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BEcoming Future-ORiented Entrepreneurs in universities and companies

Workshop

Quantitative methodologies to anticipate the future

Riccardo Apreda

Erre Quadro s.r.l.

Pisa, 26/11/2019

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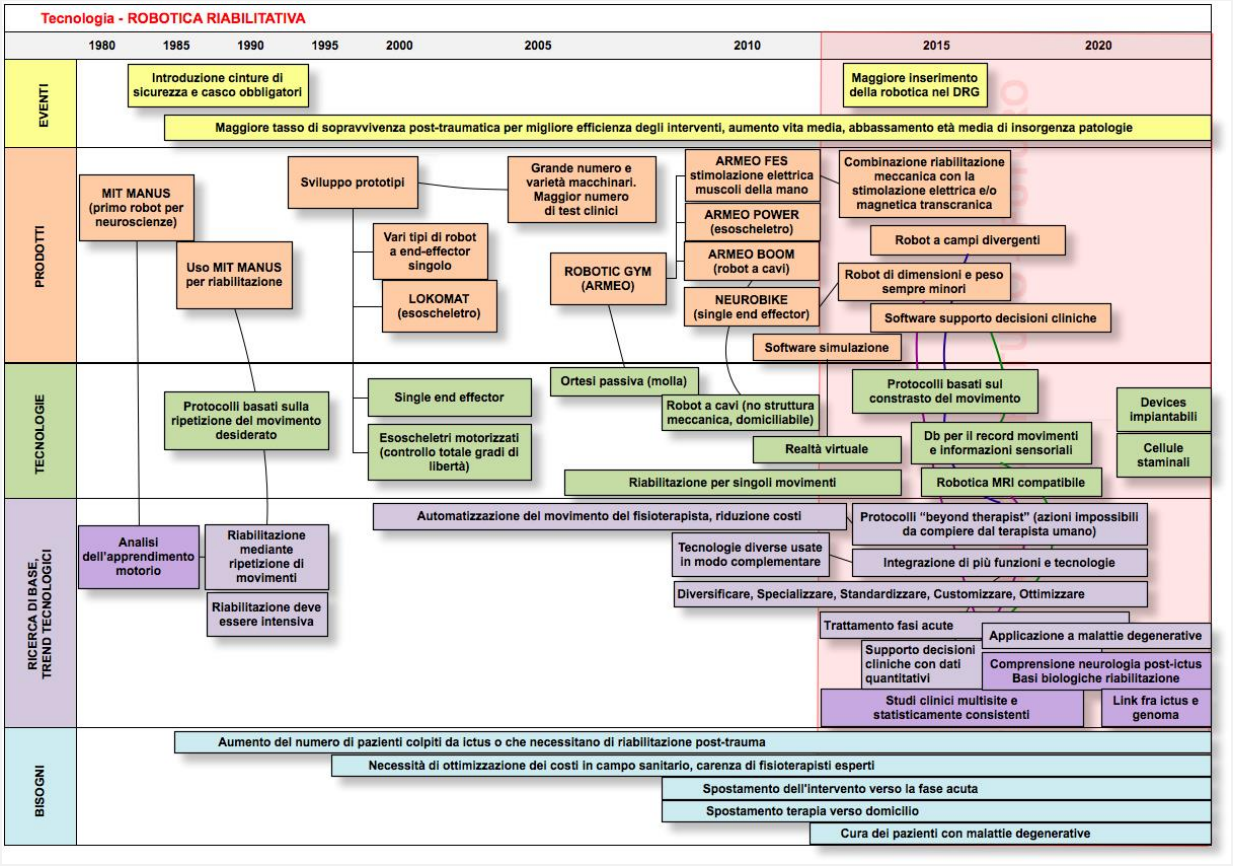
Foresight techniques: A variety of expert based methodologies



