IS BROKEN INTO TWO DIFFERENT PERIODS



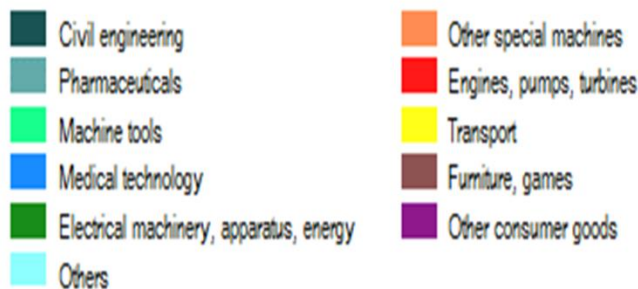
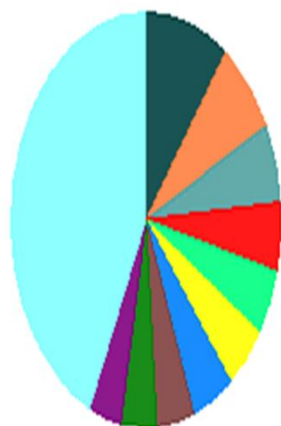
Ένα νέο μίγμα προϊόντος

- ▶ Δημιουργία νέας αξίας σε παλιούς και νέους τομείς
 - ▶ Υγεία (τεχνητή νοημοσύνη κλπ)
 - ▶ Παιδεία (αλληλεπιδραστική, πολύ-μεσική μάθηση, παιγνιοποίηση κοκ.)
 - ▶ Πολιτισμός και αναψυχή (σχεδιασμός, εμπλουτισμός εμπειριών)
 - ▶ Αγρο-διατροφή (ιχνηλασιμότητα, βιωσιμότητα, εξατομίκευση, μακριά ουρά κοκ)
 - ▶ Ενέργεια (έξυπνα, αποκεντρωμένα δίκτυα)
 - ▶ Μεταποίηση (αστικά εργοστάσια – urban factories, fab labs)



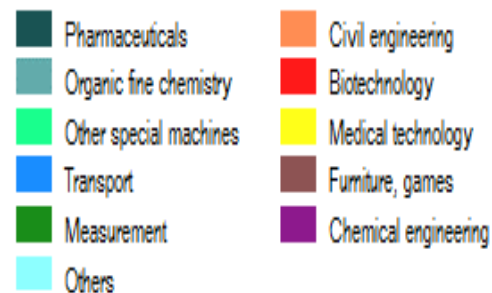
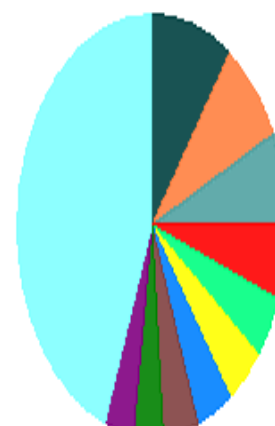
Greece vs Portugal

Patent Applications by Top Fields of Technology (2000 - 2014)



Source: WIPO statistics database; last updated: 12/2015

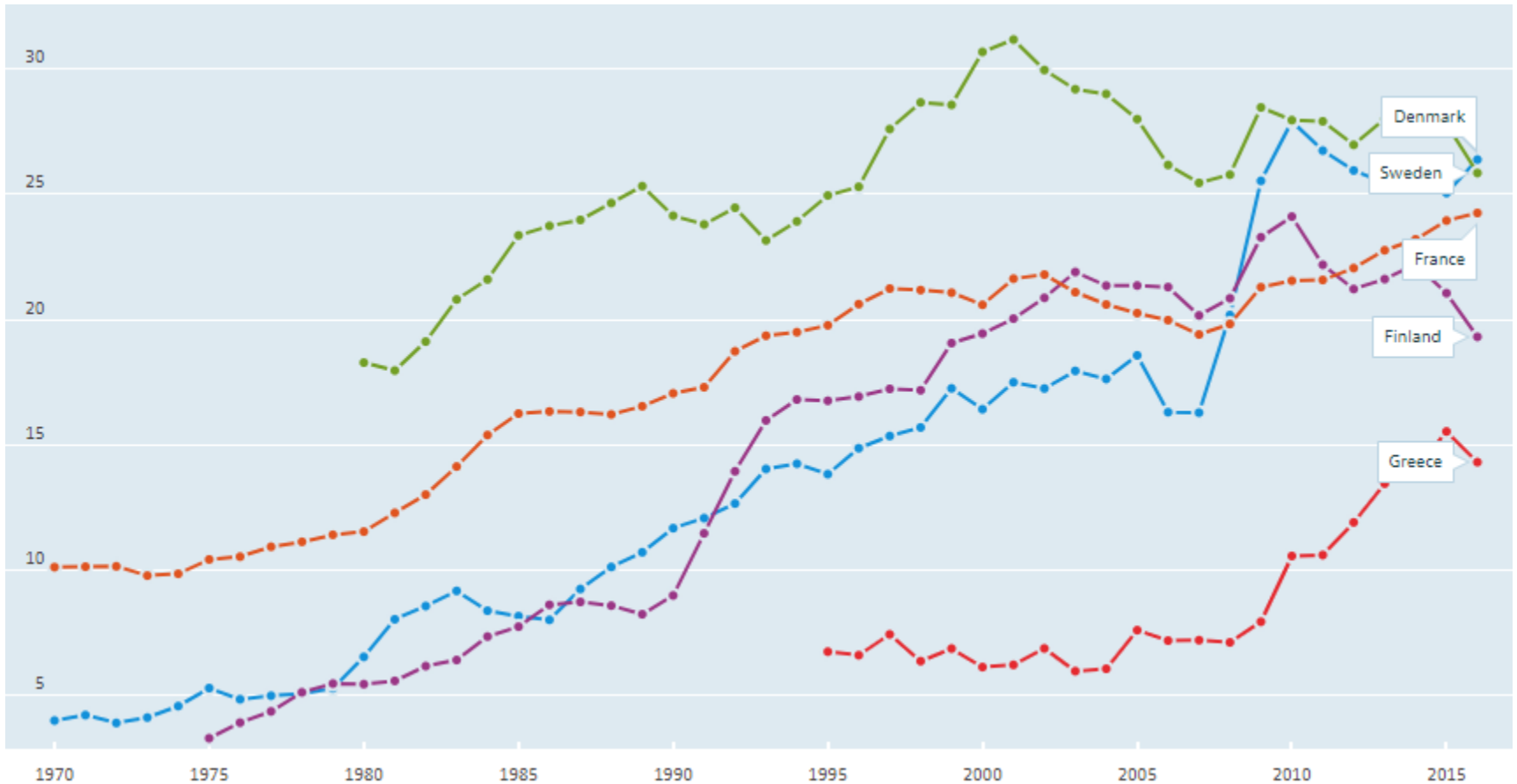
Patent Applications by Top Fields of Technology (2000 - 2014)



Source: WIPO statistics database; last updated: 12/2015

Ένα νέο μίγμα επενδύσεων

Επενδύσεις σε άυλα στοιχεία ενεργητικού, % συνόλου, 1970 – 2016



Source: OECD National Accounts Statistics: National Accounts at a Glance

Knowledge is - ontologically - a club good

▶ Easy to exclude:

▶ Exclusion mechanism:

barriers to learning (tacit, conjectural knowledge, situated learning, proximity)

▶ Inclusion mechanism:

