Models of knowldge transfer between universities and private companies: Liguria framework and cases studies

Intervenant: Roberto REVETRIA,
Université de Gènes, Italie

roberto.revetria@unige.it

Innovation

Innovation is the successful exploitation of new ideas

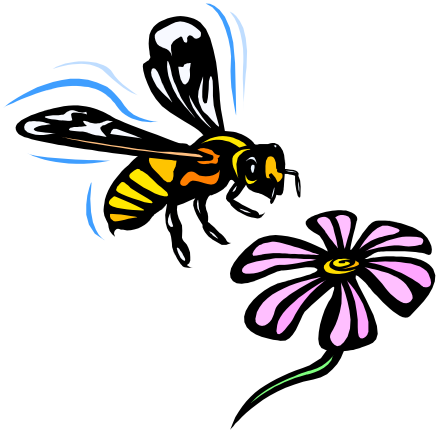
It is about

- **bringing new knowledge into business**
- **developing new, high value-added products and services**

Innovation is the key factor for competing on the global market

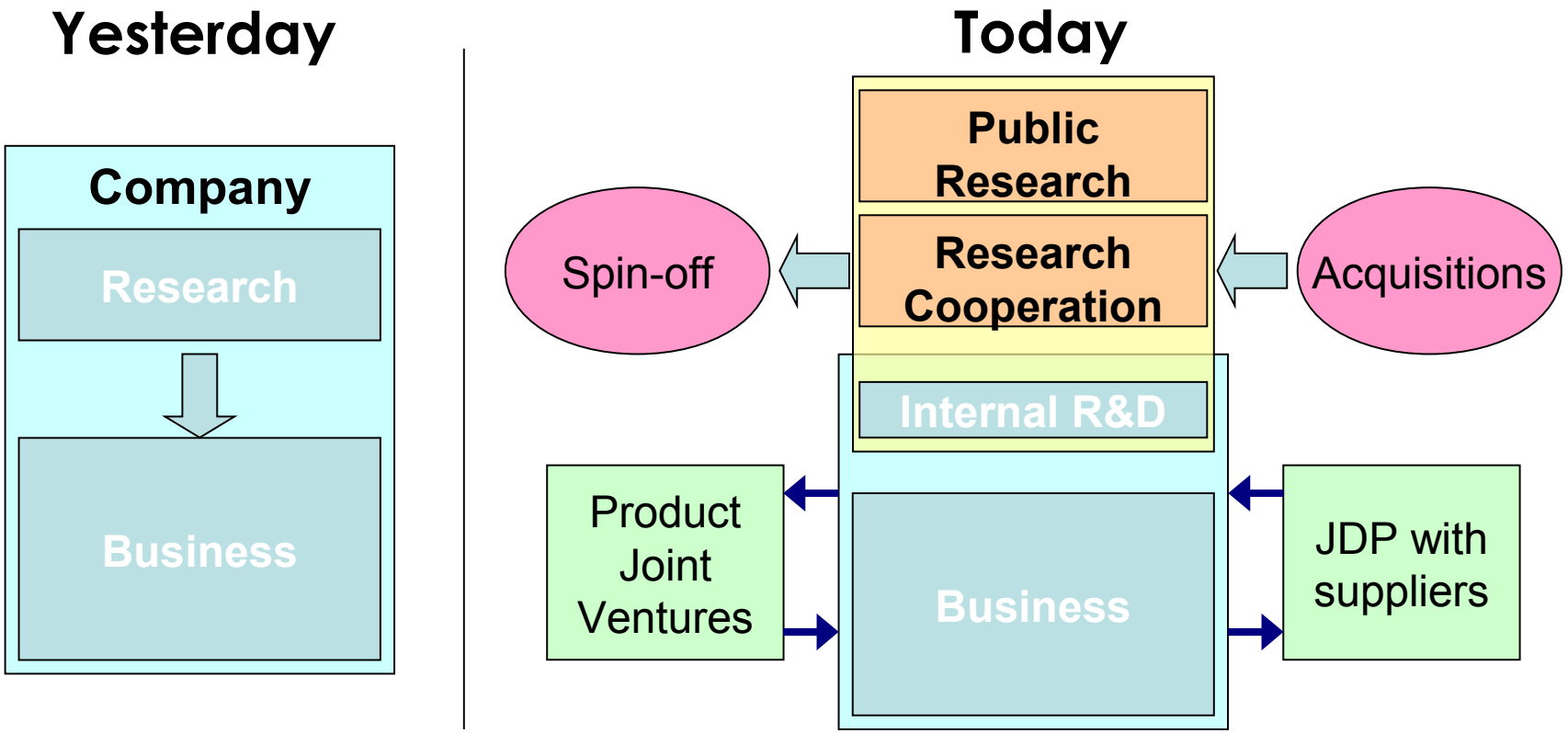
Diverging views

"Innovation is a pirate ship that you create and sail under cover of foggy darkness into the safe harbor of your competitors." - Larry Keeley, 1995



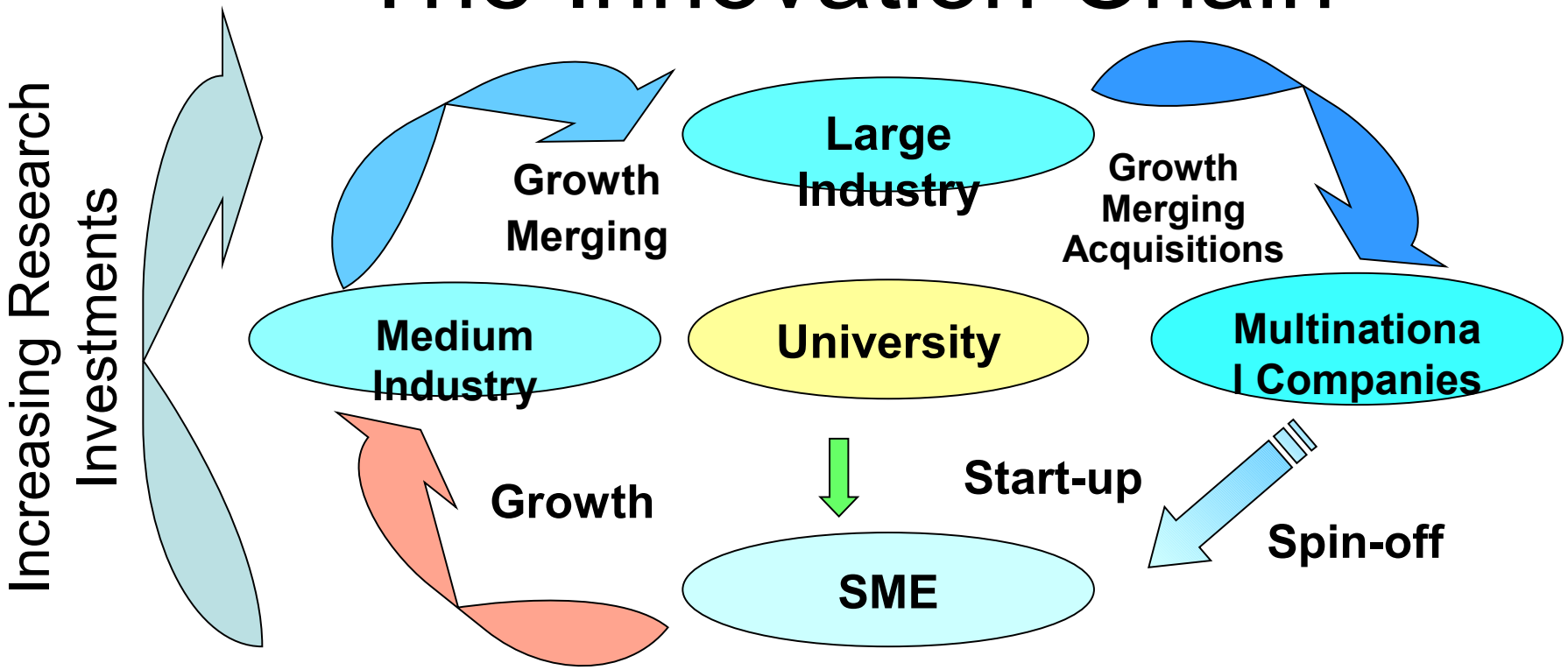
"Open Innovation is a paradigm that assumes that firms can and should use external ideas as well as internal ideas, and internal and external paths to market, as the firms look to advance their technology." - Henry Chesbrough "Open Innovation' , Harvard Business School Press, 2003

“Open Innovation” a paradigm shift



- SME’s are the ones that could profit more from sharing research costs, but
- SME’s are often too small to establish the required network

The Innovation Chain



- SME are at the base of the industry growth chain
- They form the economical environment needed for large industry prosperity

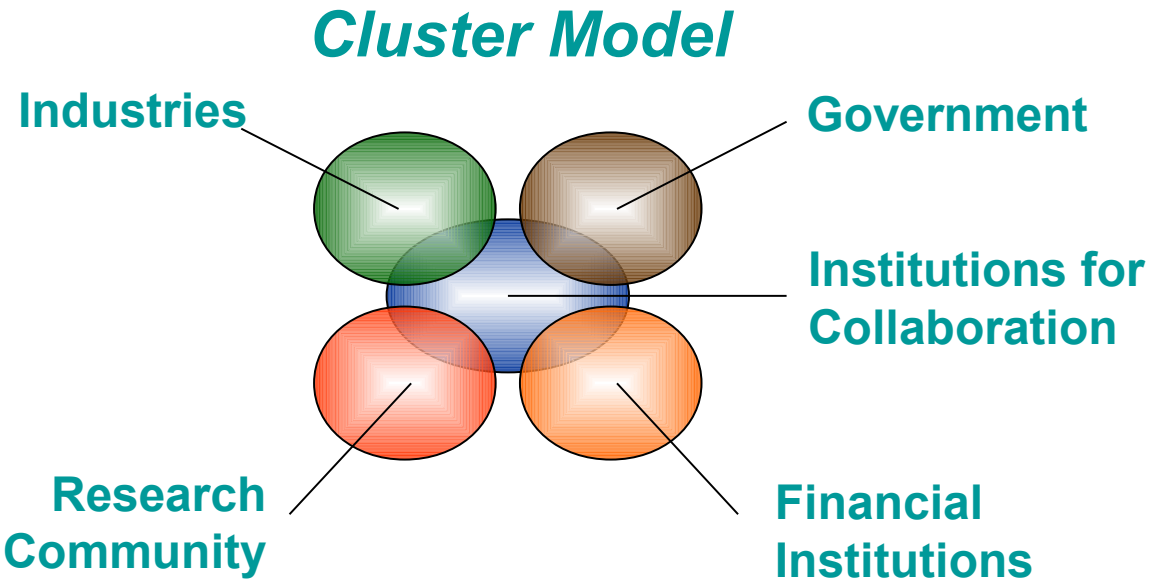
Innovation

- innovation is an interactive process to be shared by a variety of institutions
- locally embedded social, cultural and institutional arrangements are a source of knowledge, learning and innovation
- technological specialization and inter-firm collaboration are tools for innovation
- common and integrated visions contribute to achieve common goals

Innovation Systems

Innovation Systems

Clusters and Networks of Clusters as the foundations of Innovation Systems

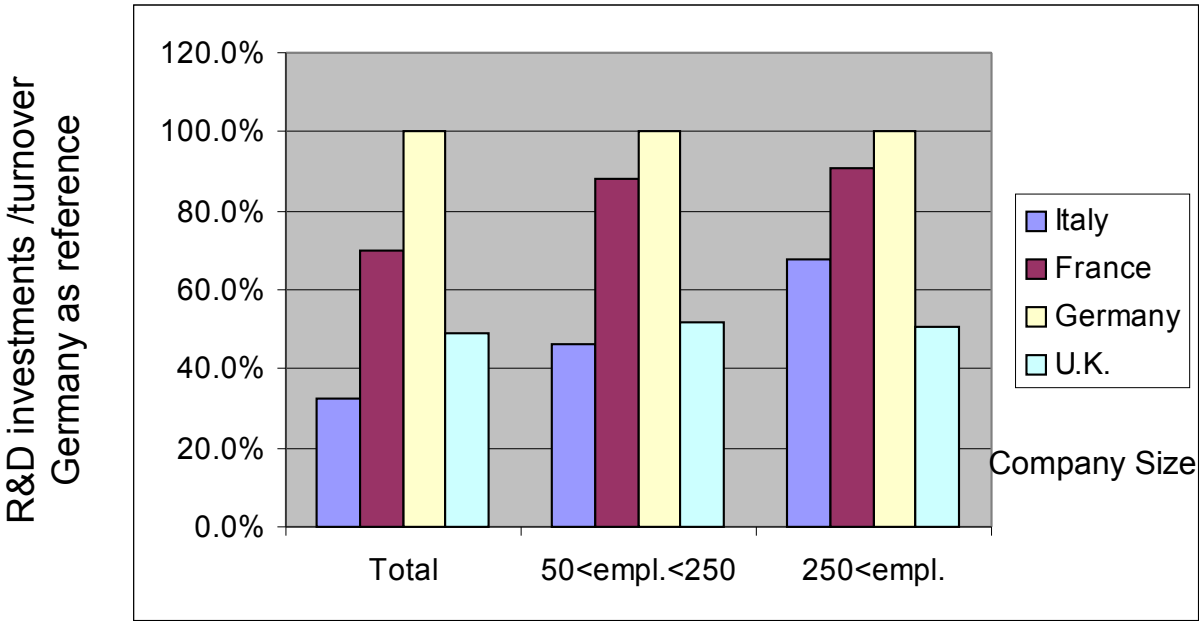


The involved parties

- Large Industry
  - SME's form the industrial environment that contributes to the attractiveness of one region for research and manufacturing.
  - Innovative SME's have the potential for being the industrial giants of tomorrow.
- Local Authorities
  - SME's are the largest contributors to local employment and to revenue generation.
- Universities and Research Centres
  - Innovative SME's could be a source of research contracts and the recipients of graduate students.
- SME's
  - Directly or through associations

Facts and figures

- In the enlarged European Union of 25 countries, some 23 million SMEs provide around 75 million jobs and represent 99% of all enterprises.
- However 61% of industrial contribution to private R&D investment worldwide is made by the first 100 Companies.
- The Italian examples: contribution to R&D investment by Companies with less than 50 employees is negligible.