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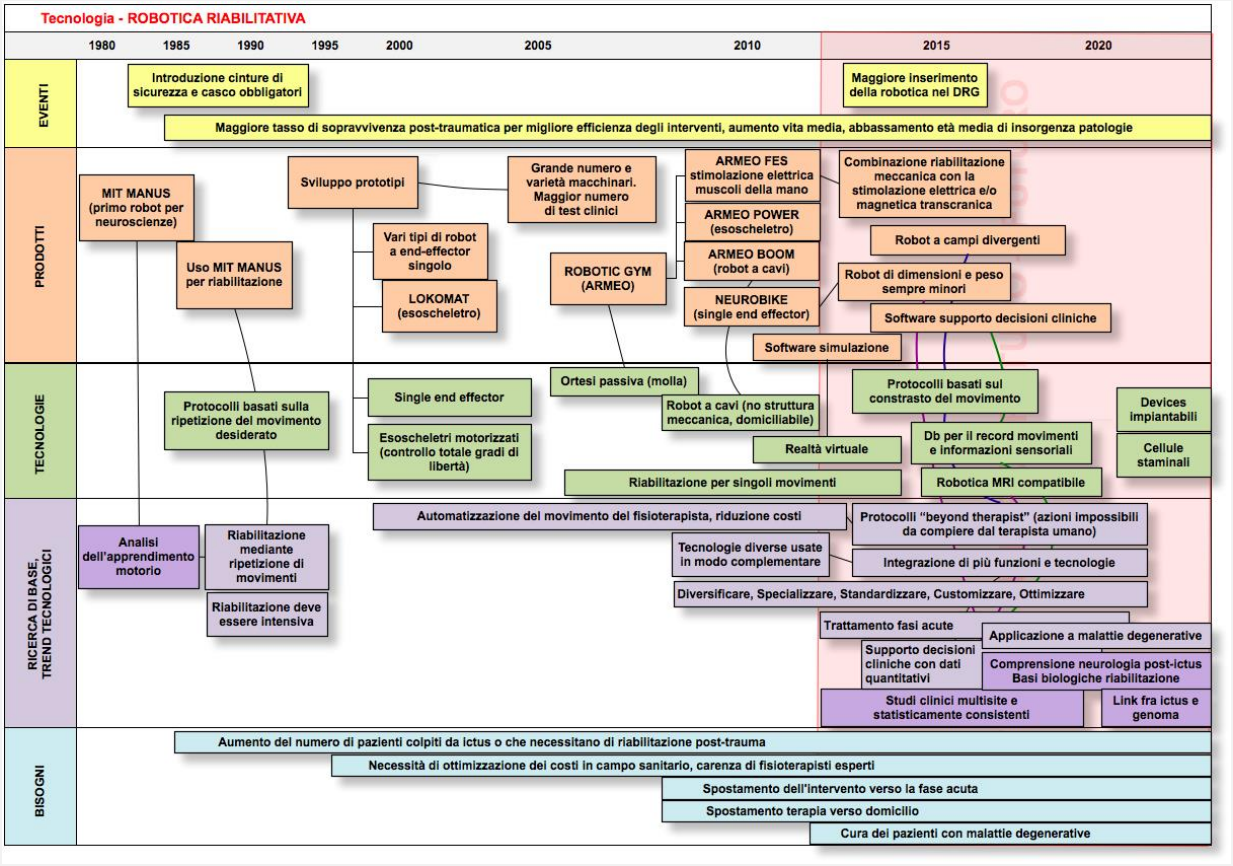
Foresight techniques: A variety of expert based methodologies



Delphi
Megatrends
+ Experts panels
Scenario building
etc.

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The role of human-independent methodologies

Some **open issues** of traditional methodologies

- Which perspective to adopt? Dichotomy users *vs* producers of technology
- Which among rival technologies? Necessary commitment *vs* risk of early lock-in
- How to see through technology hype, promises or, sometimes, vested interests?
- How to overcome cognitive biases?
- How to detect weak signals, those even experts may not be aware of?

Of course continuous improvements, such as stakeholders involvement.
However, more quantitative methodologies, e.g. the analysis of patents and papers, offer an effective way to cross-validate expert-based analyses (and *vice versa*).

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Where is the value in data-related techniques?

DATA MINING vs DATA INTERPRETATION

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Choosing the right indicator

Scientific papers of course, what about **patents**?

- 80% of the **technical information** contained in patents is not available elsewhere (Terragno 1979, Kütt et al. 1998)
- Sometimes patents **anticipate publications** or launch in the market (even considering the 18 months window)
- Patents are costly, thus reflect companies' real **strategies**
- Patents contain information about **problems** to be solved, user **needs**, etc.
- Patent data are **easier to find** for any and all sectors

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Choosing the right indicator

Different data sources for different information

- GitHub lists problems solved and to be solved in software-related areas, as much as patents do for technologies
- Startups and their promotional material may capture new trends in very dynamic sectors even better than patents
- Job offers are used to map the future need for skills but are not the only meaningful source

…

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The accuracy issue

The **quality** of the patent (/data) search becomes then the limiting and crucial factor.