Toll: the cost of learning

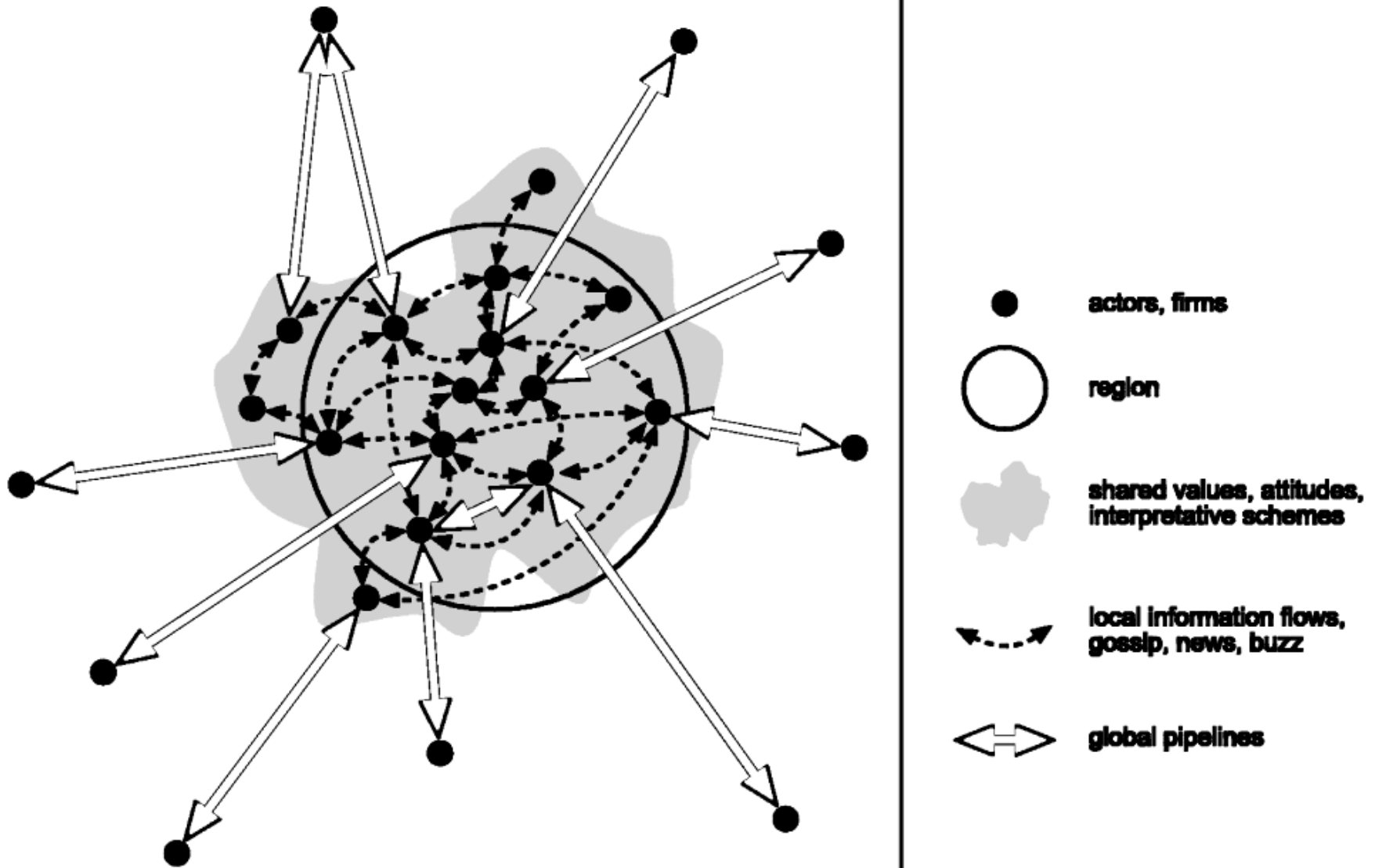
Learning as **initiation**: “absorbing and being absorbed in - the “culture of practice” (Lave and Wenger 1991, p. 95)

▶ Heterogeneous membership:

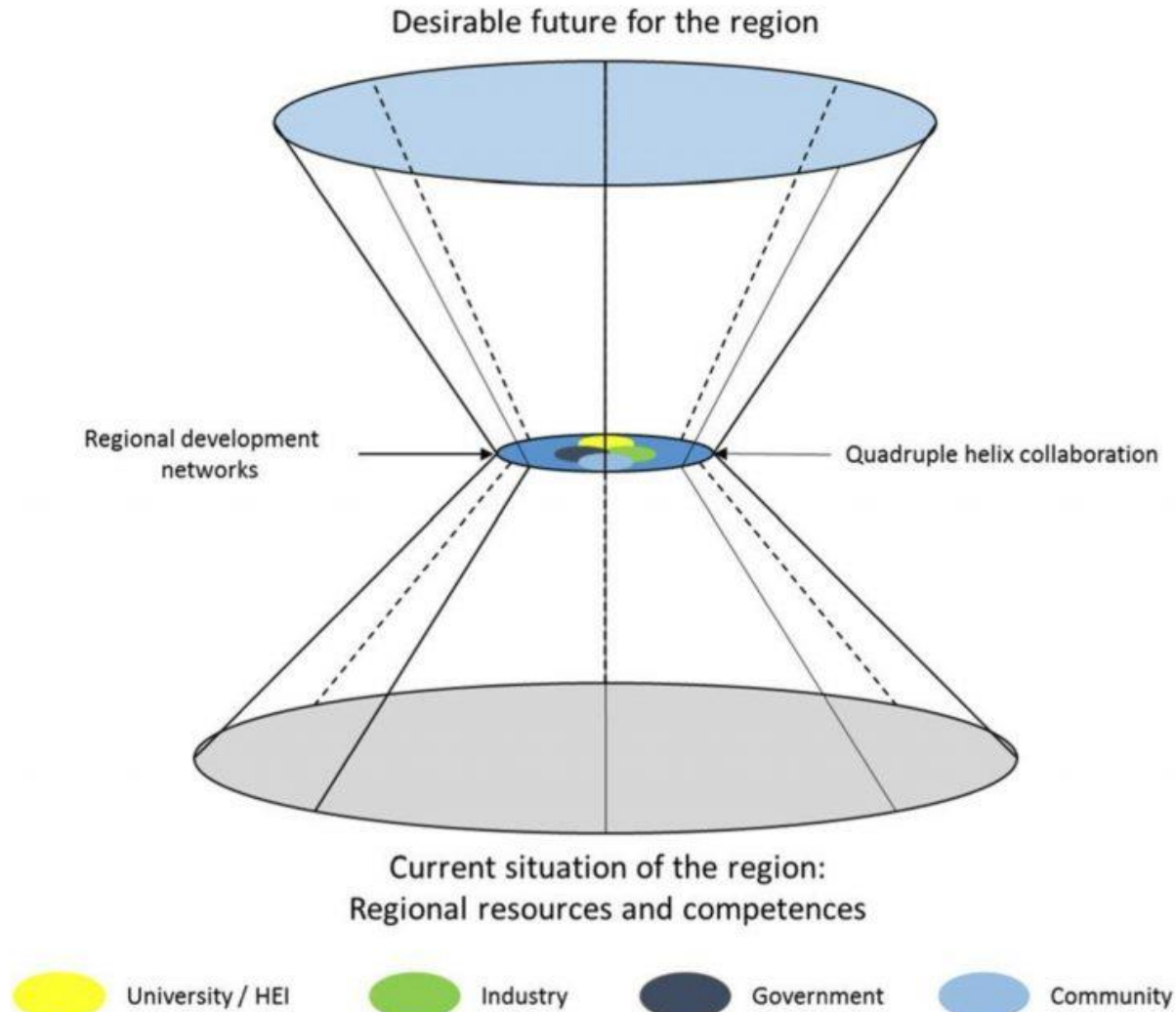
- ▶ “peripheral participation”

- non-rival
- tacit and explicit
- excludable
- cumulative
- localized – contextual - situational
- sticky
- dispersed
- organizational
- embedded
- transaction specific asset
- asymmetric
- political