Lessons learned

- High tech large industry already involved in “open innovation” scheme, driven by competition.
- High tech SME’s (start-up) in general keep good links to parent University.
- Local Consortia of low-tech sector SME’s have enough resources to activate open innovation scheme.

- Isolated SME’s do not have enough resources for medium term planning and access to research.
- Need for innovation often felt only too late

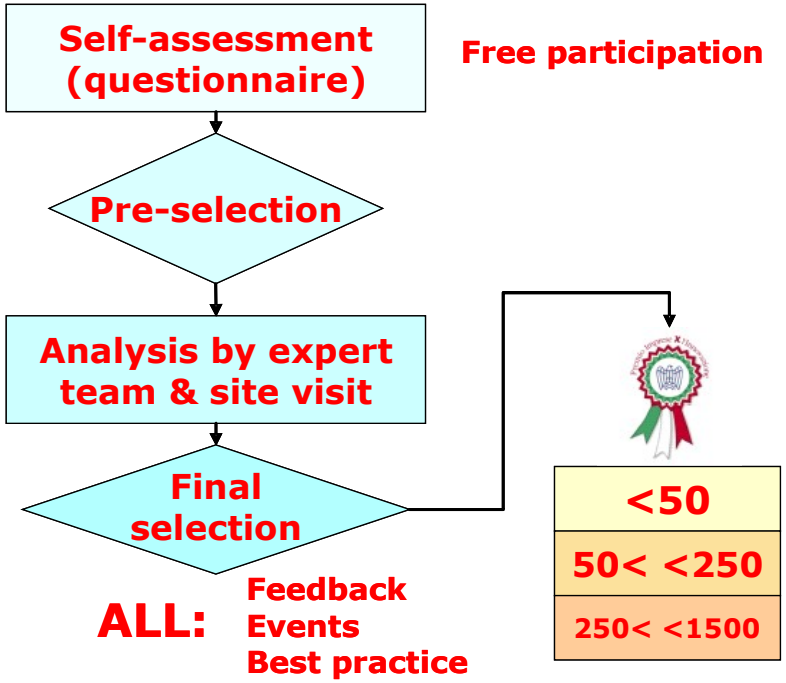
- Main entrance barriers for SME’s are lack of resources, lack of network of contacts, confidentiality and I.P. ownership, reliability of offer, local scale of operation.
- Universities in general operate on different time scales and research scopes with respect to SME’s.
- Short term vs. long term, search for a solution vs. understanding of causes.

A few basic rules

I. Create an awareness of the need for innovation
II. Provide a first access at local scale to facilitate involvement
III. Support the creation of consortia to share research costs
IV. Provide incentives for Universities to move towards SME's needs
V. Qualify the research offer
VI. Establish a progression of support tools to help SME's towards increasing access to innovation network.
VII. Provide an opening for cooperation beyond the regional level.

The first step

Confindustria Italian Prize Ixl (Imprese per l'Innovazione)
(Enterprises for Innovation)



Started in May 2007
Final classification in March 2008
Awarding Ceremony on April 2nd, 2008

More than … subscriptions
…. Questionnaires filled
…. Companies awarded

Some practical examples

- **Regione Lombardia**
  - "Innovation vouchers" for SME's to be spent in local Universities for services (technology survey, market analysis, support to patent,..)
  - "QuESTIO" initiative to certify suppliers of innovation services.
  - "Metadistrict" calls to favour aggregation of industrial and academic partners beyond the narrow geographical concentration and specialization, and along the innovation chain.
  - Seed funds, special loans, and support to Venture Capitals for future innovation growth.
  - Continuous feedback and tools "maintenance"

- **Critical Issues**
  - Bring the knowledge of the existing support tools to the SME's
  - Provide support for administrative tasks
  - Insure continuity of support tools
  - Strong selectivity of research suppliers

A particular type of

Technology Transfer
is

the realization of

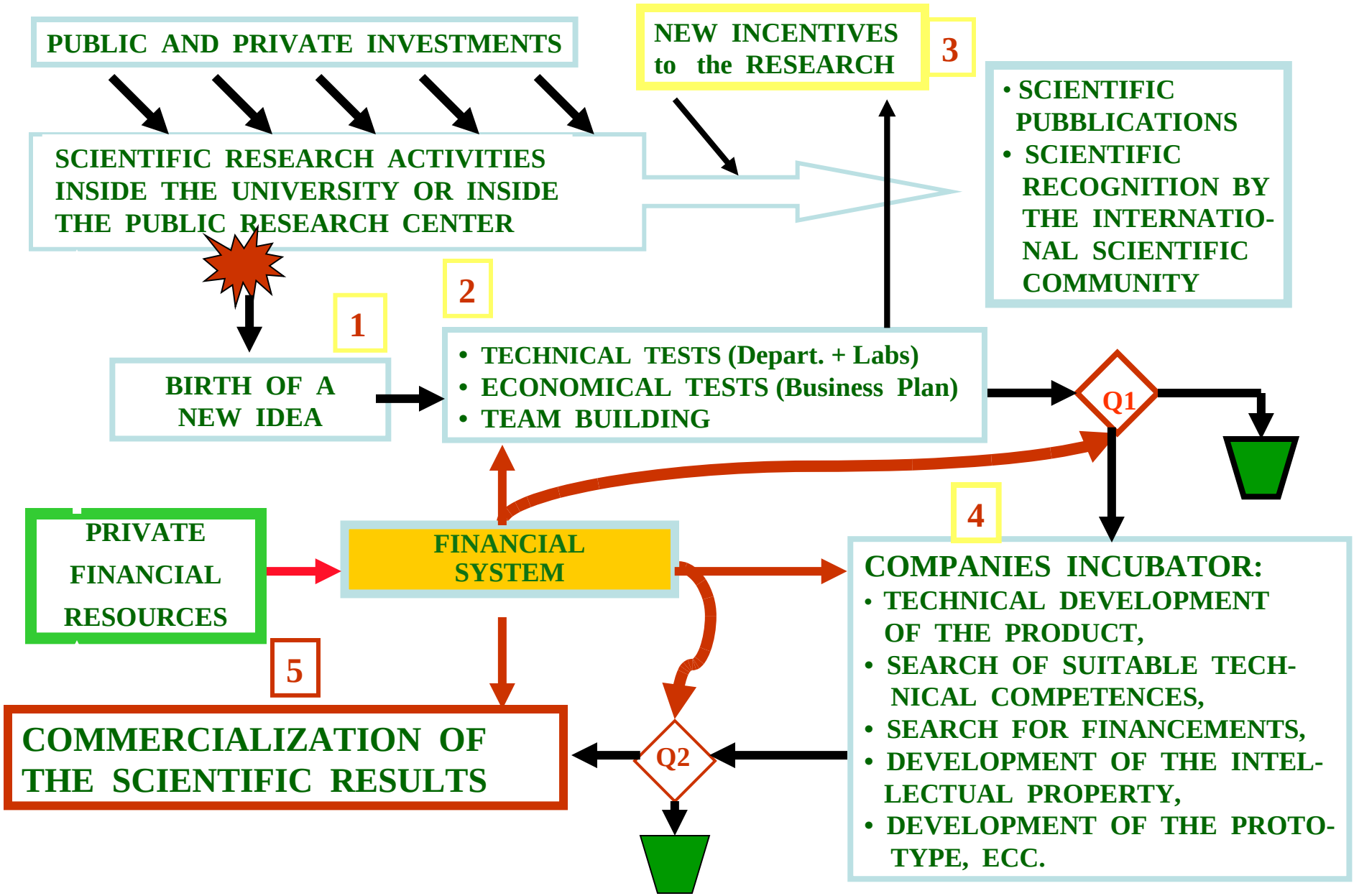
ACADEMIC SPIN-OFF

The academic Spin-off

- **A regular student, a PhD student, a researcher, a teacher, makes his/her mind to exploit some scientific results, which are derived by his/her activity of study and research;**

- **such results, suitable transformed, could become interesting applicable techniques with high economical advantages.**

Exploitation of scientific research



The Creation of new Companies, based on knowledge is made by TWO PHASES very different:

- **I° - the CREATION and the SUSTENANCE of an high-tech entrepreneurial ideas, called the INCUBATOR OF ENTREPRENEURIAL IDEAS, which is of competence of the local Universities and/or the Public/Private Research Centres;**
- **II° - the CONSTITUTION, the DEVELOPMENT and the SUSTENANCE to the development of new high-tech companies, the best selected ENTREPRENEURIAL IDEAS, called INCUBATOR OF COMPANY, managed directly by the local Universities or by local Technology Parks, or else.**

The structures inside the University in order to make reasonable that some new business ideas will be born and grow - 1/3.

- ***SUITABLE SPACES:***

  – very close to the rooms and/or laboratories, where the inventors could work for their activities of study and of scientific research;

  – useful to the potential inventors (students, PhD students, researchers, professors) to verify in their own department the technical feasibility of their entrepreneurial ideas;

  – useful to the potential inventors to receive an offer of organizational, economical, managerial knowledge, which cannot be offered by the Department, since it is the site of only the technical knowledge, in order to verify also the economical feasibility of their entrepreneurial ideas.

The structures inside the University in order to make reasonable that some new business ideas will be born and grow - 2/3.

- ***INTELLECTUAL PROPERTY OFFICE:***

– which establishes and controls the relationships between the inventors and their University;

– which should be able to obtain a suitable patent, whose property should be split between the inventors and the University;

– which is supposed:

- to promote inside the University the suitable policy for the development of the requests of PATENTS;

- to assist the inventors and/or the University to present the request of the patent to the Patent Office, either national or European;

- to be able to manage the portfolio of the patents owned by the University.

The structures inside the University in order to make reasonable that some new business ideas will be born and grow - 2/3.

<> ***ENTREPRENEURSHIP DEVELOPMENT CENTER***, **which should be supposed to promote and to organize:**

- **educational activities (i.e. how to construct a BP);**
- **visits, meetings with entrepreneurs, seminars on different subjects related to the entrepreneurship development, etc.;**
- **scouting for students who have the vocations to become entrepreneurs, but they did not know;**
- **local contests for the best entrepreneurial ideas, with interesting prizes to the best ideas;**
- **management of local professors, to be tutors for the future entrepreneurs, and recognitions for the most active;**
- **etc.**

Notice

- **we understood that the FINANCIAL SYSTEM must be in charge:**
  - **not only to finance the selected spin-off,**
  - **but also in charge of the evaluation and selection of the most promising entrepre-neurial ideas;**

The academic Target for the Incubator of Entrepreneurial Ideas

- **Let us suppose that a suitable environment has been settled inside our University, we believe that it is reasonable to state that:**
  - **only about 10% of the total number of students (plus researchers, PhD students, professors, etc.) is interested every academic year to be involved in some entrepreneurial activities;**
  - **after all the initiatives in the incubator, only 2% of the total number is willing to create a new company;**
  - **but, perhaps, only 1% EVERY YEAR is going to create the new company.**

Case Studies

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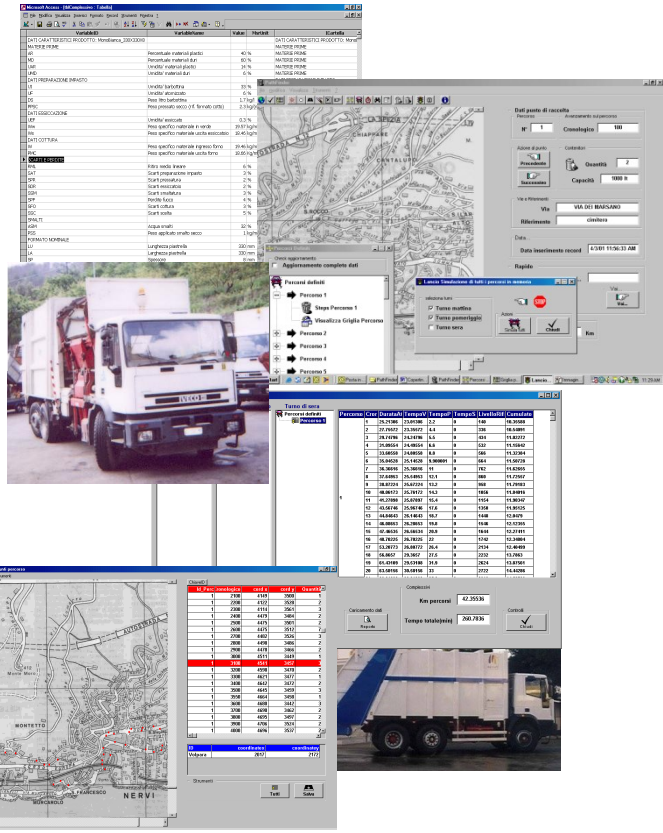
TECA Consulting

Simulation and plannig engineering

Gestione, Pianificazione ed Ottimizzazione della Raccolta dei Rifiuti Solidi Urbani



Caratteristiche della consulenza

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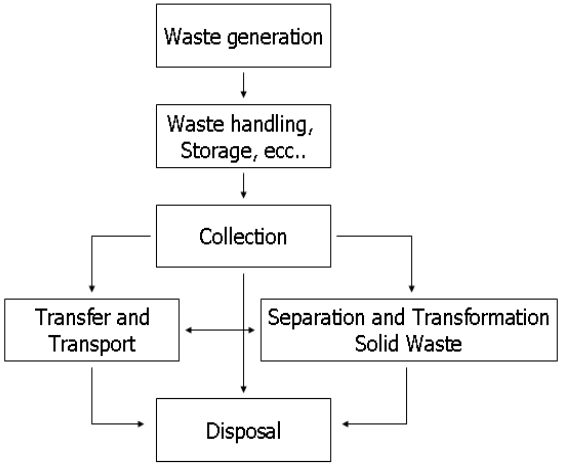

- Raccolta ed elaborazione dei dati relativi alla produzione di RSU e alle caratteristiche socio-economiche della città.
- Data mining e data modelling basato su modelli polinomiali del II ordine al fine di stimare la produzione di RSU per canale distributivo e le relative produttività unitarie.
- Georeferenzazione caratteristiche sensibili nucleo urbano (vie, civici, punti di raccolta, ecc..) e definizione dei relativi attributi (utenze domestiche, utenze non domestiche).
- Analisi di Scenario per la progettazione del servizio di raccolta (indifferenziato, differenziato) e modalità della raccolta (raccolta stradale, porta a porta,ecc..)
- Individuazione del numero, della tipologia e l'ubicazione dei cassonetti per la raccolta del rifiuto.
- Percorsi di raccolta e loro caratteristiche.