Detecting the right set of the patents (/data) related to a relevant technical area is the key for a successful analysis.

- A wrong definition of the search **focus** provides misleading or incomplete results.
- Inadequate **recall** loses important elements.
- Low **precision** and noise produce poor results.

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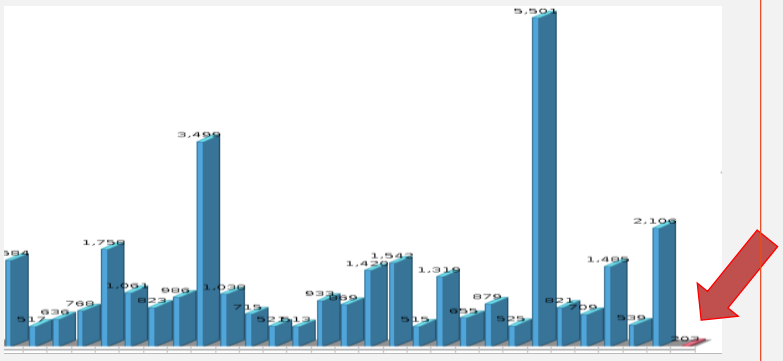
Data-related issue

can (type of combustor) is also:

- to be able to (modal auxiliary)
- can bus
- cylindrical container
- preserve food



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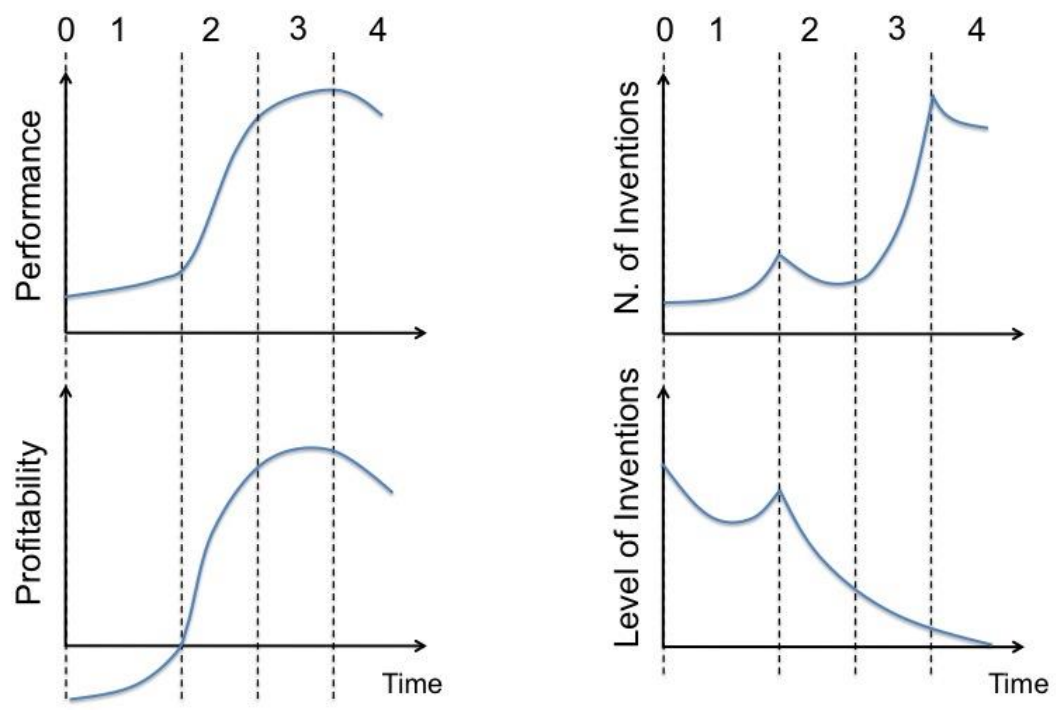
The innovation cycle