Clusters: local buzz and global pipelines



Η πολλαπλή έλικα της καινοτομίας, για τη μετάβαση στην οικονομία της γνώσης



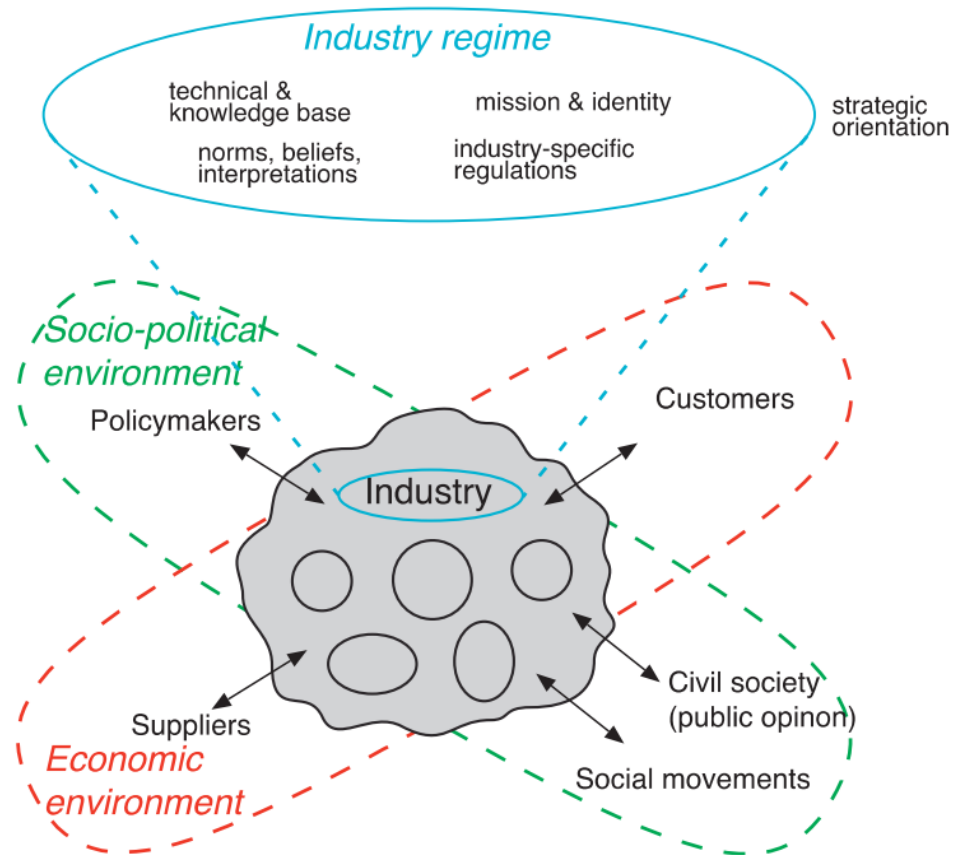
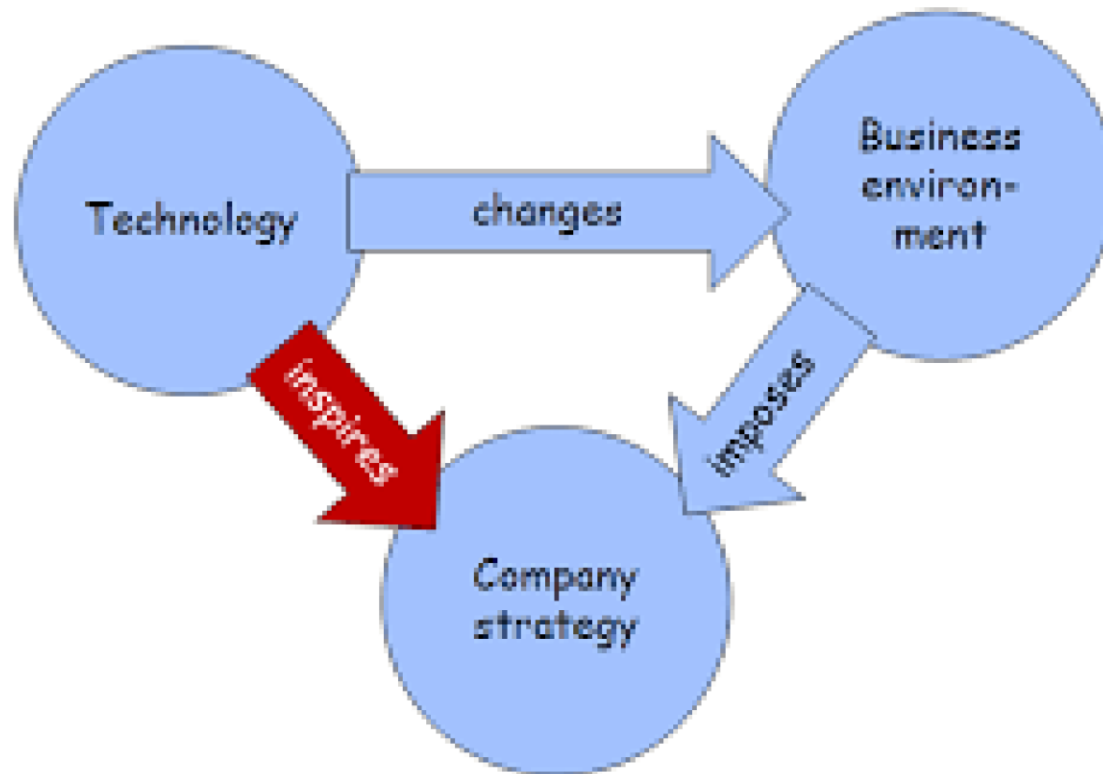


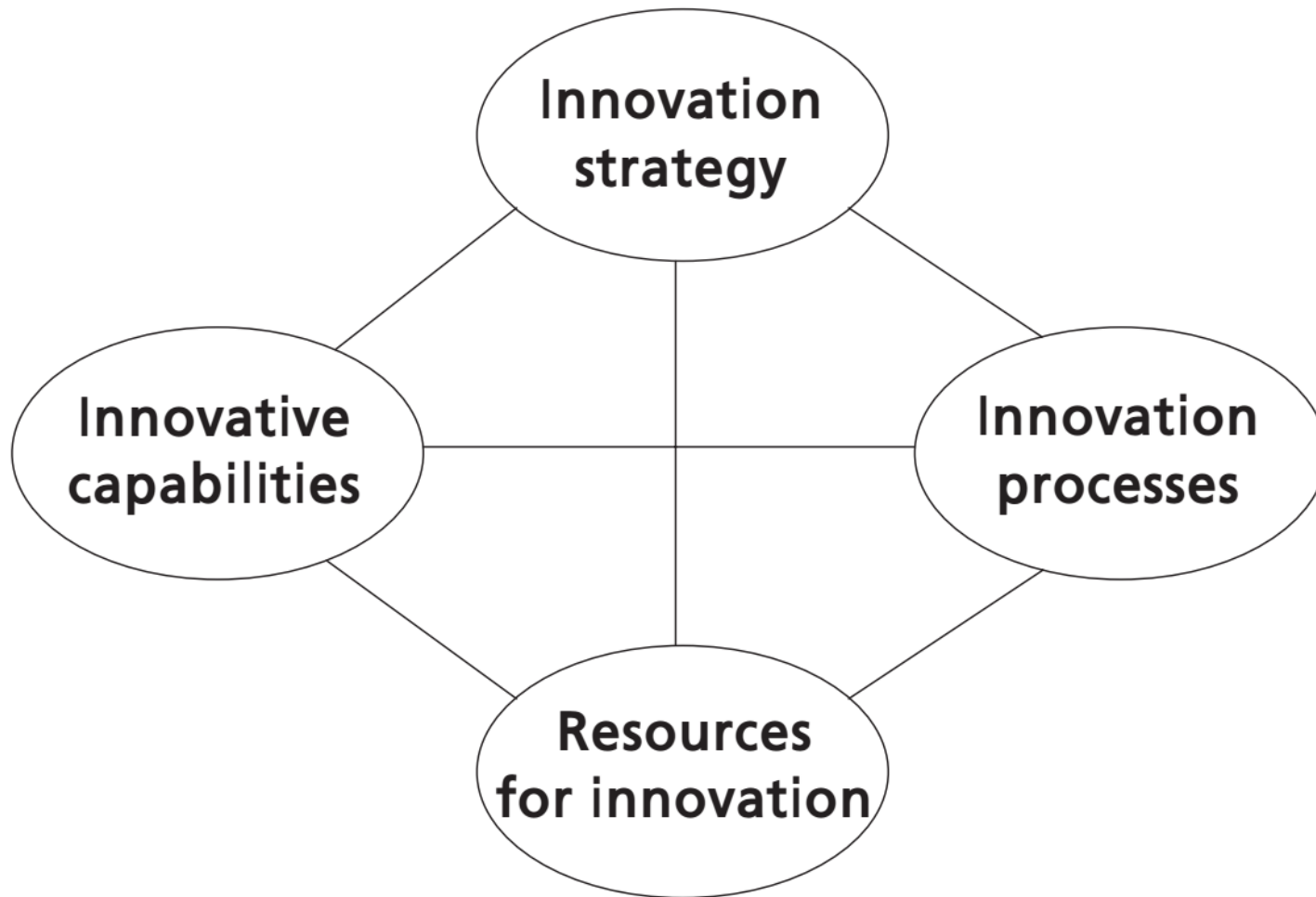
Fig. 2. Triple embeddedness framework of industries.
 Source: (adapted from Geels, submitted for publication).