Lavori svolti/in corso di svolgimento

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Boston College (Computer Scienze Department) USA – In collaborazione con la facoltà di Ingegneria di Genova (Diptem), sviluppo applicativo software per l'ottimizzazione del placement dei punti di raccolta RSU. A causa delle particolari condizioni al contorno del problema, è stato necessario realizzare un network al fine di distribuire il run di simulazione su più computer in parallelo mediante tecnologia Peer to Peer (package JXTA). Permanenza di 6 settimane presso il Boston College

Molise Ambiente S.c.r.l. – Sviluppo applicativo web-Gis (tramite protocollo SOAP) per la pianificazione, gestione ed ottimizzazione raccolta RSU. Il software permette: di visualizzare la parte del territorio oggetto di indagine, di effettuare analisi spaziali sul territorio e di definire le relazioni esistenti tra le caratteristiche socio economiche del territorio e la produzione RSU relativa (tramite un modello sviluppato ad hoc basato su reti neurali e modelli polinomiali del II ordine). L'applicativo è utilizzato dalla Molise Ambiente S.c.r.l. per la città di Termoli (Cb) e attualmente in fase di implementazione presso Progesam S.r.l. per il consorzio del Pollino (Cs).

Università degli studi di Genova (DIPTEM) - Sviluppo applicativo software per:

1. ***la definizione della locazione ottimale delle piazzole private, comunali e le piattaforme di smistamento in funzione dei flussi di RAEE previsti in fase di regime (nell'ipotesi che gli impianti di recupero siano fissi)***
2. ***La determinazione del routing ottimale dei flussi.***

Raccolta Dati – Case study Termoli

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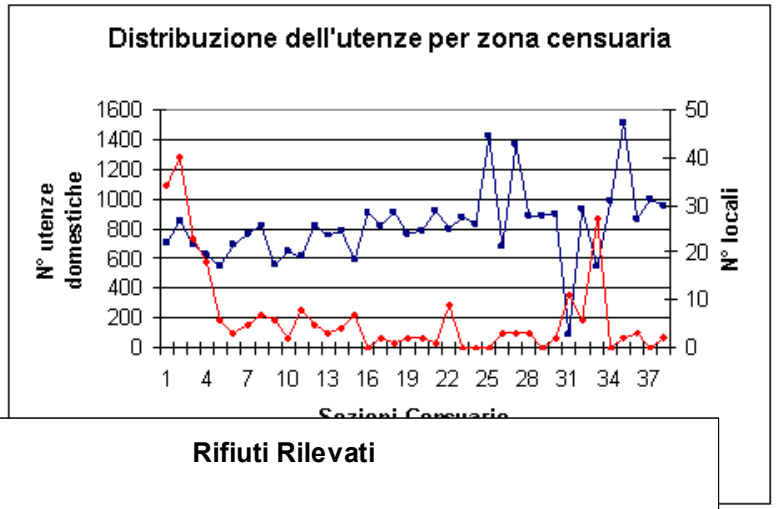
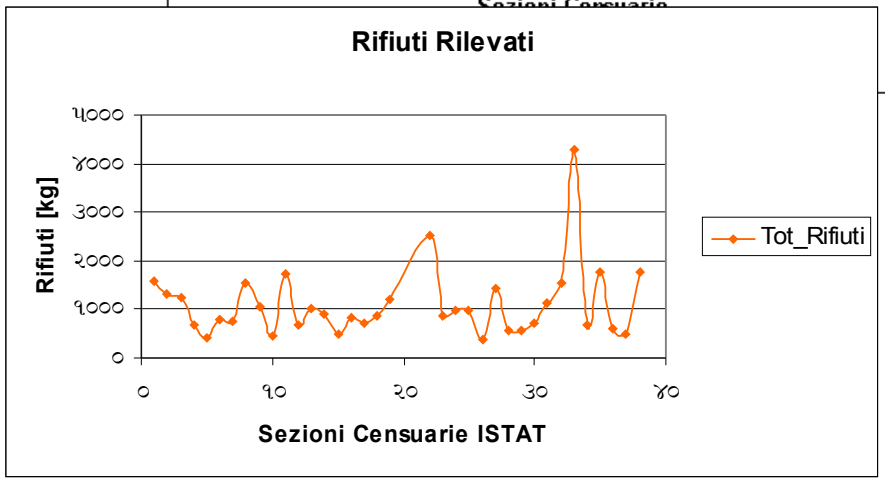
Id_Frequenza	DescrFrequenze
1	Giornaliero

Id_TipoMezzi	ClasseMezzi	DescrClasseMezzi	DescrTipoMezzi	Tara
1	A	AutoCompattatore Raccolta Laterale	FARID190LAT	15500
2	A	AutoCompattatore Raccolta Laterale	OMB 190 LAT	15500

Codice Via	Nome1	Nome2	CircOld	CircNew	UT
	ABBA VIA GIUSEPPE CESARE	VIA GIUSEPPE C BA	9	2	11
40	ACACIE VIA DELLE	VIA DELLE A	19	4	5
60	ACCADEMIA VICO ANTICA	VICO ANTIC CADEMIA		1	10





1. Corretto Campionamento
2. Raccolta dati di 1° aprox.
3. Raccolta dati 2° aprox.

Data modelling – Case study Termoli

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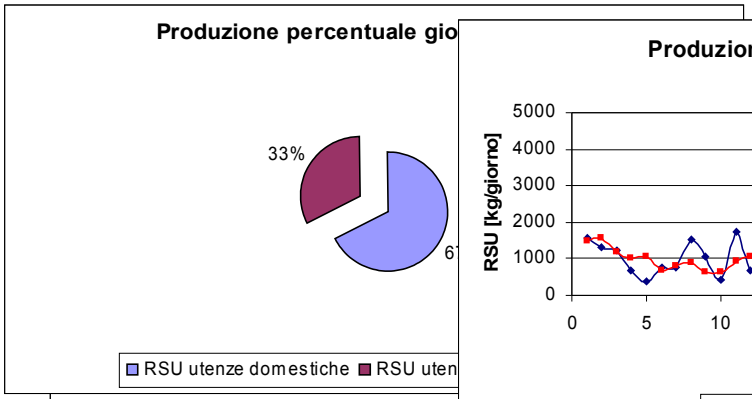
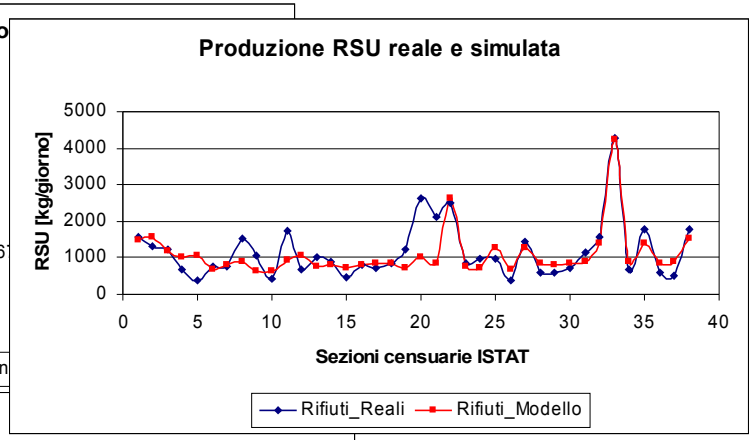
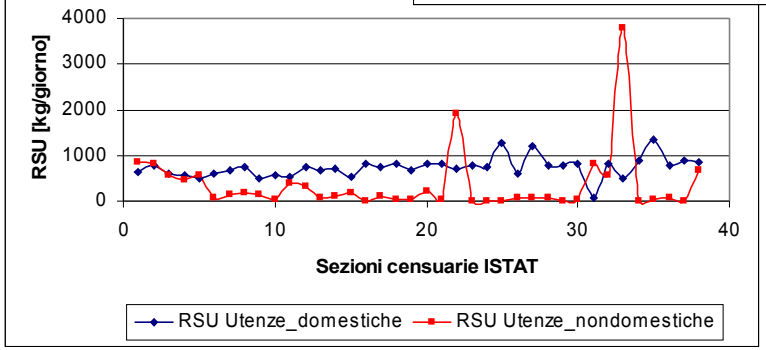
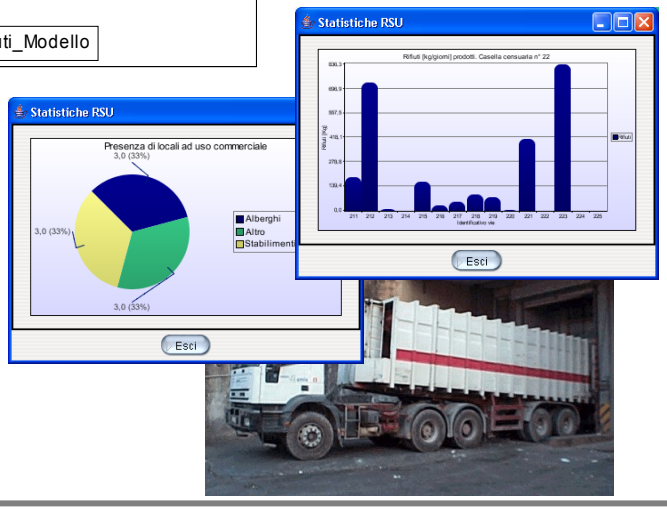
Caratteristiche socio economiche → Analisi Regressiva → Stima della Produzione RSU per canale distributivo e per macroarea della città

Stima del rifiuto per frazione merceologica









Il modello Regressivo – Case study Termoli

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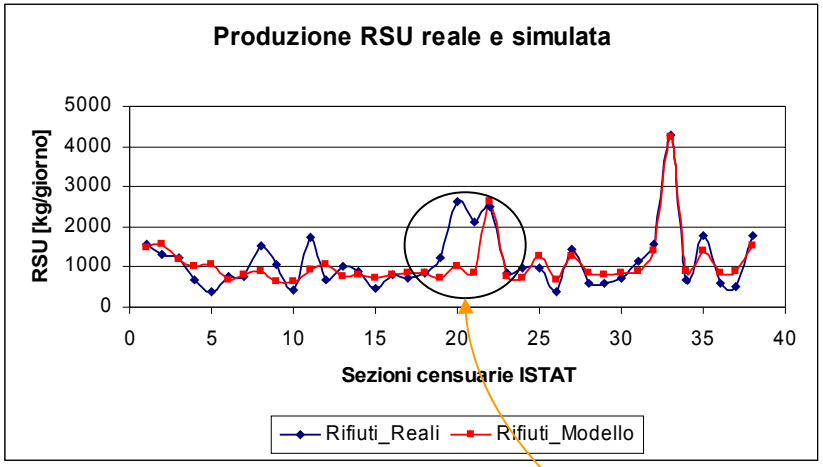