Technical performance S-Curve can be correlated to economic and inventive curves



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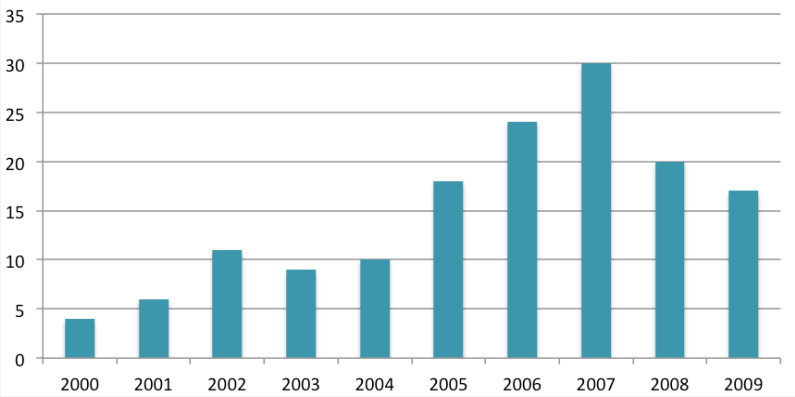
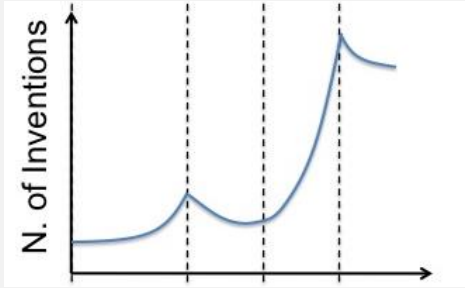
The innovation cycle

A product in the declining stage: device for cancer therapy

2010





Cross check with doctors and with semantic analysis: too many collateral effects
Conversely the expert stated that this device was “the future”.

2016 Promises to cure every cancer have failed, reconverted to a very limited use nowadays, with no further innovation, in a niche where the game changer has not arrived yet

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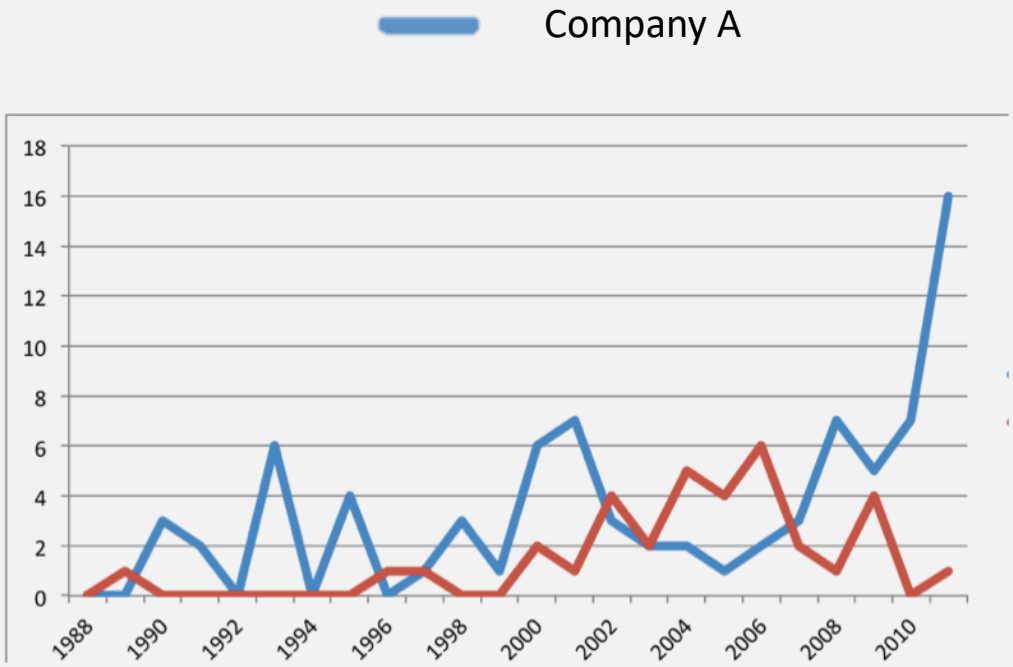
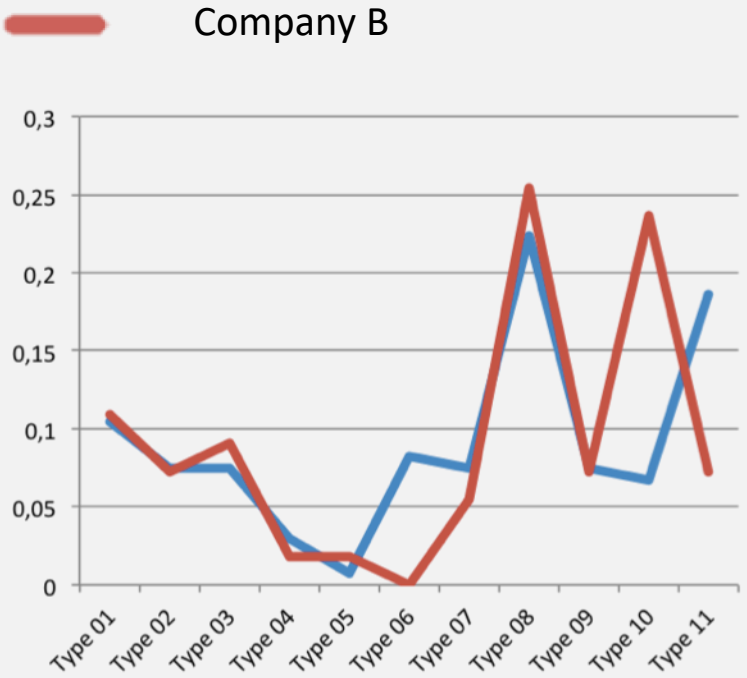
Competitive advantages