(Turnheim and Geels, 2012)

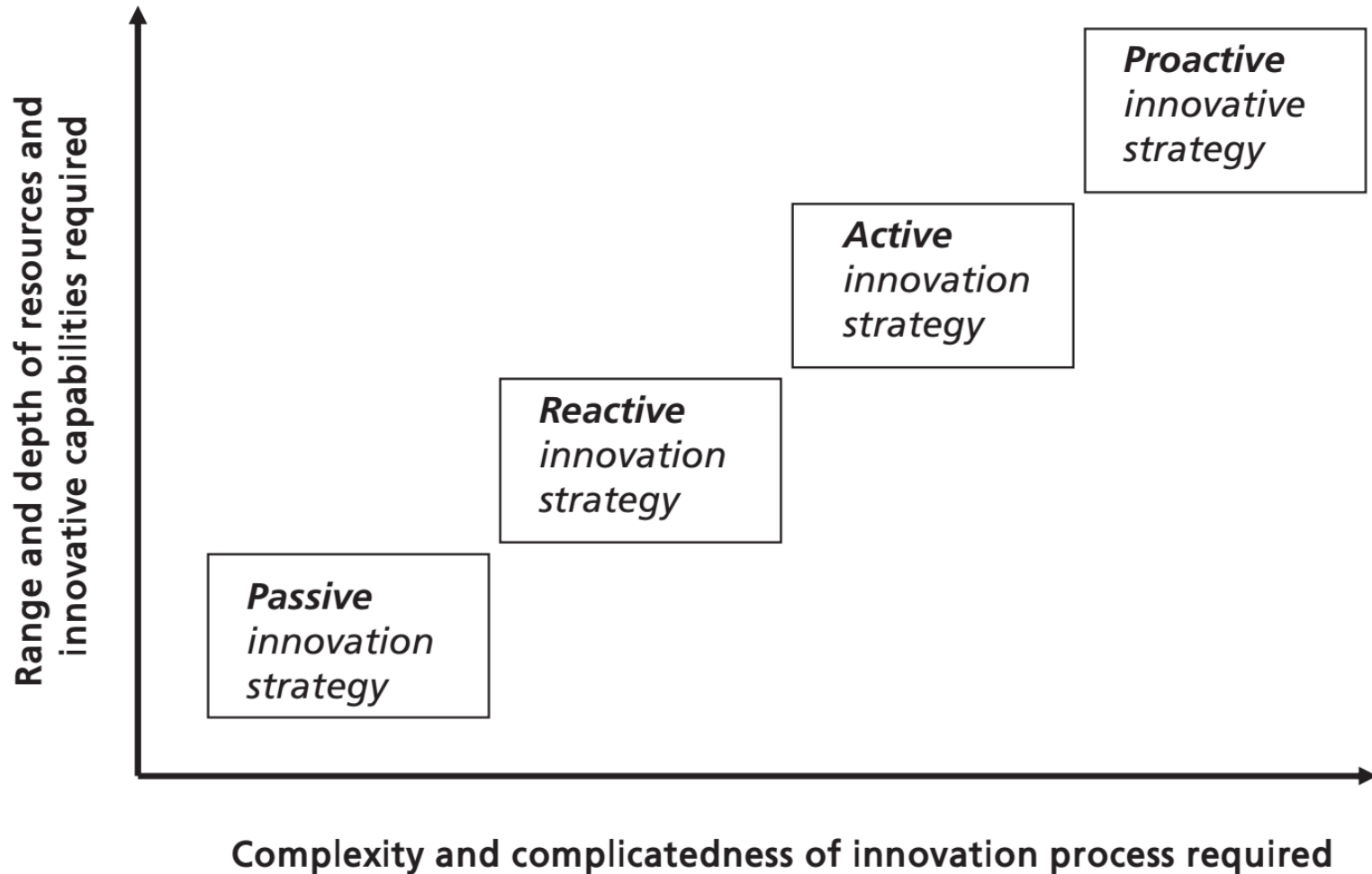
Τεχνολογία και Στρατηγική



A simple model of innovation strategy



Επίπεδα ανάπτυξης τεχνολογικής στρατηγικής



Καινοτομικές ικανότητες, αναλυτικά πλαίσια, εργαλεία και μέθοδοι

Innovative Capability	Key objectives	Analytical frameworks/concepts (some examples)	Tools & techniques (some examples)
<i>Searching</i>	Seeking and assessing market and technology opportunities and threats	Technological trajectories, Sustaining or disruptive innovation, Radical–incremental innovation, Lead customers/suppliers	Forecasting/Foresight, Delphi, Bibliometrics, Technology road maps
<i>Selecting</i>	Choosing amongst future options, based on evaluation of available resources and results of search activities	Life cycle analysis, Core competencies/technologies, Platform technologies, First-mover/fast-follower advantage	Technology and Innovation Audits, Social network analysis, Portfolio analysis, Peer Assist, Gamechanger, Multi-criteria assessment
<i>Configuring</i>	Ensuring the coordination and integration of innovation efforts	Lean Thinking, Integrated Solutions, Innovation brokerage, Balanced teams, Agile manufacturing	Technology Plans, R & D alignment tools, Quality Function Deployment, User tool kits
<i>Deploying</i>	Delivering internally generated and acquired innovations. Protecting and delivering value from innovation	Complementary assets, Dominant designs, Market for ideas or products, Appropriability regimes	IPR portfolio management, Standards setting, Real options
<i>Learning</i>	Improving the performance of innovation processes	Learning curves, High-level learning	Post-project evaluations, Strategic reviews, Balanced Scorecard

Τεχνολογική Προοπτική Διερεύνηση (Technology Foresight)

Τεχνολογική Παρακολούθηση

Μέθοδοι Τεχνολογικής Προοπτικής Διερεύνησης

Δημιουργία και ανάλυση σεναρίων

Technology scanning and forecasting

Τεχνολογικός χάρτης ανάπτυξης (Technology Road-Mapping -TRM)

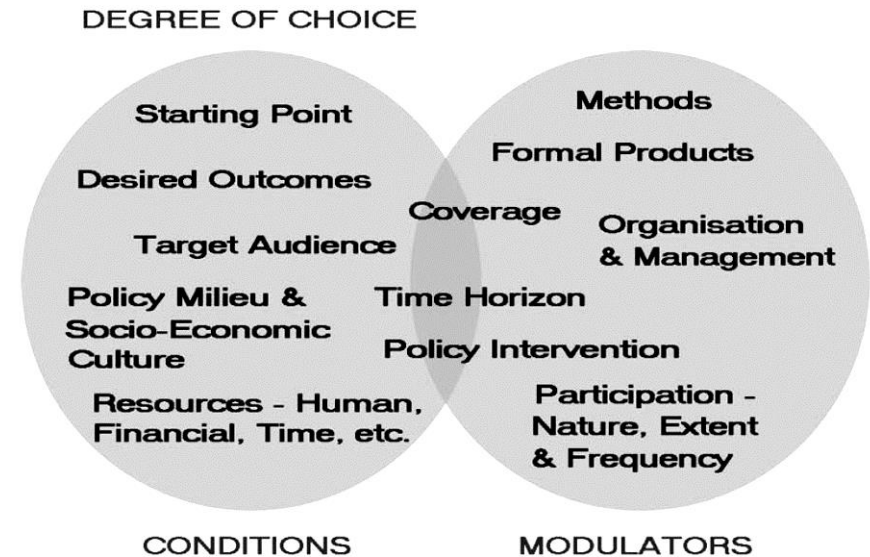


Τεχνολογική Προοπτική Διερεύνηση (Technology Foresight - TF)

The broad aim of technology foresight is to identify emerging generic technologies likely to yield the greatest economic and social benefits

scoping : ενέργειες διαμόρφωσης μιας ΤΠΔ - Scoping TF involves three main tasks:

- Gathering background information (literature reviews through books, journals, reports, and web sites).
- Eliciting views and advice through private bilateral discussions with key stakeholders, scoping workshops, open conferences. The aim is to gather ideas, obtain commitment of future support and participation, and to begin the process of securing buy-in to the results of the exercise.
- Articulating and presenting options