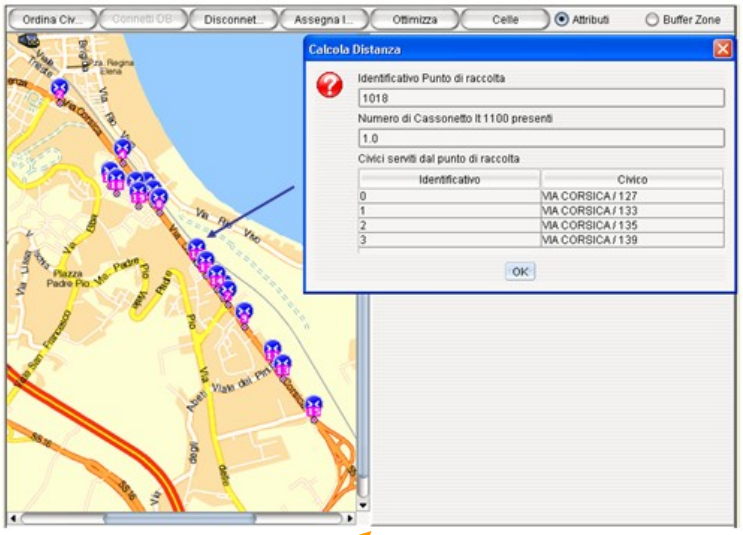

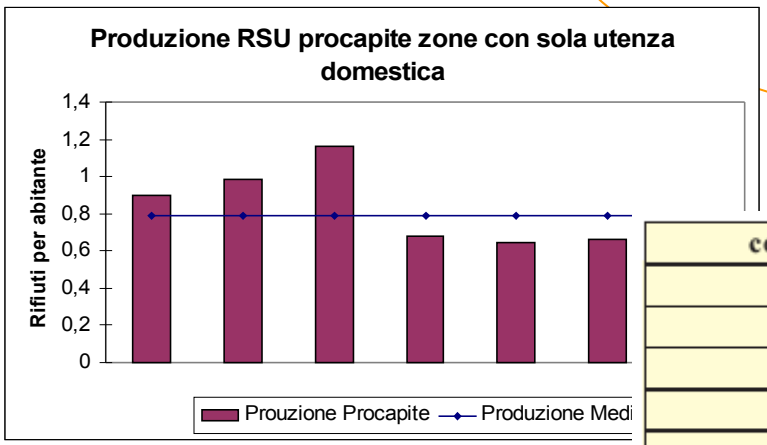

Città di Treviso. 1996

componenti	Media (gr/giorno)
1	1.100
2	1.360
3	1.800
4	2.170
5	2.400
6+	2.610

Metri Quadrati utenze	Produzione RSU kg/anno stimata	Produttività [Kg/anno m2] consentita	Produttività [Kg/anno m2] stimata reale
143.502	5.238.404	1	36,50

Georeferenzazione nucleo urbano

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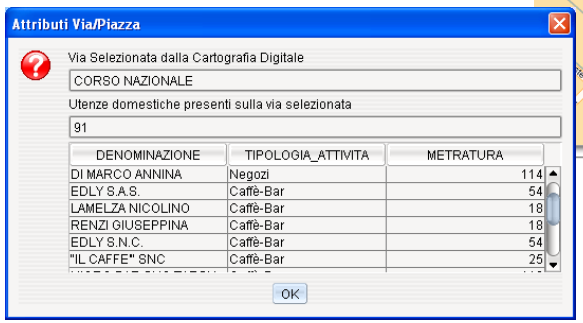
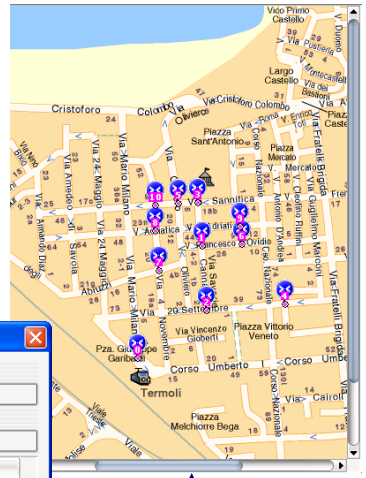
Prototipizzazione Rapida

Massima Flessibilità di utilizzo

Minor costi e tempi di implementazione rispetto ai GIS tradizionali

Possibilità di aggiungere punti non censiti mediante palmare GPS





Analisi Spaziali del Territorio

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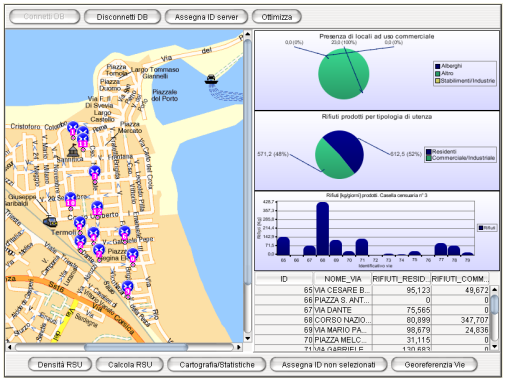

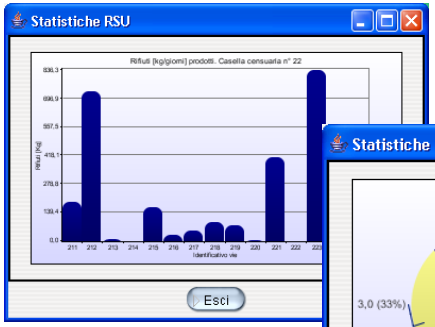

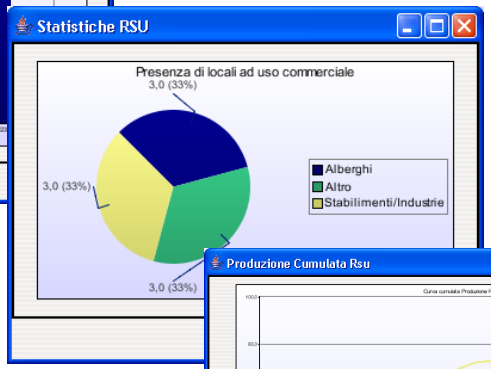

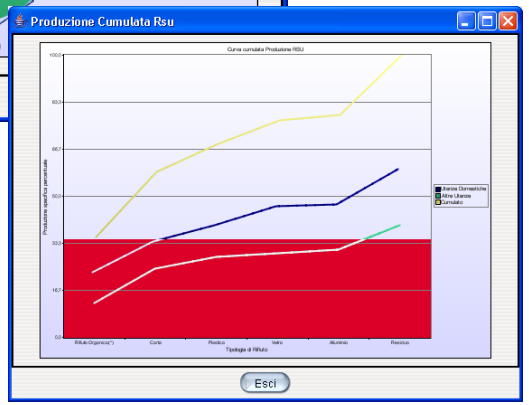

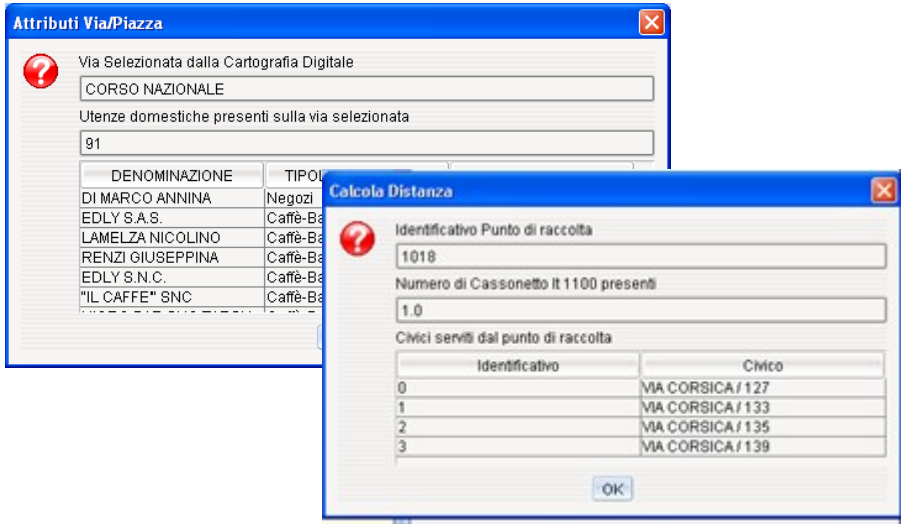

Disposizione Cassonetti – Case study Termoli

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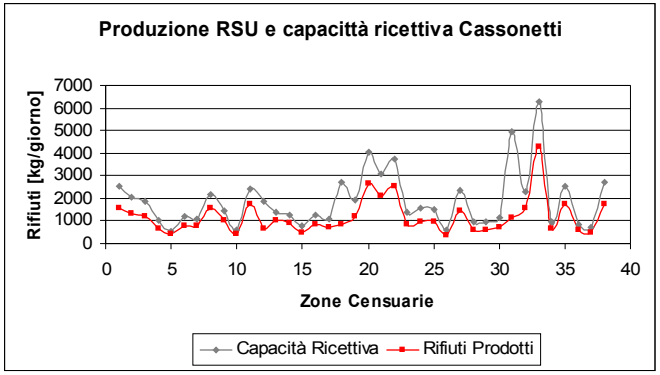
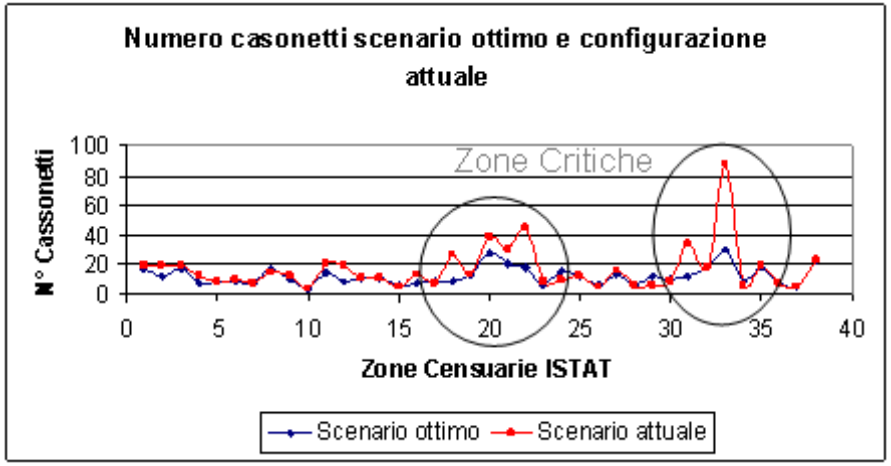
	Configurazione Ottima		Configurazione Attuale	
Sezioni	Cassonetti 2400 lt	Cassonetti 1100 lt	Cassonetti 2400 lt	Cassonetti 1100 lt
1	12	5	14	5
2	12	9	8	11
3	4	13	6	13
4	7	0	2	10
5	8	0	0	8
6	5	4	6	4
7	7	1	7	0
8	6	11	14	0
9	8	2	7	5
10	4	0	4	0
11	12	2	11	10
12	8	0	6	13
13	7	4	7	4
14	8	6	6	5
15	6	0	5	0
16	6	1	4	9
17	7	2	7	0
18	5	2	9	18
19	12	1	12	1
20	13	15	16	22
21	11	9	11	19
22	18	0	7	37
23	6	0	9	0
24	0	16	10	0
25	7	5	8	4
26	3	3	3	2
27	13	0	14	2
28	6	0	6	0
29	0	12	6	0
30	4	6	6	3
31	10	2	30	4
32	8	10	12	6
33	30	6	0	88
34	6	2	6	0
35	10	8	14	5
36	4	3	4	3
37	4	1	4	1
38	0	35	13	10
Totali	297	196	314	322



Carico medio Veicolo [kg]	N° cassonetti svuotati	Capacità progetto cassonetto [kg/bidone]	Rifiuto per cassonetto [kg/bidone]
14948	150	140	100



Cassonetti presenti (ottimo)	Cassonetti attualmente presenti	Differenza	Risparmio
493	636	143	22 %

Raccolta del RAEE

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Il RAEE prodotto dalle utenze domestiche e da quelle commerciali viene trasportato alle piazzole di stoccaggio temporaneo dove, in funzione del tipo di "rifiuto", viene smistato e trasportato nei centri di recupero. I centri di Recupero provvederanno allo smontaggio, se necessario, dei rifiuti nei componenti elementari riutilizzabili o da smaltire

Partendo dalla situazione di massima dispersione delle piazzole (allo stato iniziale queste coincidono con le utenze) viene calcolato sia il costo totale di Feederaggio (Cfeeder = Cgestione_piazzole + Ctrasporto) sia il costo di linehaul (Clinehaul = Ctrasporto). Si procede quindi con la clusterizzazione, raggruppano le piazzole più vicine e calcolando per il nuovo scenario i costi di feeder e di linehaul. Si itera il procedimento sopra illustrato (ad ogni iterazione corrisponde uno scenario logistico) fino ad ottenere un'unica piazzola per tutto il territorio. Lo scenario ottimo sarà quello con il costo logistico (Cfeeder + Clinehaul) minore

The Italian Policy of Clusters

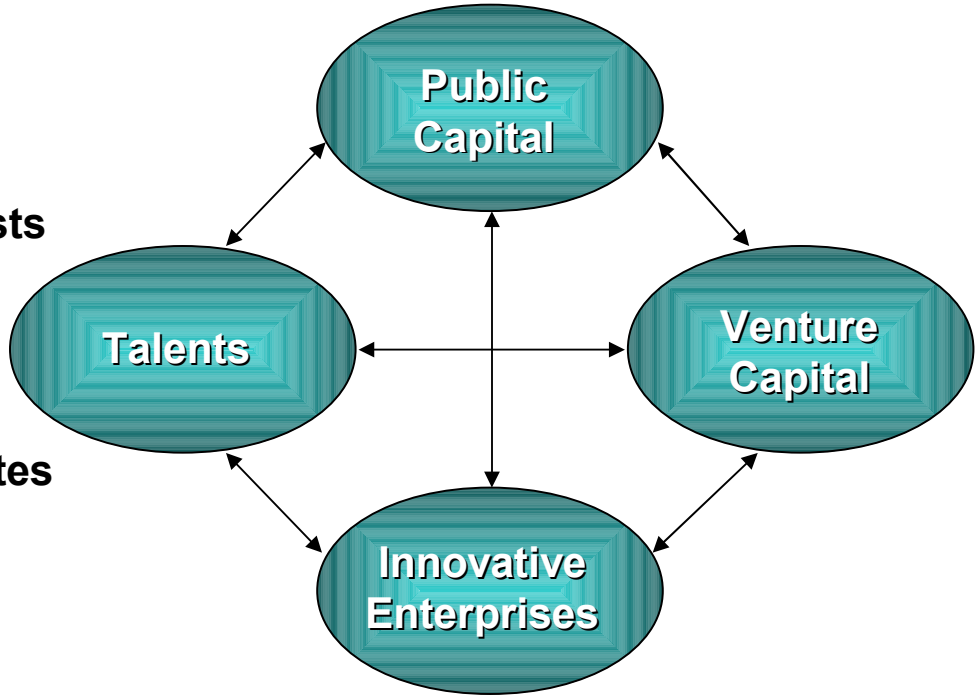
In 2003, the Italian Ministry of University and Research launched a programme to create Regional Innovation Clusters