Filing activity over years



Filing activity over sectors

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Threats and opportunities

Active Newcomers

Assignee	# brevetti precedenti al 2004	# brevetti 2004-2005	# brevetti 2006-2007	# brevetti 2008-2009	# brevetti 2010-2011	# brevetti 2012-2013
Chan Li Machinery Co., Ltd	0	5	22	22	22	4
FUTURA SpA	38	32	17	23	0	9
MTC S.r.l	11	15	18	20	0	5
OMET S.r.l	21	12	17	14	2	0
O.M.T. S.r.l	6	2	6	1	10	2
OPTIMA	37	12	5	3	4	0

	#	% > 2011	Main assignee	Trend
Topic 3: Winding and Rewinding devices Description: web winders are used to form large parent rolls. From the parent rolls, rewinders are employed in order to wind the web material into a rolled product. Examples include techniques for monitoring and control of tension, wrinkle prevention, etc.	58	53%	P&G	↗
Topic 4: Folding of multi-ply products and tissue stacks Description: selective folding or redirecting of multiply webs, particular implementations or production techniques of tissue stacks.	45	47%	SCA	↗

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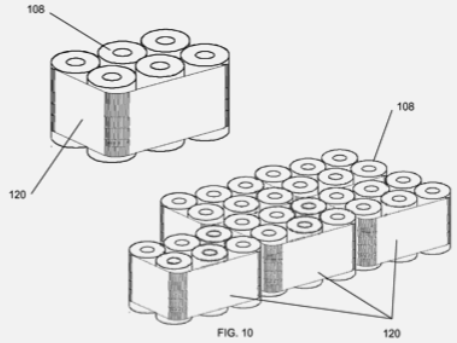
Predicting the emergence of new technologies…

Some years ago, the new wave in the world of **bed mattresses** was **memory foam**.
Indeed wool mattresses are expensive and spring ones were uncomfortable…
However the network of links between patents (and its time evolution) indicated that **metal springs were about to return**, specifically to improve the supporting performance.
The client dismissed our indication saying “metal springs are dead”.
Two years later, Permaflex launched a new line of microspring-based mattresses…



https://www.youtube.com/watch?v=ue0nptBqsKE

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Technological Foresight of the mechatronic sector

Goal of the analysis:

Provide insights about the **future trends** of the **mechatronic sector** to the Autonomous Province of Trento. The results will be used to formulate policies aimed at improving the territory's competitiveness.