Εικόνα 1. Οι διαστάσεις των ασκήσεων Τεχνολογικής Προοπτικής Διερεύνησης

Πηγή: Popper, 2008

The 12 scoping elements of TF

Γλυκερία Καραγκούνη

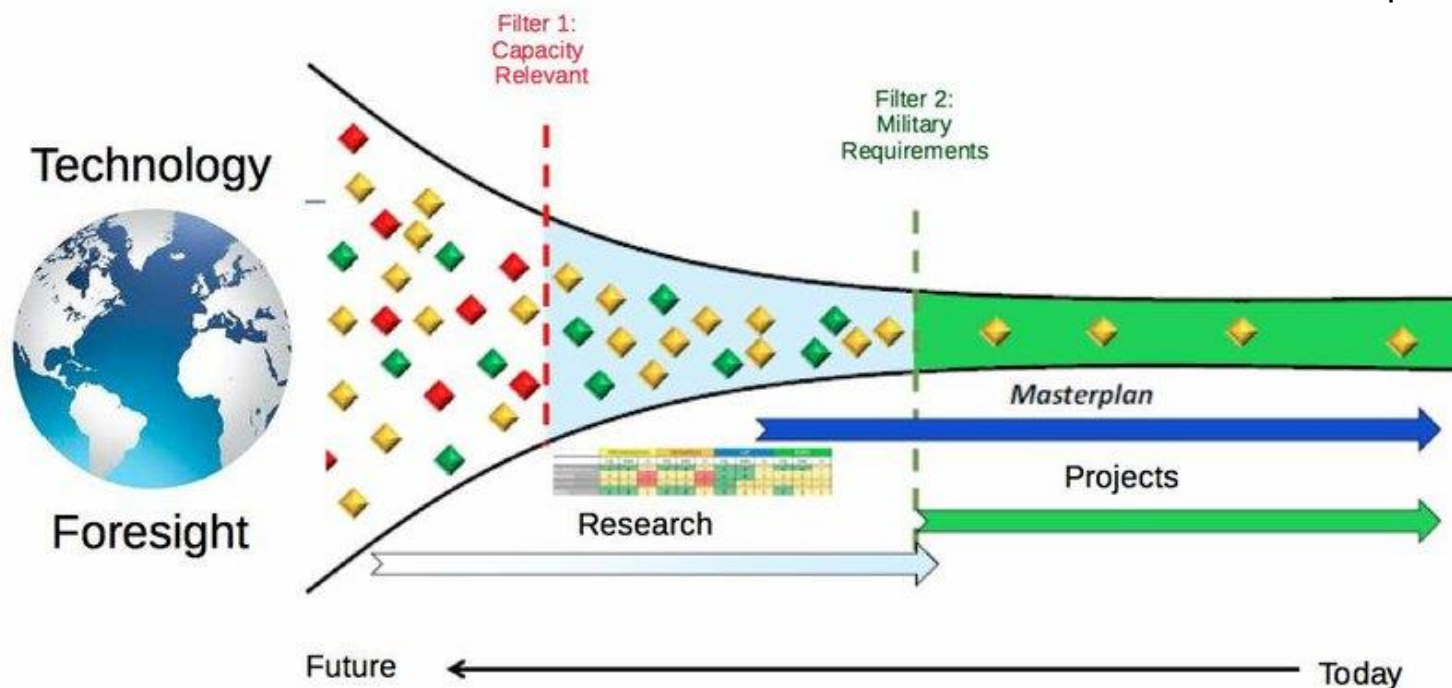


Technology Foresight: - Η διαδικασία - TECHNOLOGY FORESIGHT METHODS

Group	Method
Identifying Issues	Environmental Scanning, SWOT Analysis, Issue Surveys
Extrapolative Approaches	Trend Extrapolation, Simulation Modelling, Genius Forecasting, Delphi
Creative Approaches	Brainstorming, Expert Panels, Cross-Impact Analysis, Scenarios
Prioritization	Critical (and Key) Technologies, Technology Roadmapping

Source: Miles and Keenan, (2003).

- Delphi.
- Scenario building.
- Brainstorming.
- Critical Technologies.
- Roadmapping
- SWOT
- Analytical hierarchy process
- The Bayesian model
- Morphological analysis



Technology Foresight: Η διαδικασία - TECHNOLOGY FORESIGHT METHODS Σενάρια

Stephen A.W. Drew, (2006)

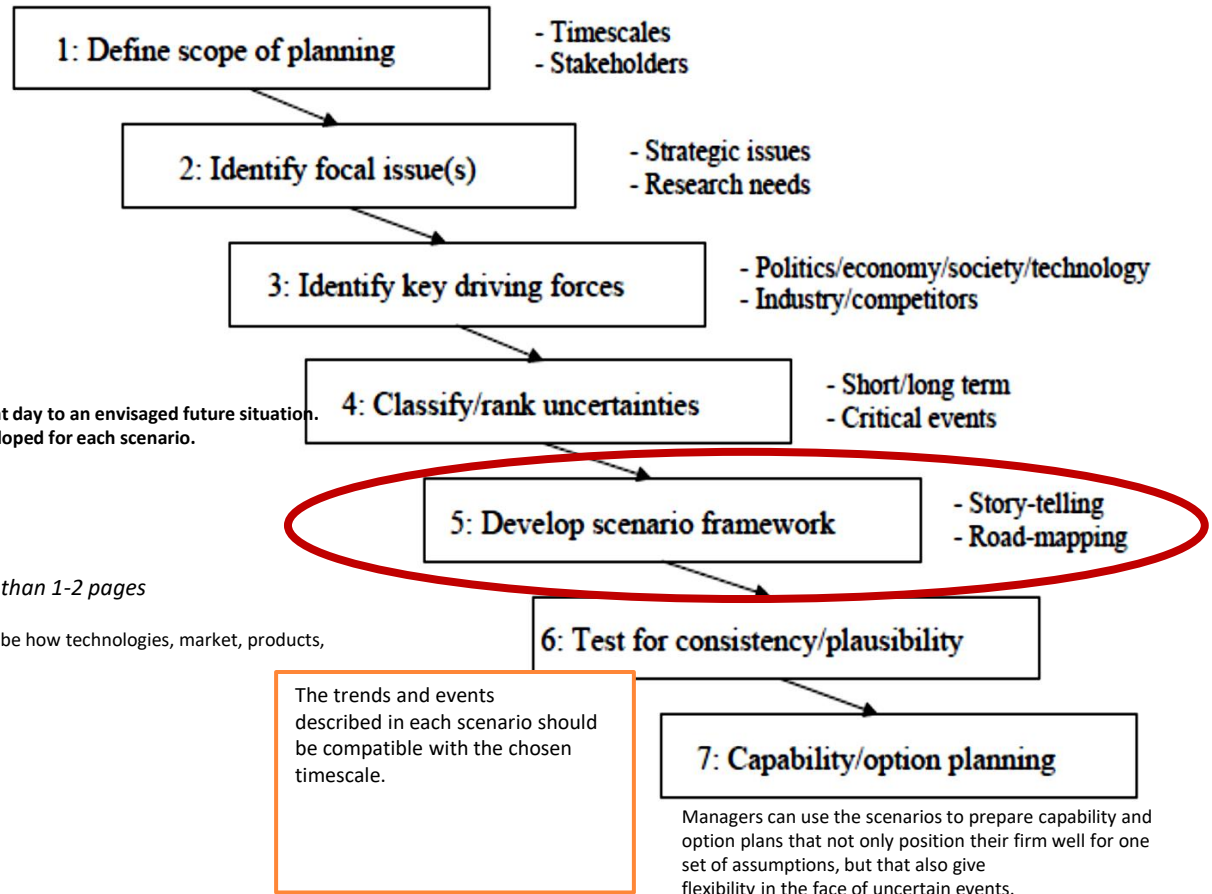
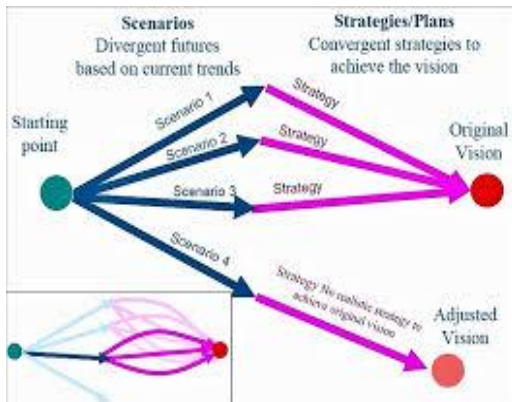
A scenario is a rich description of a possible future, built to explore how an innovation might develop, given particular assumptions. A scenario framework offers a range of scenarios designed to help guide strategic decision making

Typically a max of 3-4 scenarios is suggested
one may be a base case extrapolation of existing trends.