Regional Innovation Clusters were created in the frame of an agreement with the Italian regions that were able to show off specialized competences as well as experienced research and innovation structures in key-technology fields

The agreement funds the development of research projects between public and private institutions to be activated through tenders issued by the Innovation Clusters

The basics of Innovation Clusters in Italy

- Centres of excellence in R&D
- Research Projects funded by Public Capital
- Technology Platform



- Top level scientists and researchers
- Hi – Tech entrepreneurs
- Top level graduates and Ph.D.'s

- Network of venture capitalists
- Financial and administrative management

- Focus on product and process innovation
- Private investments in R&D
- Focus on Hi – Tech activities

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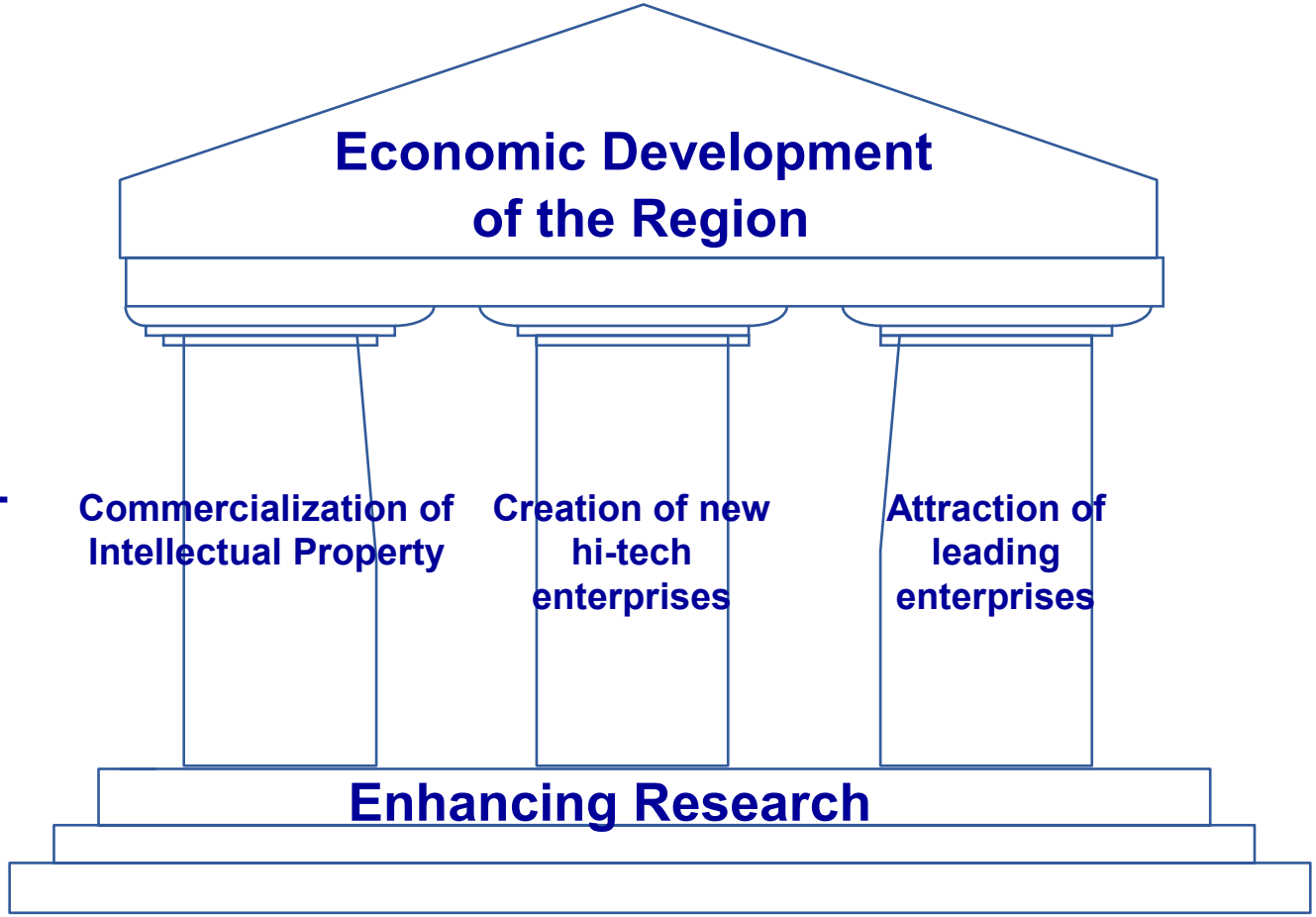
Innovation Clusters at work

TARGET

DEVELOPMENT FOCUS



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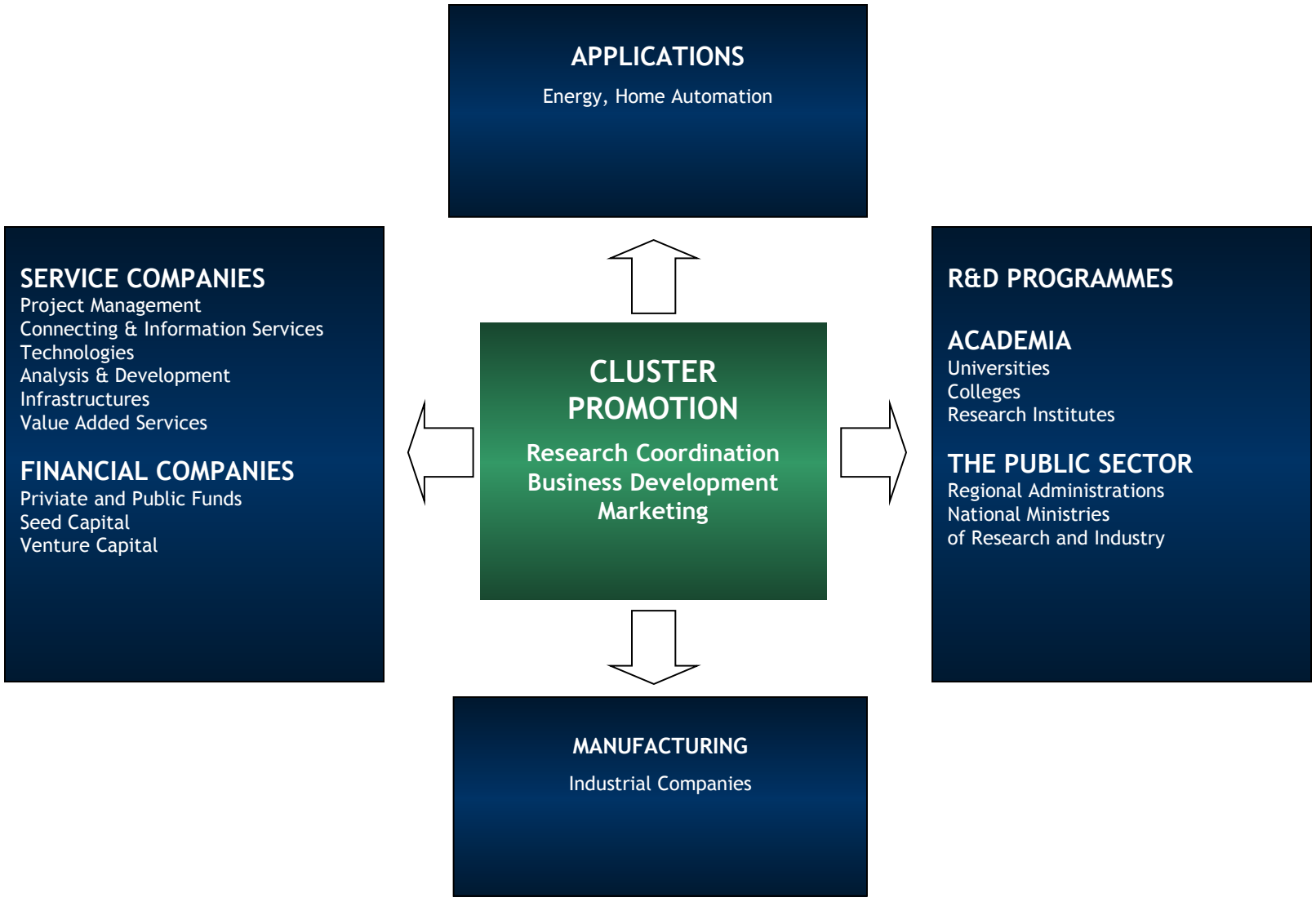
Innovation Cluster Model



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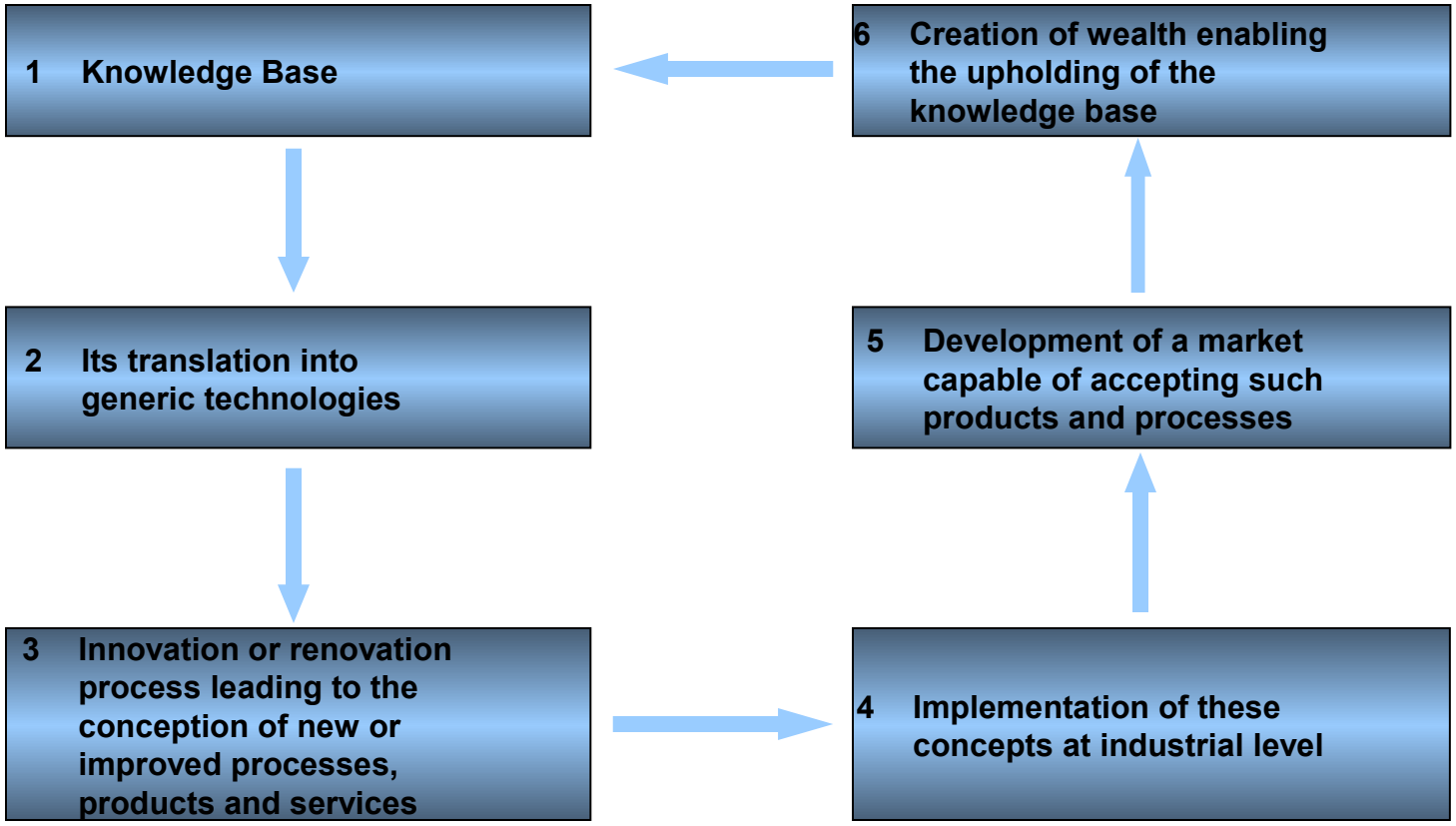
Innovation Clusters as Knowledge Producers and Users

Innovation clusters stimulate the running of the Closed Chain of Innovation and Technological Change



Science and Technology Parks

Science and Technology Parks are Cluster-based Innovation Systems that

- **stimulate and manage knowledge and technology amongst universities, R&D institutions, companies and market**
- **facilitate the creation and growth of innovation-based companies**
- **provide value-added services together with high quality space and facilities**

AREA Science Park

- the leading Science and Technology Park in Italy
- a research institution of the Ministry for Education, University and Research
- a national no-profit organization committed to the development of Region Friuli Venezia Giulia and its people, founded in 1982