PROVINCIA AUTONOMA DI TRENTO

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Research over Research

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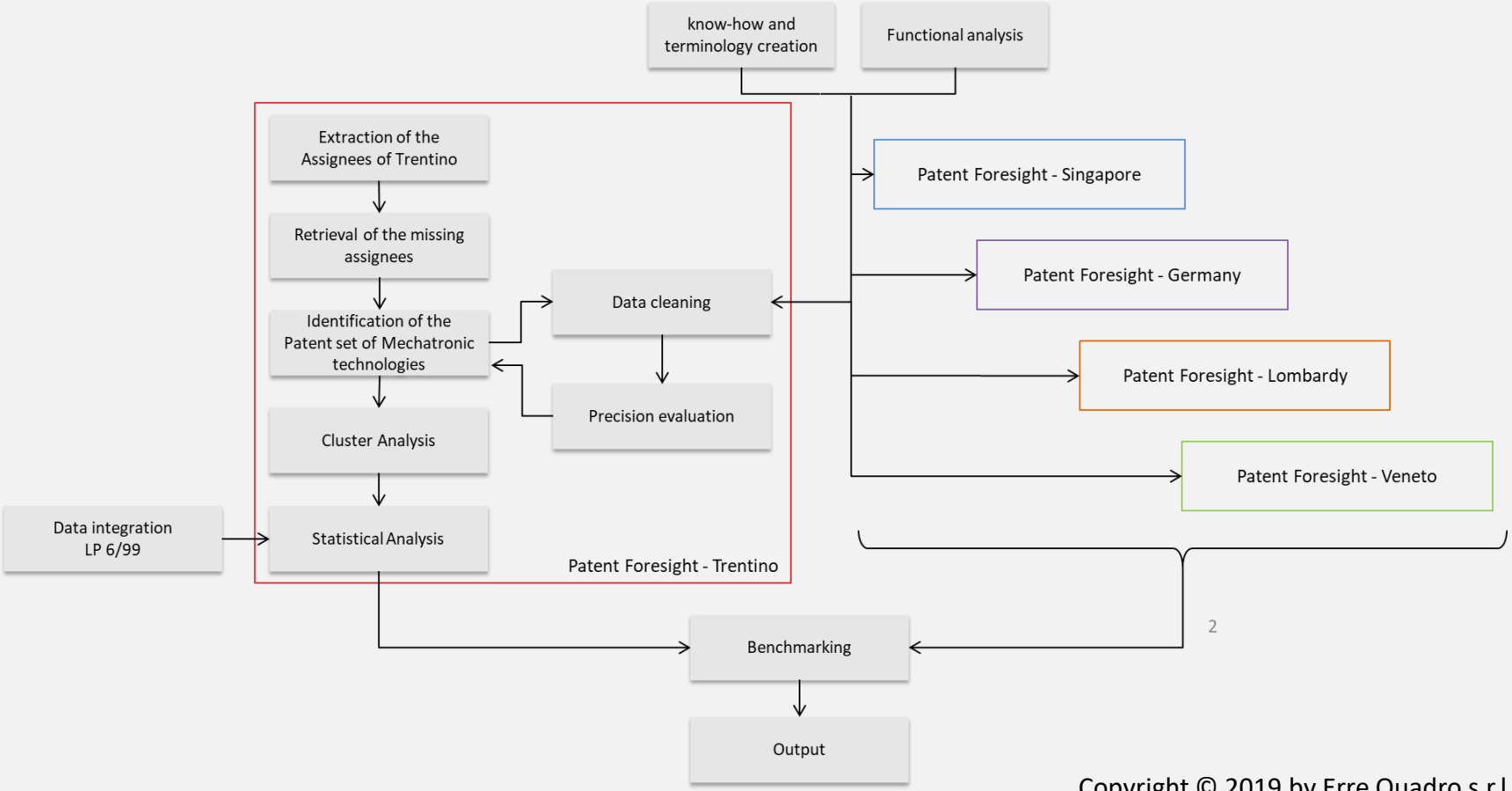
The adopted methodology



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Perimeter of investigation

Technologies that integrate solutions related to the fields of **mechanics**, **electronics** and **automated control**

Particular focus on technologies linked with the Industry 4.0 area

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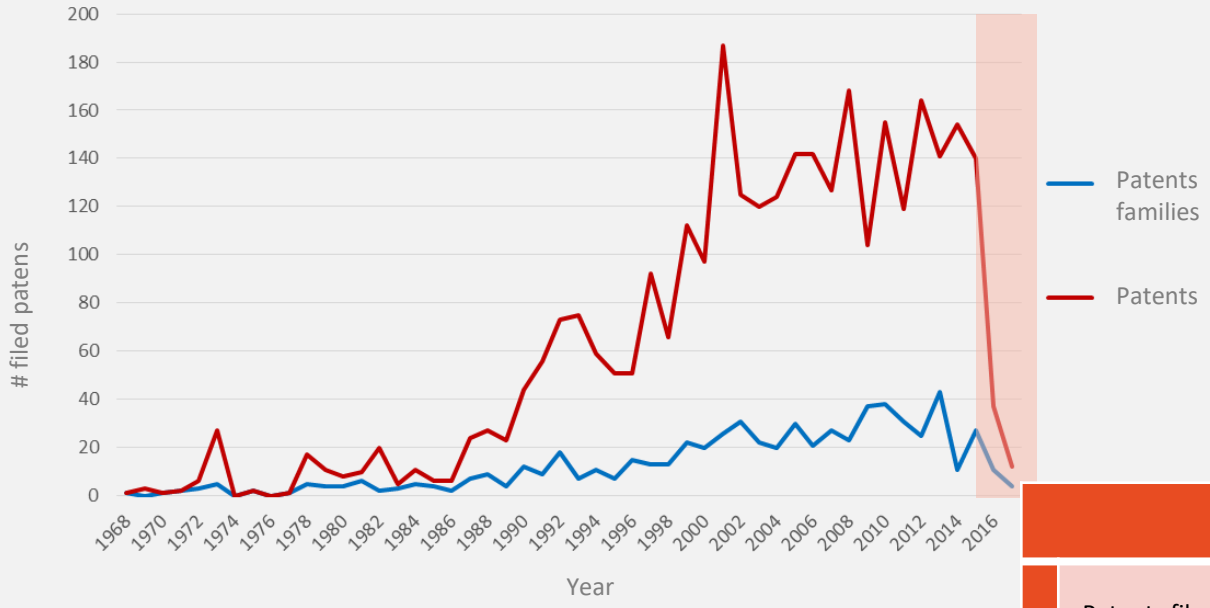
The mechatronics in Trentino