Broad themes are usually identified for each scenario, and the scenario written by a team as a story of events from the present day to an envisaged future situation. Supporting quantitative data, models, and forecasts might be developed for each scenario.

Initially, scenarios can be written as short stories of no more than 1-2 pages

The scenario stories can be elaborated into more road maps that describe how technologies, market, products, and processes unfold in each scenario



Από την ιδέαστο προϊόν

**Δημιουργία
Πνευματικής
Ιδιοκτησίας**

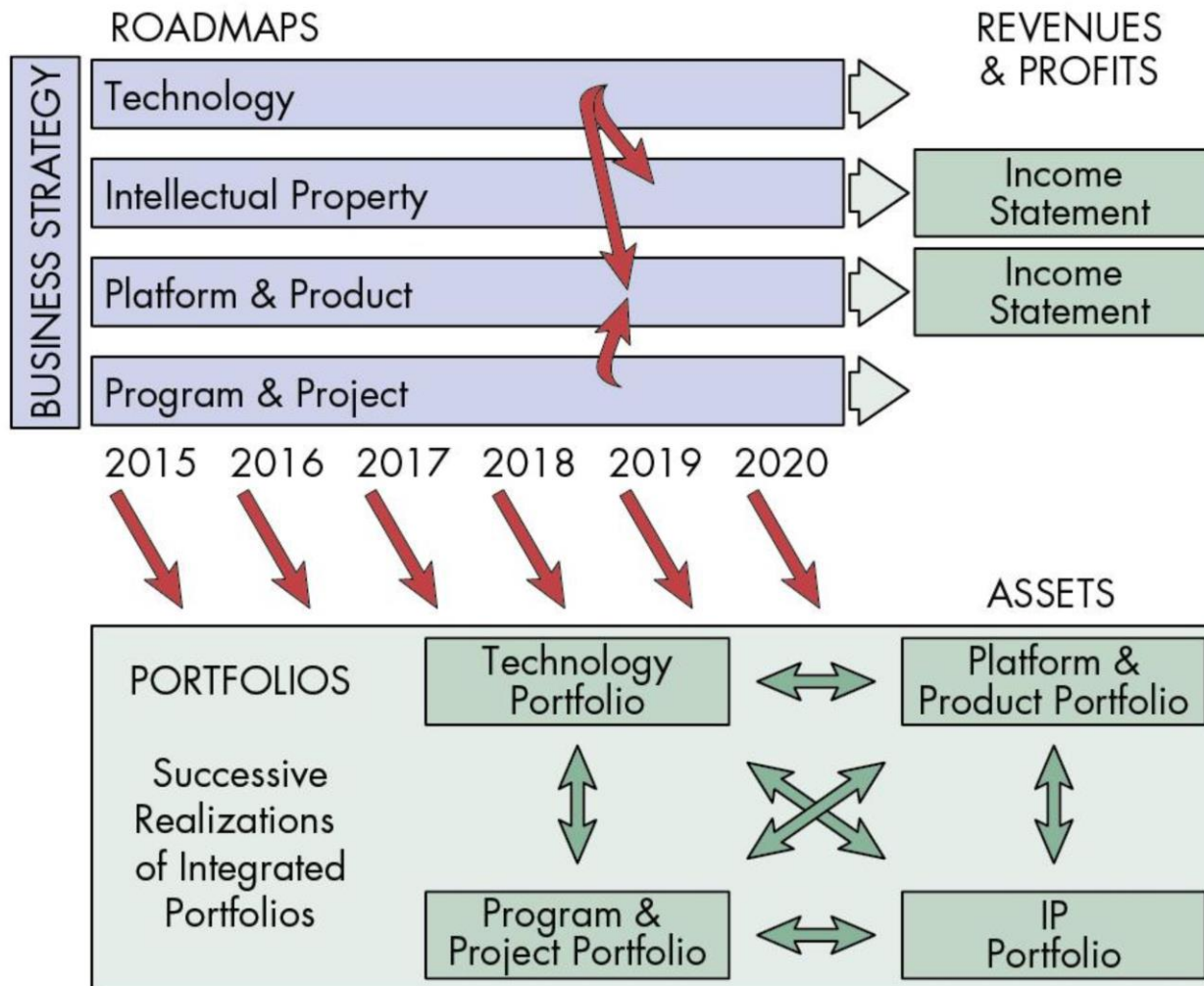
**Προστασία
Πνευματική
ς
Ιδιοκτησίας**

**Αποτίμηση
Πνευματική
ς
Ιδιοκτησίας**

**Εμπορευματοποίηση
Πνευματικής
Ιδιοκτησίας**

Τεχνολογικοί οδικοί χάρτες

Four Dynamic Roadmaps Yield Four Dynamic Portfolios



Source: Goldense Group, Inc., Needham, Mass.

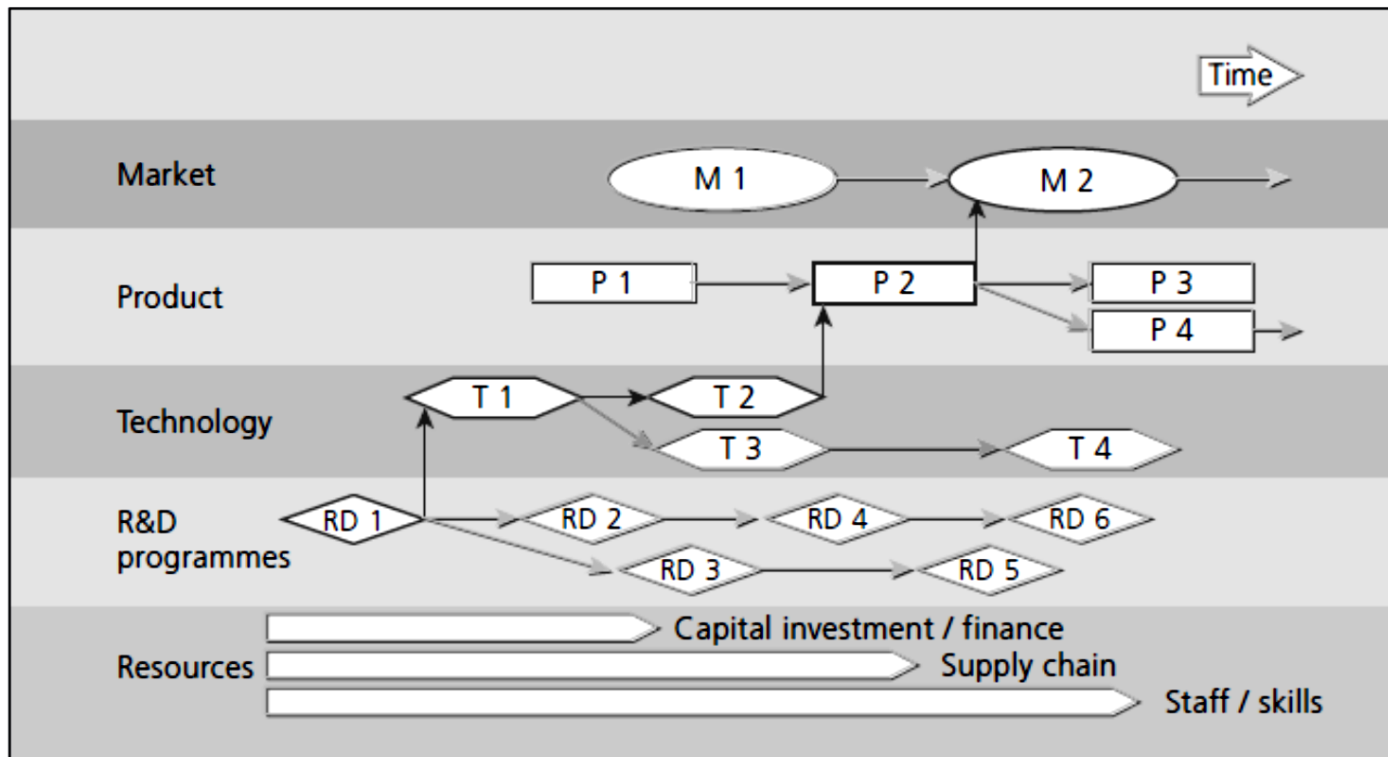
Technology Foresight: Η διαδικασία - TECHNOLOGY FORESIGHT METHODS

TECHNOLOGY ROADMAPPING

Η μέθοδος technology roadmapping (χαρτογράφησης της πορείας της τεχνολογίας) χρησιμοποιείται ευρέως στη βιομηχανία για την υποστήριξη της τεχνολογίας στρατηγικής και σχεδιασμού. Η προσέγγιση αναπτύχθηκε αρχικά από τη Motorola πριν από 25 χρόνια, για την υποστήριξη του σχεδιασμού ολοκληρωμένων προϊόντων τεχνολογίας. – είναι πολύ ευέλικτη μέθοδος

Οι χάρτες πορείας της τεχνολογίας μπορούν να λάβουν διάφορες μορφές,

Η πιο κοινή προσέγγιση = το γενικό έντυπο EIRMA (1997) δείχνει τον τρόπο με τον οποίο η τεχνολογία μπορεί να ευθυγραμμιστεί με τις εξελίξεις προϊόντων και υπηρεσιών, την επιχειρηματική στρατηγική και τις ευκαιρίες



The generic roadmap is a time-based chart, comprising a number of layers that typically include both commercial and technological perspectives.