AREA Science Park

Main figures

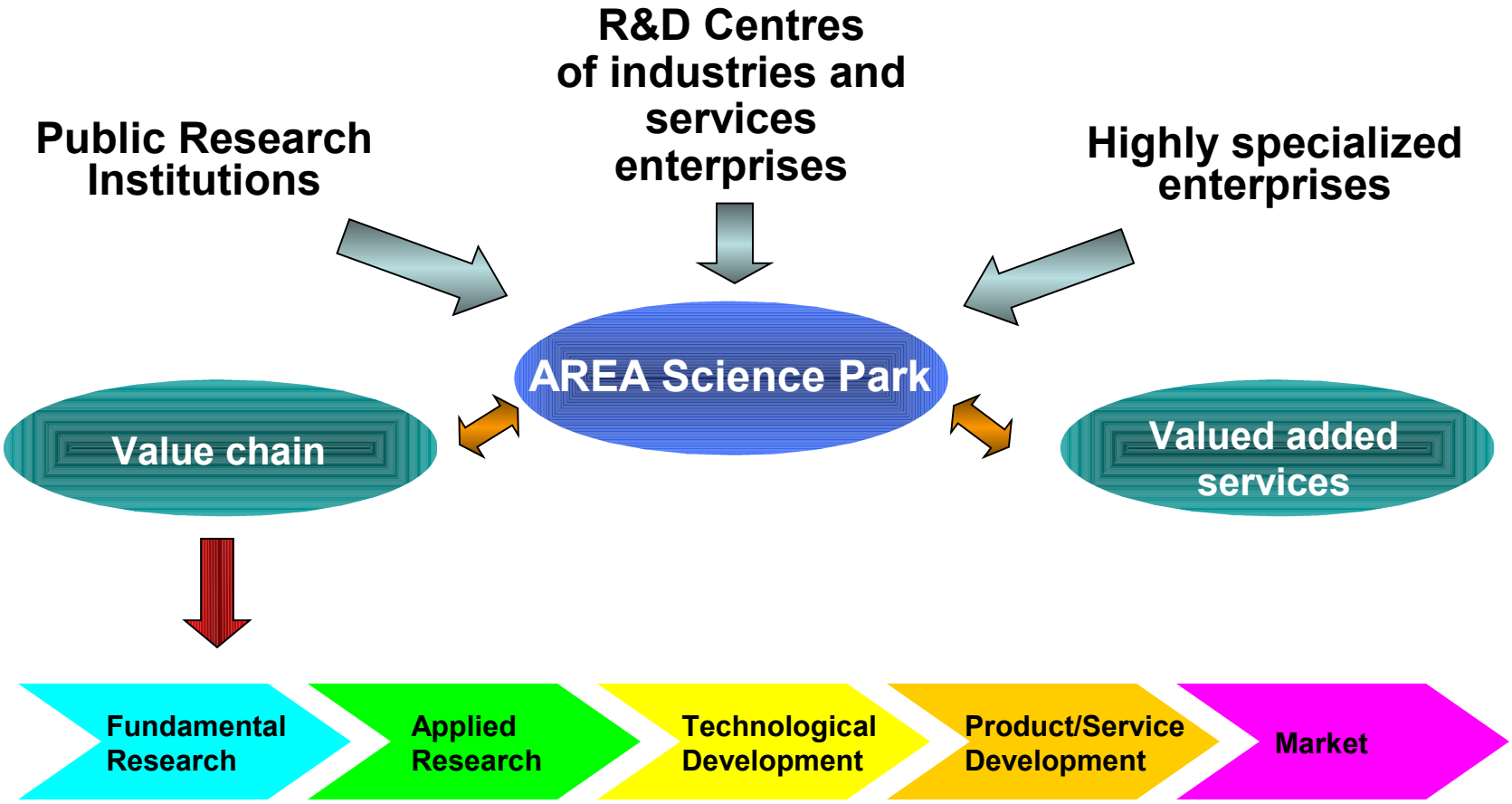
- 2 extended campuses: Padriciano and Basovizza
- 84 PRIs, R&D Centres, Knowledge-based Companies (15% growth since 2003)
- 1680 qualified persons: researchers, technicians, entrepreneurs and service staff (620 for biotech)
- Extent: 55.000 hectares
- Facilities: 75.000 sqm of equipped laboratories, offices and services (8.100 sqm for biotech)
- Development plans (2006 – 2014): 46.000 sqm

AREA Science Park - Padriciano

AREA Science Park - Basovizza

AREA Science Park

A Knowledge Cluster – Multiple Participants



AREA Science Park

Value Added Services

- state-of-the-art facilities
- world-class infrastructures and instrumentation
- regional hub for the valorisation of research results
- promotion of innovation and technology transfer
- promotion of investments in technology-oriented business
- partnerships and networking
- technical, legal and marketing assistance
- high level training, education and mobility of human resources
- management of national and international joint R&D programmes
- financial services
- research and industry internationalization

AREA Science Park

A Knowledge Cluster - Multi-disciplinary features



biotechnologies and diagnostics
chemistry and biochemistry
biomedical technologies


physics
new materials
nanotechnologies

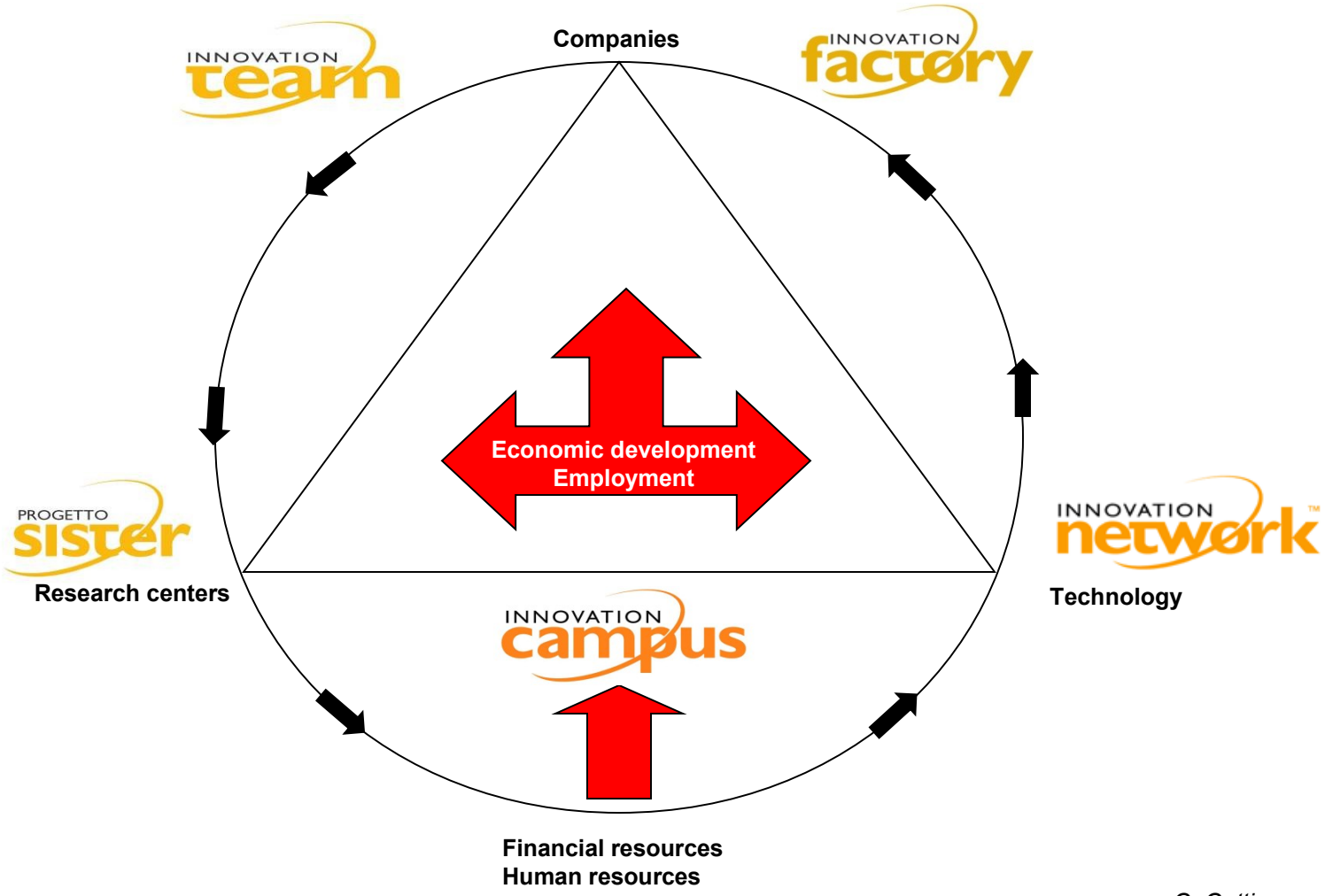


information science
telecommunications
electronics

environmental technologies

The AREA Science Park Innovation System

A multi-feature fully integrated action



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The AREA Science Park Innovation System

Exploitation of research results

Regional network of Competence Centres for technology transfer

Academic spin-off incubator and entrepreneurial programme

Training laboratory for “Technology Brokers”

Skilled persons and professionals to support innovation in industry

PROGETTO SISTER

Aims

- scouting of research results
- technology assessment
- market studies
- patenting
- support for the creation of NTBFs

innovation network

Aims

- introducing new technologies to improve the business
- exploring the commercial feasibility of an idea and whether there's a market for it
- bringing a new product to market
- starting up partnerships and cooperation projects
- searching published patents as a source of ideas and information
- protecting the intellectual property
- capitalizing on new knowledge and innovative ways of doing things
- competing successfully and profitably in today's fast-changing marketplace

Aims

- **equipped spaces**
- **consultancy and assistance services (management, R&D, administration, finance, ….)**
- **training and human resources valorization**
- **financial support for seed and venture capital**
- **approach to market**

Cluster in Cluster within AREA Science Park: the regional Technology Cluster in Molecular Biomedicine

The Cluster is managed by cbm
consorzio per il centro di biomedicina molecolare

Financed by

MUR (Ministry of University and Research), Region Friuli Venezia Giulia, AREA Science Park, Fondazione CRTrieste, Assicurazioni Generali SpA, Bracco SpA, Rotary Nord

Public shareholders

AREA Science Park, CRO, Aviano, CIB, IRCCS Burlo Garofolo, SISSA, University of Trieste, University of Udine

Industrial shareholders

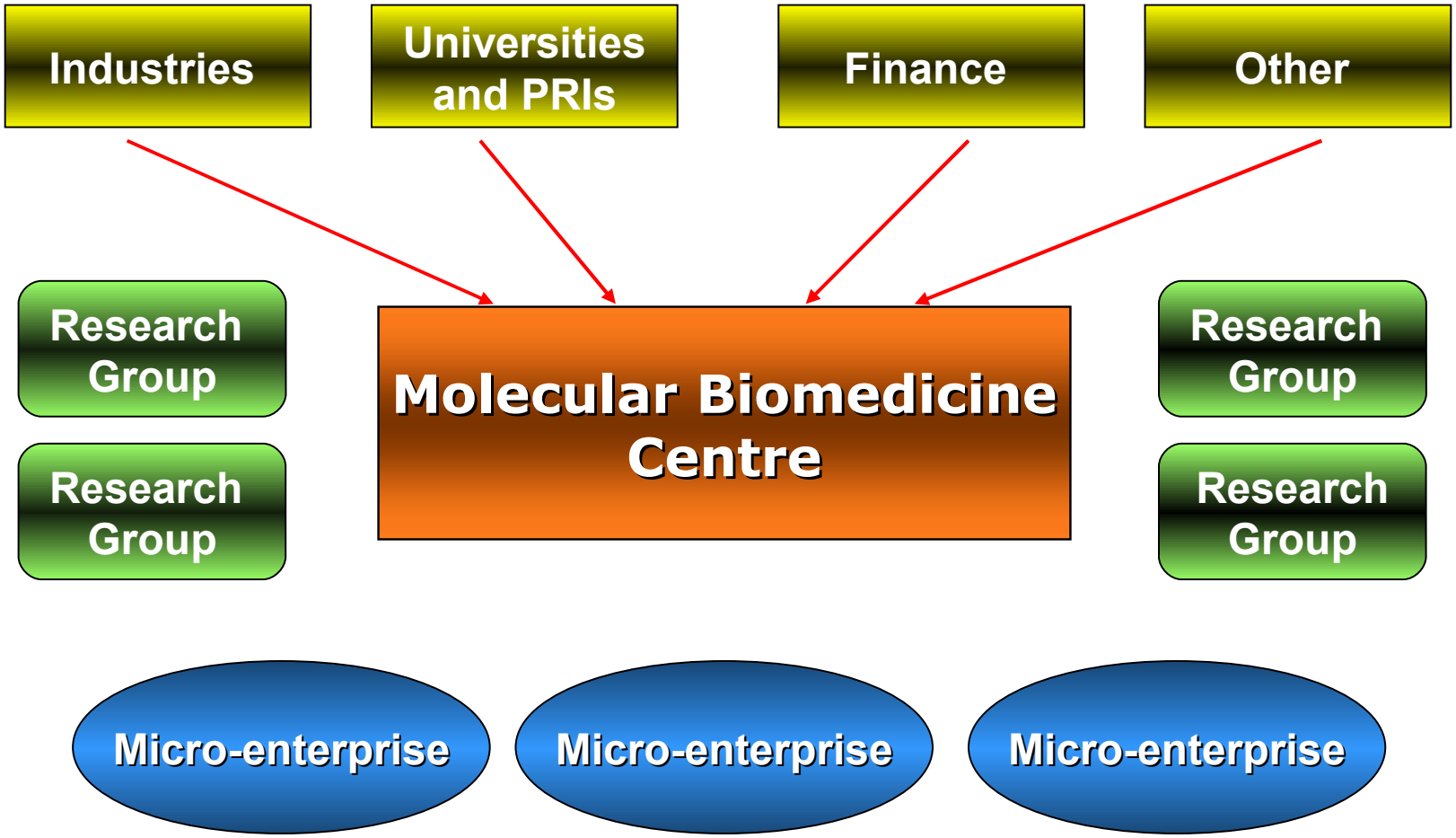
Bracco Imaging SpA, Eurospital SpA, Italtbs SpA, Laboratori Diaco Biomediocali SpA, Instrumentation Laboratory Spa, Transactiva Srl