Inventive activity over the years



Patents activity		
Patents filed by Trentino companies in the field of mechatronic from 1995	526 patent families	Average # of patents per family: 5,1
	2630 patents	

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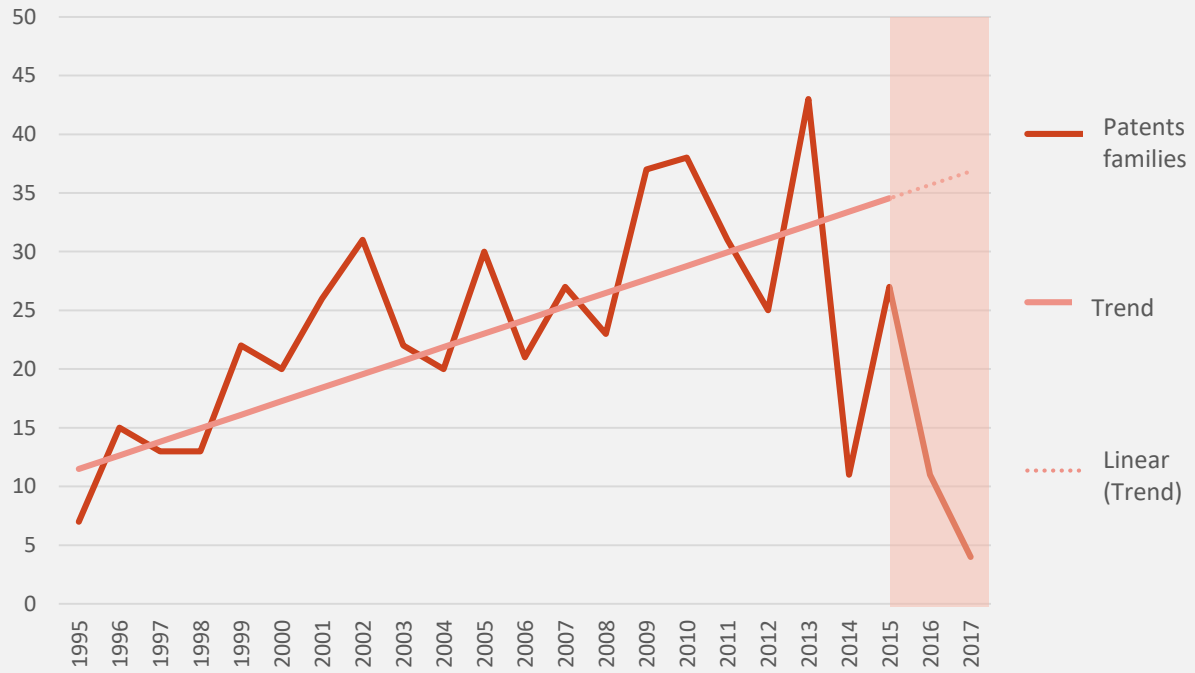
The mechatronics in Trentino