The roadmap enables the evolution of markets, products and technologies to be explored, together with the linkages between the various perspectives.

Source: Phaal, (2003).

Τεχνολογία και αγορά

Στατική

Εξελισσόμενη

Οι πελάτες είναι:

Ομογενείς:

Ετερογενείς:

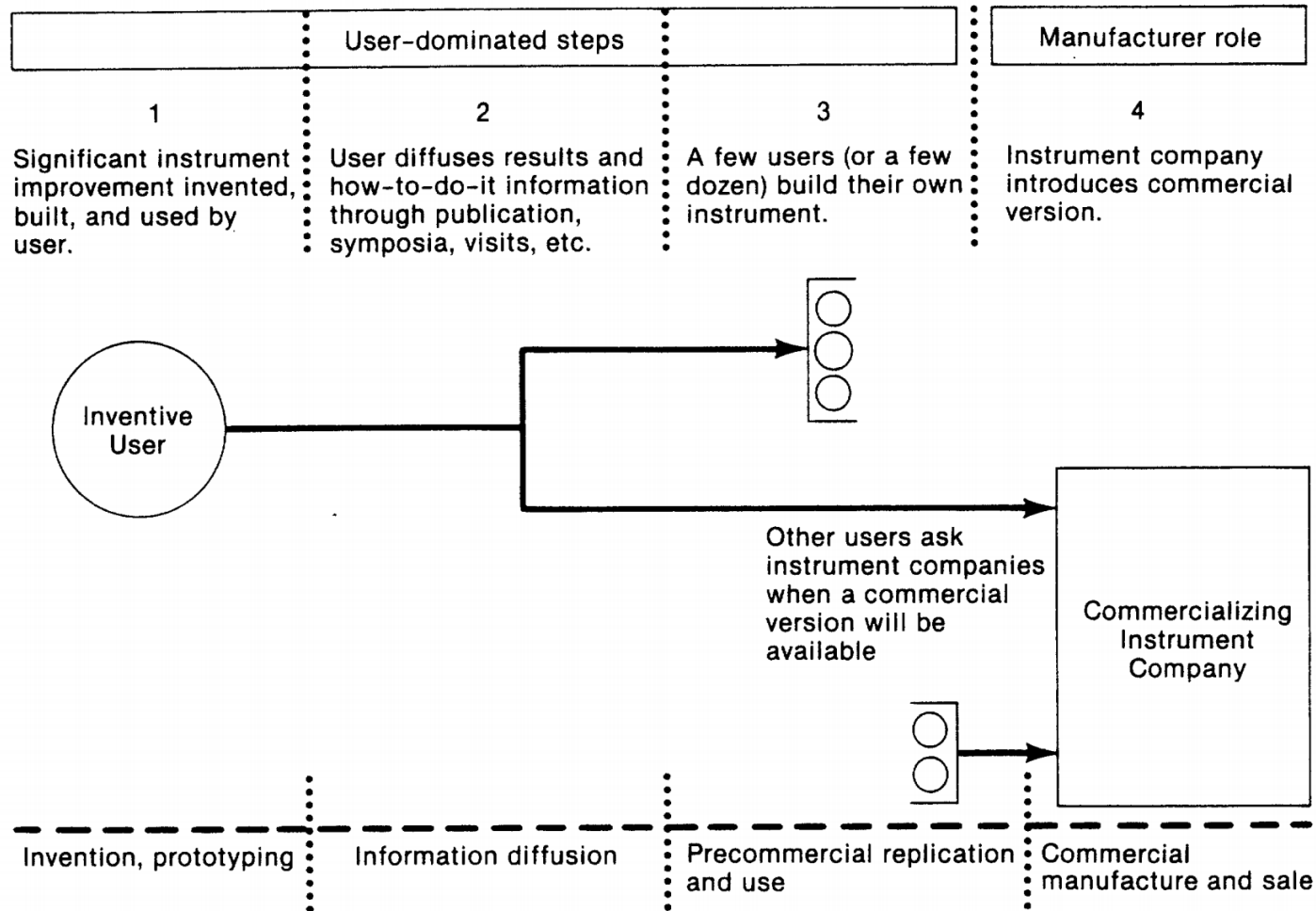
Information
Externalities
Supply constraint
Price

“Technology push”
new capabilities
gate demand

Market pull: Diffusion
evolves Across segments



Typical Steps in the Development and Diffusion of a Scientific Instrument Innovation



Το παιχνίδι είναι πολυεπίπεδο

- ▶ Τεχνολογική αρχιτεκτονική (και «αρχιτεκτονική» καινοτομία)
- ▶ Τεχνολογικά πρότυπα
- ▶ Τεχνολογικές πλατφόρμες
- ▶ Τεχνολογικές συνεργασίες
- ▶ Τεχνολογική ασυνέχεια (αδράνεια, εγκλωβισμός)



Θέλει τρόπο ...