Other shareholders

Assicurazioni Generali SpA, Bruker Biospin Srl, Fondo per lo Studio delle Malattie del Fegato Onlus, Fondazione Callerio Onlus, Friulia (the Regional Investment Company of Friuli Venezia Giulia) – *pending subscription*

The regional Technology Cluster in Molecular Biomedicine

The operative model



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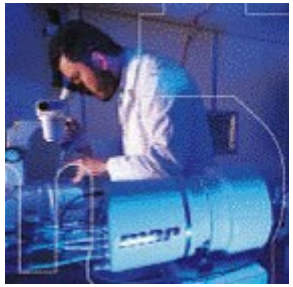
The regional Technology Cluster in Molecular Biomedicine

Technological and industrial aims

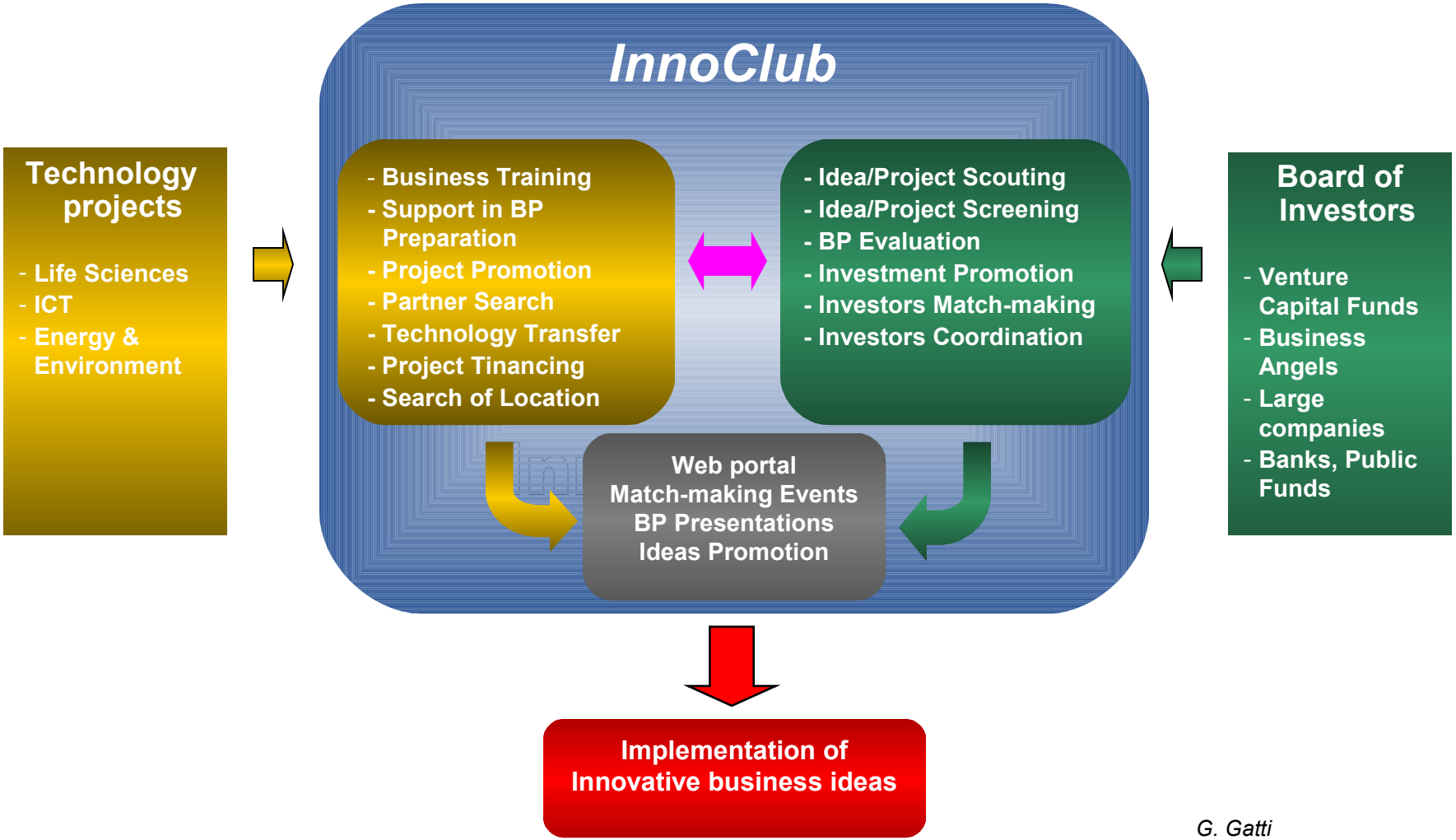
- **to be highly interdisciplinary**
- **to fill a bridge between Nanotechnology and Genomics**
- **to link Mathematics and Physics to Biology and Medicine**
- **to provide a high class training to students and post-docs**
- **to develop and transfer new technologies**
- **to develop medical application for :**
  - **neurodegenerative diseases**
  - **cancer**
  - **cardiovascular diseases**
- **to create new hi-tech business**



The regional Technology Cluster in Molecular Biomedicine
Main functions

- development of public-private networking
- attraction of leading companies
- promotion of new technology-based entrepreneurship
- pre-competitive development and spin-off creation
- intellectual property management
- management of advanced core facilities
- international mobility and training
- grant writing and management

InnoClub
Clustering investors and innovative business ideas



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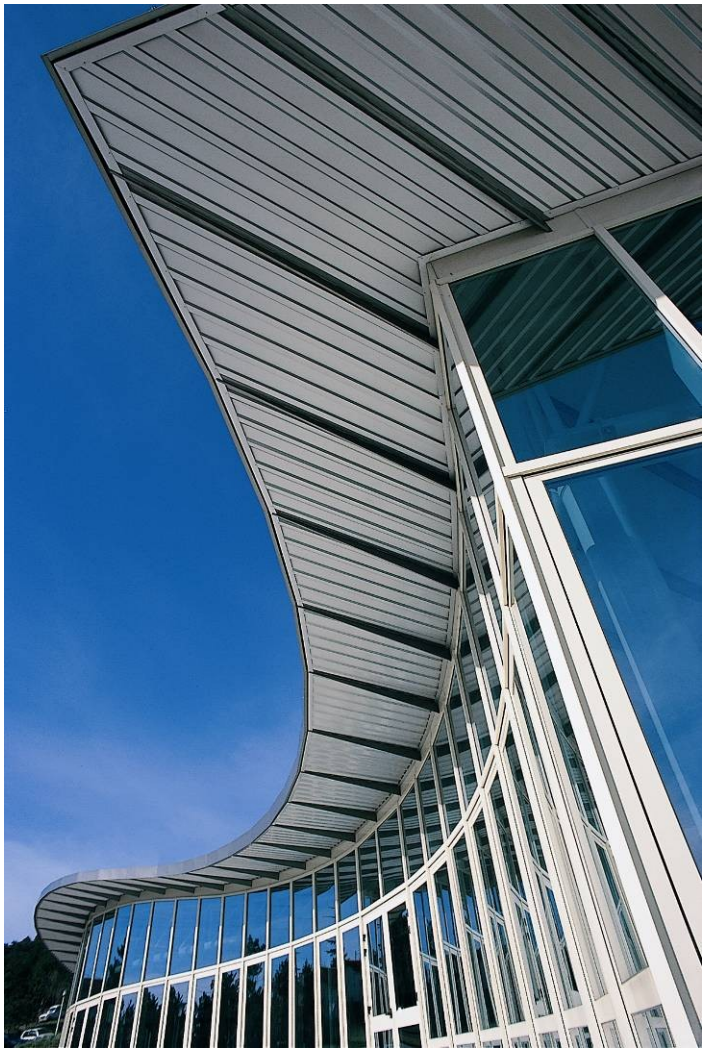
International Innovation Clusters
ITI – International Technology Incubators

ITI is an initiative of industrial promotion by AREA Science Park aimed at

- **establishing and manage service structures abroad for Italian innovative hi-tech SMEs interested in starting up activities on international markets**
- **attracting FDIs in R&D and technology-intensive sectors**



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ITI-International Technology Incubators

The business model

to promote the internationalisation of Italian companies in the direction of a convergence of economic and industrial growth with the development of knowledge-intensive businesses

Main issues

- **valorising the competencies and knowledge of the Italian scientific and productive systems**
- **promoting the creation of technical and industrial partnerships**
- **sharing methodologies, services and structures**
- **creating innovation clusters abroad**

ITI-International Technology Incubators

Clustering in China

AREA's International Branch Office in Beijing to establish Italian innovation clusters:

- **physical spaces to host companies and R&D labs**
- **legal representation and aids**
- **promotion of investments**
- **management consultancy**
- **marketing intermediation**
- **financial intermediation**
- **networking with Universities and research centres**
- **training**
- **ancillary services**

TRE: Tele-Rilevamento Europa

Committed to developing and implementing radar-based technologies that *provide reliable information from remote-sensing data and solve real-life problems*

In particular, our work is focused on:

detection,

measurement,

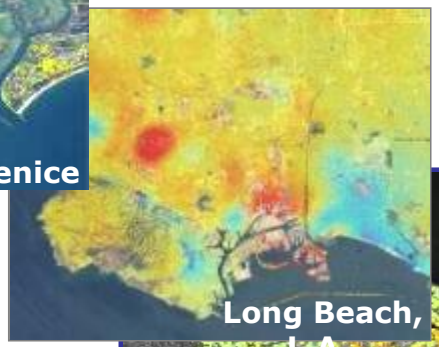
monitoring,

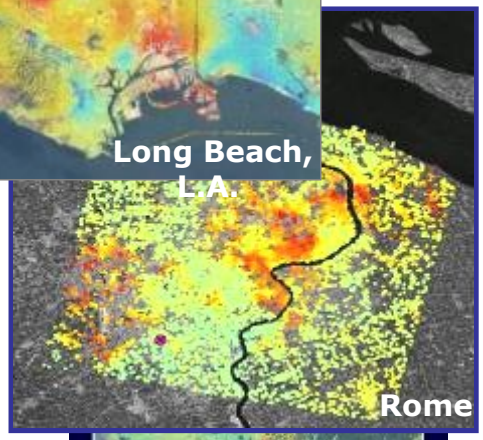
of land movement

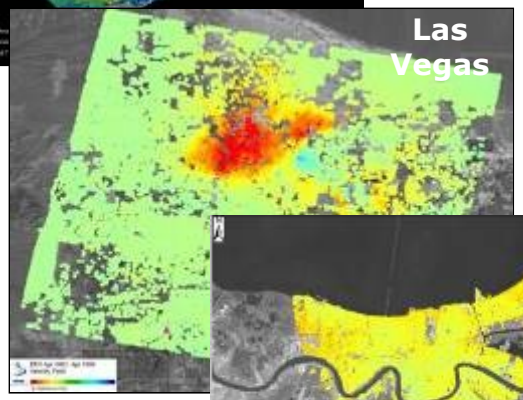
TRE: from research

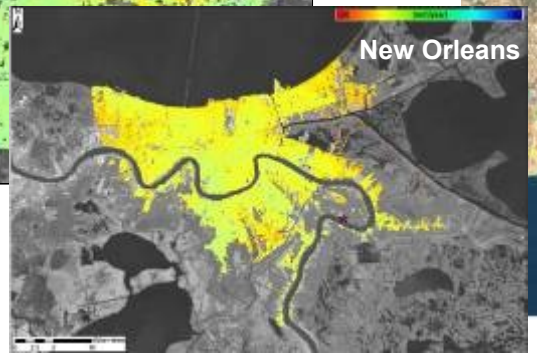
- 20 years of research in Data Signal Processing Radar Group, Eln. Dept. Politecnico di Milano
- May 1999: Permanent Scatterers Technique Patent IT, EU, USA (ext. Australia, Japan) POLIMI PS Technique™ - PSInSAR™
- March 2000: TRE foundation first *spin-off* company of Politecnico di Milano Worldwide exclusive licensee of the patent
- Shareholders: 10% Politecnico, 90% the inventors
- June 2005: ISO 9001:2000 certification
- January 2008: TRE expands to North America, creating TRE-Canada, a Canadian subsidiary of TRE