Ρηξικέλευθες
αλλαγές
και
θεμελιώδεις
ακαμψίες

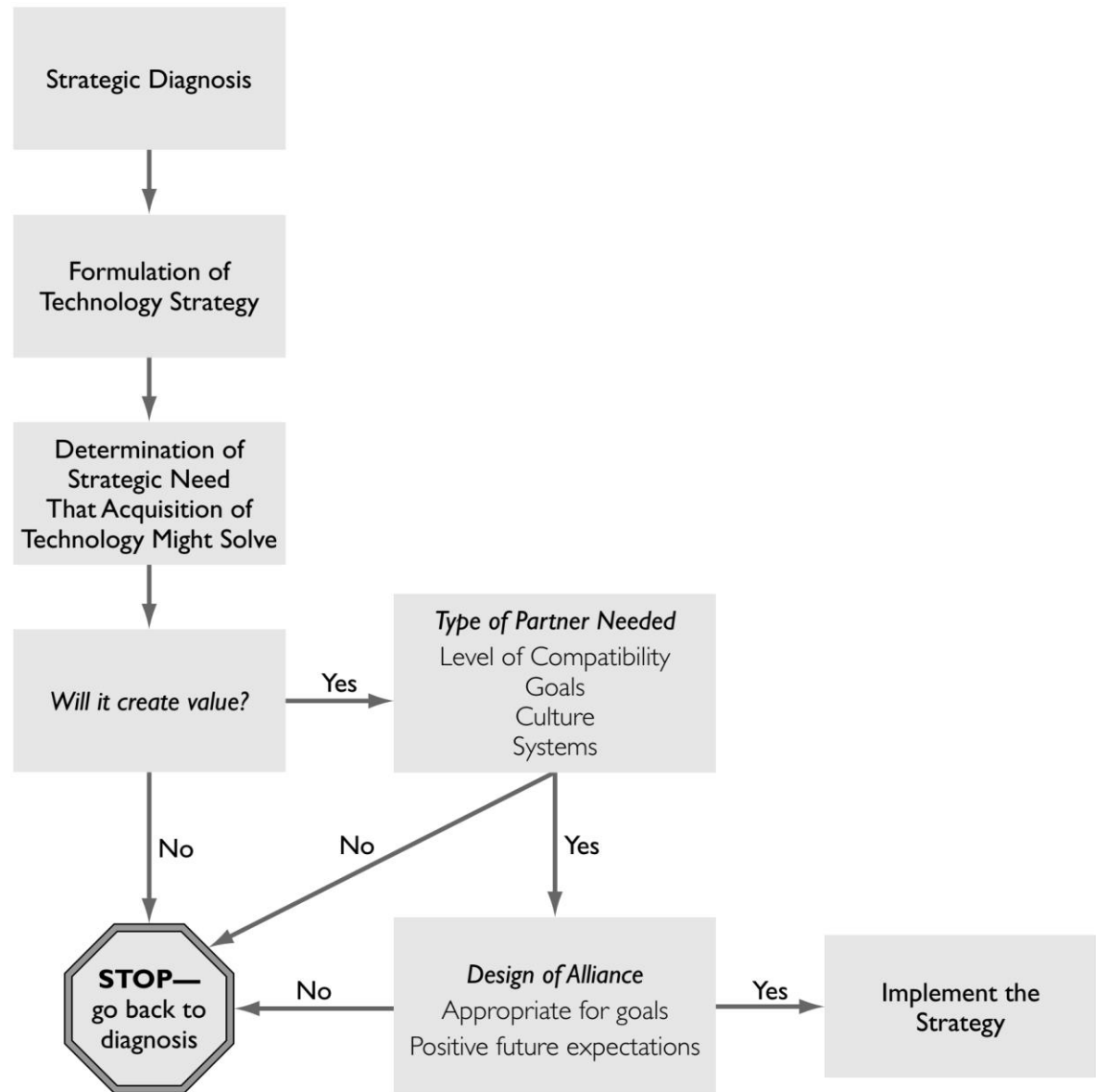


Στρατηγική εισόδου

- ▶ Τεχνολογία: οι αδυναμίες γίνονται τα δυνατά σημεία - συνέργειες
- ▶ Αγορά: θύλακες με νέα κριτήρια
- ▶ Οργανωσιακή στρατηγική: νέα οντότητα ή ενδο-επιχειρηματικότητα;
- ▶ Οργανωσιακή ικανότητα:
 - ▶ σύνθεση δικτύων αξίας - οικοσυστημάτων



Δέντρο απόφασης τεχνολογικής εξαγοράς



Profiting from innovation

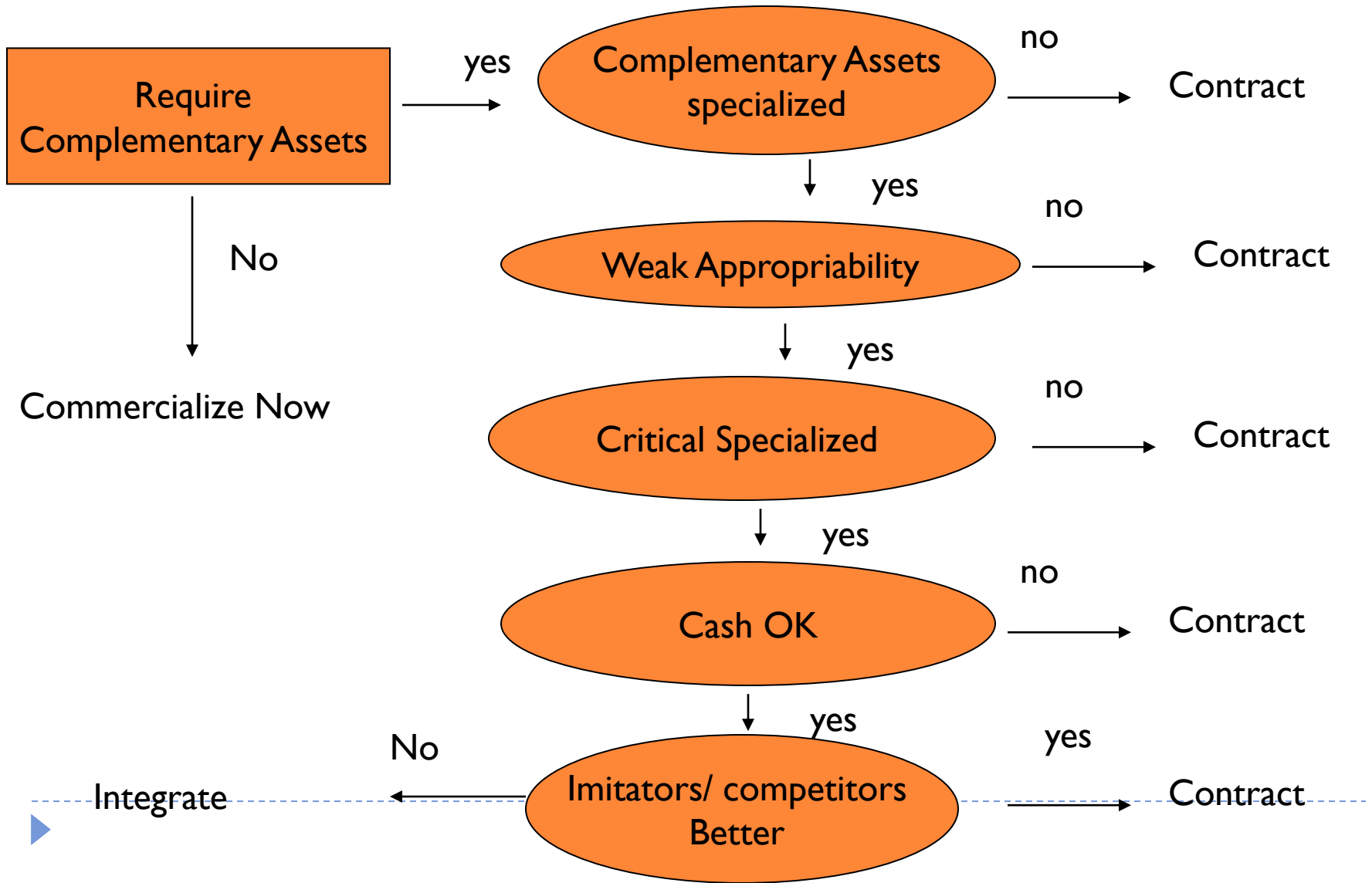
- ▶ “appropriability, and success at innovation more generally, is related not so much to the innovator’s ex ante market share, but to the (complementary) asset structure of the innovator, management’s market entry timing decisions, and the contractual structures employed to access missing complementary assets” (Teece, 2006)
- ▶ *Appropriability regime*
- ▶ *Complementary assets and co-specialization*



WHO PROFITS FROM INNOVATION?

Imitability of Invention or Value	Low	<p>IV</p> <p>(\$)</p> <p>Inventor (first-mover) makes money</p>	<p>III</p> <p>(\$\$\$)</p> <p>The firm with both the invention and complementary assets, the one with bargaining power, or their lawyers make money</p>
	High	<p>I</p> <p>Difficult to make money</p> <p>(-\$)</p>	<p>II</p> <p>Holder of complementary assets makes money</p> <p>(\$\$)</p>
		Freely available or unimportant	Tightly held and important
		Complementary Assets	

Flowchart for Integration versus Contract



Key:



Strong Legal/Technical Appropriability	Weak Legal/Technical Appropriability	
	Innovator Excellently Positioned versus Imitators with Respect to Commissioning Complementary Assets	Innovator Poorly Positioned versus Imitators with Respect to Commissioning Complementary Assets

Innovators and imitators advantageously positioned via a vis independent owners of complementary assets	(1) contract innovator will win	(2) contract innovator should win	(3) contract innovator or imitator will win; asset owners won't benefit
	Innovators and imitators disadvantageously positioned via a vis independent owners of complementary assets	(4) contract if can do so on competitive terms; integrate if necessary innovator should win; may have to share profits with asset holders	(5) integrate innovator should win

Market power of innovators/imitators versus owners of complementary assets

Degree of intellectual property protection

Fig. 2. Contract and integration strategies and outcomes for innovators: specialized asset case (Fig. 11 in Teece (1986)).

Λίγη ακόμη βιβλιογραφία

- ▶ Teece, D. J. (1986) "Profiting from technological innovation: Implications for integration, collaboration, licensing and public policy," *Research Policy*, Volume 15(6), pp. 285-305
- ▶ Teece, D. J. (2006) "Reflections on "Profiting from Innovation"", *Research Policy*, Volume 35(8), pp. 1131-1146
- ▶ Witt U. (1998) "Imagination and Leadership – The Neglected Dimension of an Evolutionary Theory of the Firm", *Journal of Economic Behavior & Organization*, Vol. 35 (1998) 161-177