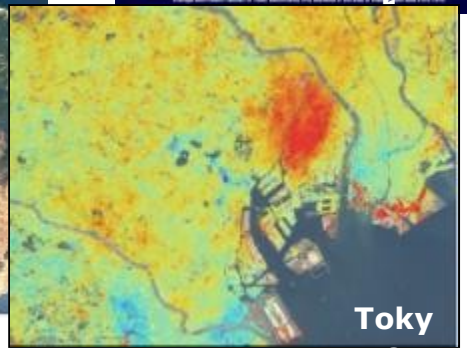
Core business









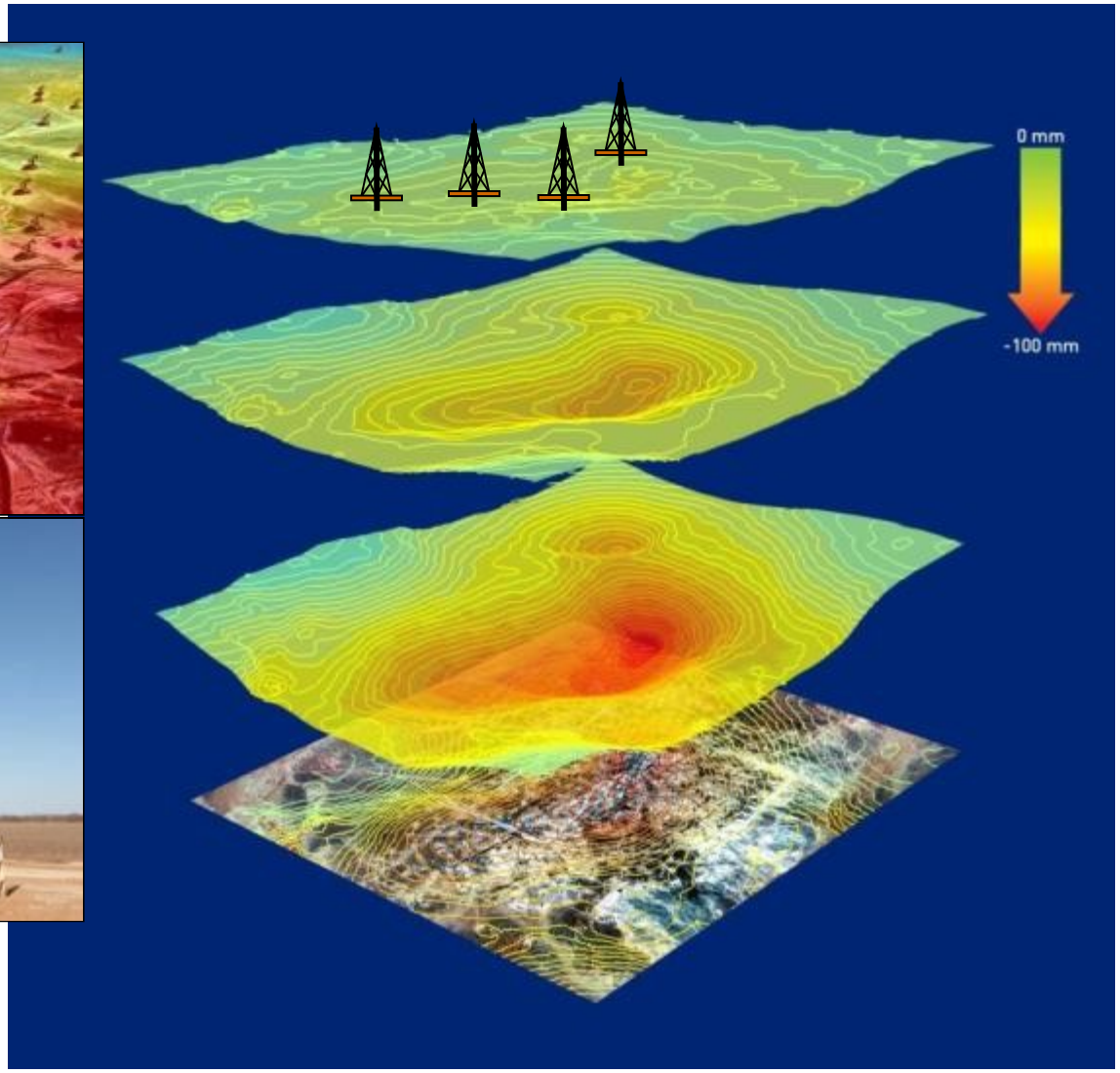


Detecting and monitoring ground displacements

hundreds of projects carried out using radar data

thousands of satellite images processed all over the world

Oilfield Monitoring



TRE in 8 years…

- Staff: > 25 people
- Turnover: 4.2 M€ (2007), 4.7 M€ (forecast 2008)
- Proprietary PSInSAR™ software: > 400,000 C-code lines
- Processing Center: 128-node Linux Cluster
- > 14,000 radar scenes processed
- > 750,000 sqKm analyzed
- > 100,000,000 PS identified
- TRE Canada incorporated in January 2008

Main customers

Energy Sector and Engineering

- Snam Rete Gas (ENI Group)
- AEM S.P.A (Electricity supplier)
- CAVET (Engineering)
- CESI (Electricity supplier)
- Enel.Hydro (Electricity supplier)
- Image ONE (Japan)

Oil Companies

- Eni S.p.A.
- Shell
- Petroleum Development Oman
- Devon Canada

University and Research Centers

- Polytechnic University of Milano
- INGV (National Institute of Geology)
- University of Florence, of Bologna, of Calabria
- University of Berkeley
- Stanford University
- University of Miami
- University of Alaska

Public Administrations

- Civil Protection
- Environment Ministry
- Regional environment Agency of Emilia – Romagna, Lombardia, Piemonte
- Region of Lazio
- Region of Liguria
- Province of Trento

Trends of the Pharmaceutical Industry 1

The Italian Pharmaceutical industry ranks fifth in the World. However it is losing ground vis-à-vis the US

TURNOVER PHARMACEUTICAL INDUSTRY			
	1999 US$ bn	Representativity of the Industry	Increase 1989-1999
USA	128,8	42,23%	125,2%
Japan	47,7	15,63%	31,2%
Germany	18,3	6,00%	23,1%
France	17,8	5,85%	38,6%
Italy	11,2	3,68%	17,7%
UK	11,0	3,62%	74,0%

Source: Farmindustria 2000

Trends of the Pharmaceutical Industry 2

- The number of trials necessary to put a product on the market doubled in the last 10 years
- The R&D costs have increased dramatically (costs of complete drug development process are in the range of US$ 350-650 millions)
- New technologies are now available (biotech, hightroughput screening…)

Technological and institutional changes have led to changes in firms' organisation and in market structure

Trends of the Pharmaceutical Industry 3

The industry is populated by three types of companies:

- The multinational companies covering approx. 70% of the Italian national market. These are highly R&D intensive with divisions and activities in several countries (Bayer, Pharmacia, Glaxo, Schering, Du Pont, etc.).

- The smaller companies specialised in the sales of non-R&D intensive drugs. They conduct mainly manufacturing and commercialisation activities and do not invest in R&D (Bracco, Monsanto, Recordati, Poli, etc.).

- ***The New Biotech Firms. Since the past 20 years research intensive companies sprung off from the new opportunities opened up by life sciences (biology, biochemicals, genetics, biochemical engineering, combinatorial chemistry, etc.). They are specialised in development of new drug compounds and drug screening or research tools technologies***

Trends of the Pharma Industry

Pharmaceutical industry recorded a good performance in the last years in terms of turnover, but evidence shows that R&D investments and employment is too weak compared to US, Japan and other EU countries.

Companies complain the fact that it is not advantageous to carry out research in Italy due to inefficiency of the Italian health authority both in validating clinical tests and in accepting new products for public subsidy.

As a result the activity of Italian firms, or Italian subsidiaries of multinational companies, is mostly concerned with the production of existing products and the distribution of new products created abroad.

Potential entrepreneurs a Survey

All the interviewees live and work in the greater Milan Area.

They work either in the academy (8/17) or in the R&D departments of high technology companies (9/17).

Most of them have a degree in Life Sciences (12/17), three of them have a degree in Chemistry (3/17), two in Electronic Engineering (2/17).

2 of them have, in addition to their science/technology degree, a master degree in management (2/17).

3 of them completed their education with a PhD in Life Sciences abroad (USA and Switzerland).

Potential entrepreneurs Characteristics of the “would be” entrepreneurial venture 1

None of the potential entrepreneurs had a previous entrepreneurial experience.

9 of them intend to create their own firm, while the 8 remaining got discouraged by the practical difficulties.

15 of them intend to provide products to other companies (new molecules), while the other 2 intend to offer some services to other companies (laboratories with innovative instruments and/or processes).

Potential entrepreneurs Characteristics of the "would be" entrepreneurial venture 2

8 of these projects were developed in an academic context, while the 9 remaining were developed in high technology companies (1 in a 20-49 employees company, 8 in a >49 employees company).

The interviewees coming from the University context actually intended to create their own company.

All the interviewees coming from the Industry context but one stated that they were discouraged by the practical difficulties.

Potential entrepreneurs Characteristics of the "would be" entrepreneurial venture 3

Competitive advantages of the project identified by the potential entrepreneurs:

- New need (8)
- First Mover (6)
- Sector knowledge (6)
- Technical knowledge (5)
- Service (5)
- Personal contacts (3)
- Price (3)
- Process innovation (1)

Potential entrepreneurs Characteristics of the "would be" entrepreneurial venture 4

Most interviewees (14/17) attributed to the location of the new firm a great importance

- Infrastructures (10)
- Availability of services (8)
- Availability of qualified human resources (4)
- Proximity of other companies of the same industry (2)
- Availability of suppliers (1)

Potential entrepreneurs Financing 1

Most potential entrepreneurs did not prepare a Business Plan and have never carried out a realistic analysis of the initial budget needed for starting their activity.

The financing needs depend on:

- the drug development phases the potential entrepreneur is willing to cover with his own activity (most likely the Lead Discovery, Pre-Clinical Development and Phase I of Clinical Development)
- what kind of products would be developed (the costs of equipment can vary hugely)
- the stage of the development the inventor is able to reach relying on "free resources"

Potential entrepreneurs Financing 1

Potential entrepreneurs usually know the existence of structures or measures aimed at financing and/or helping start-ups, while they do not prove to know their actual functioning and procedures.

Only three of them(3/17) have applied to public incubators, while other 3 (3/17) consulted Venture Capitalists.

Main perceived problems associated with applying to this kind of structures and measures are:

- Confidential information (Incubators (8/17) and VCs(7/17))
- Bureaucracy (Incubators (8/17)

Potential entrepreneurs Financing 2

Hereafter is an average of marks associated to the perceived difficulty of activities related to the setting-up of a new firm are:

- Fund raising: 4,5
- Intellectual property rights: 3,75
- Strategic plans: 3,75
- Marketing: 3,4
- Management: 3
- Development of contacts (2,75)
- Market trends: 2,75
- Consulting and legal aspects: 2,75
- Human resources: 2,5
- Technical information: 1,25

Potential entrepreneurs Personal characteristics and perceived difficulties

Hereafter is an average of marks associated to the perceived advantages and disadvantages related to becoming an entrepreneur:

Disadvantages

- Should leave an assured job: 2,6
- Legislation too harsh in case of failures: 2,2
- Would lose peacefulness: 1,8
- Would have less leisure time: 1,4
- Should change place of residence: 1,0

Advantages

- Personal fulfilment: 3,9
- Higher reward: 3,4
- Higher flexibility: 2,5

Potential entrepreneurs Considerations 1

Potential entrepreneurs interviewed to this date can be regrouped in 2 main categories:

- People working in research groups of large pharmaceutical companies (from the database of inventors).
- People working in research centres of universities or hospitals (from other sources).

Potential entrepreneurs Considerations 2

There are some general considerations that are valid for the 2 groups:

Cultural barrier. Researchers usually "love" research and a big company or a university centre is a privileged place to do it. Furthermore, in Italy, the tradition of academic elitism, which tends to discourage commercial involvement in academic science, persists.

Scarce perception of the market. They do not know what is the value of their potential idea, and what kind of agreements could be possible with other companies.

Lack of resources associating economic and scientific skills.

High costs in terms of time and investment needed and the rate of success is too low.

Potential entrepreneurs Considerations 2

A far as the researchers working in large companies are concerned, we had some difficulties in identifying some real potential entrepreneurs. The main reasons are:

Kind of research. Most large companies in Italy do not carry out "radical research", but they are specialised in "incremental research" (usually research activities are carried out in USA).

Property rights. They belong to the companies researchers that have developed it are working for. It is hardly conceivable to carry out ones own research using the laboratories of a company.

Potential entrepreneurs Considerations 3

People working in research centres of universities or hospitals usually are freer to carry out independently their own research using the infrastructures of the university or the hospital.

Main concerns of this category are:

- The law that banned university researcher from working in private firms (with the new law probably things will be easier).
- They usually have an extremely high risk aversion.
- They have difficult access to seed capital.
- The venture capital funds are not considered interesting (the project has still a low value).

Start-ups

Start-ups interviewed were 5

- Biosearch: established in 1996 following a management-buy-out of the Lepetit Research Center from Hoechst Marion Roussel (after the acquisition of Marion-Merrel-Dow by Hoechst).
- Novuspharma: established in 1998 following acquisition of the Boehringer Mannheim Group by Hoffman-La Roche.
- Molmed, Primm, GenEra: they were created as spin-offs of the San Raffaele Science Park

Start-ups

Most start-ups in the pharmaceutical industry are New Biotech Firms created with the support of big pharmaceutical companies or by technology transfer offices. Typically we will find:

MBOs carried out by the managers of research centres of big pharmaceutical company which decided to stop activities in a particular area or as the result of M&A in the industry.

Spin-offs of research groups of universities or hospitals with the help of technology transfer offices

Start-ups

MBOs usually represent the result of strategic choices of the large companies to externalise some research activities (MBO by a research group).

These are not typical start-ups as the MBO transaction usually grants these companies with a support by the large company which can be represented by:

- the possibility to use the results of the research carried out within the large company
- the guarantee of a market outlet during the first years of activity
- the use of operating facilities, plants, services and equipment.

Start-ups

Spin-offs of academic research programs are created through the transfer of know-how, technology and intellectual property.

The Universities or hospitals play an important role in the first years of activity:

They can provide facilities and necessary infrastructures.

They can provide a market outlet for the new established firm.

They represent a quality guarantee vis-à-vis the potential investors (first screeners of the projects).