Inventive activity over the years



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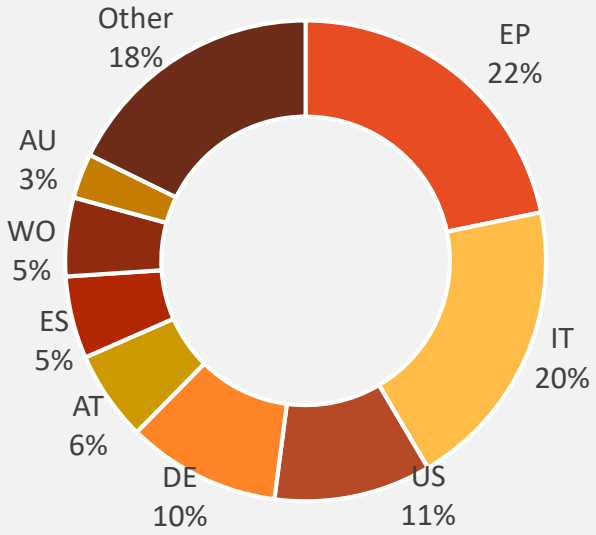
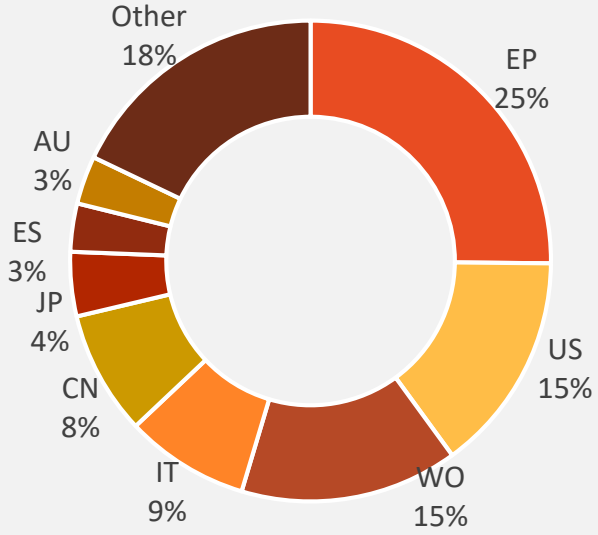
The mechatronics in Trentino

Patent distribution in different jurisdictions



2000-2005



2012-2017

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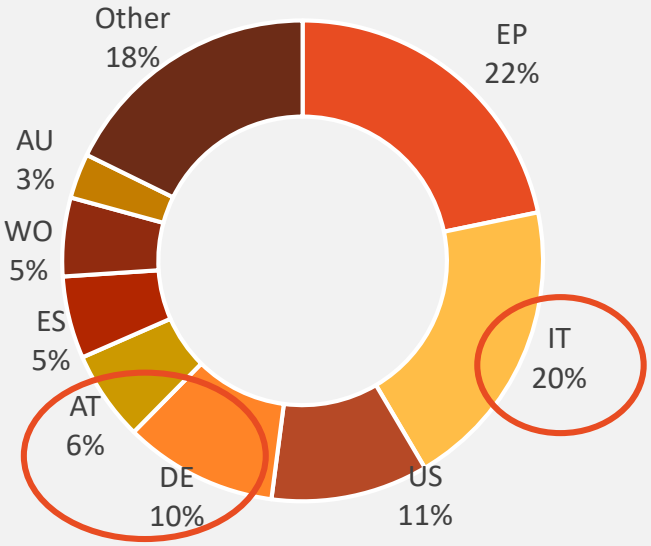
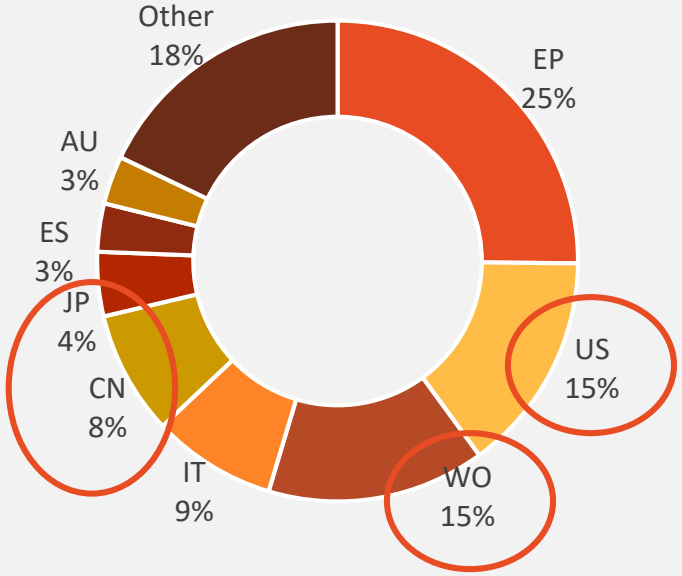
The mechatronics in Trentino

Patent distribution in different jurisdictions



2000-2005



2012-2017

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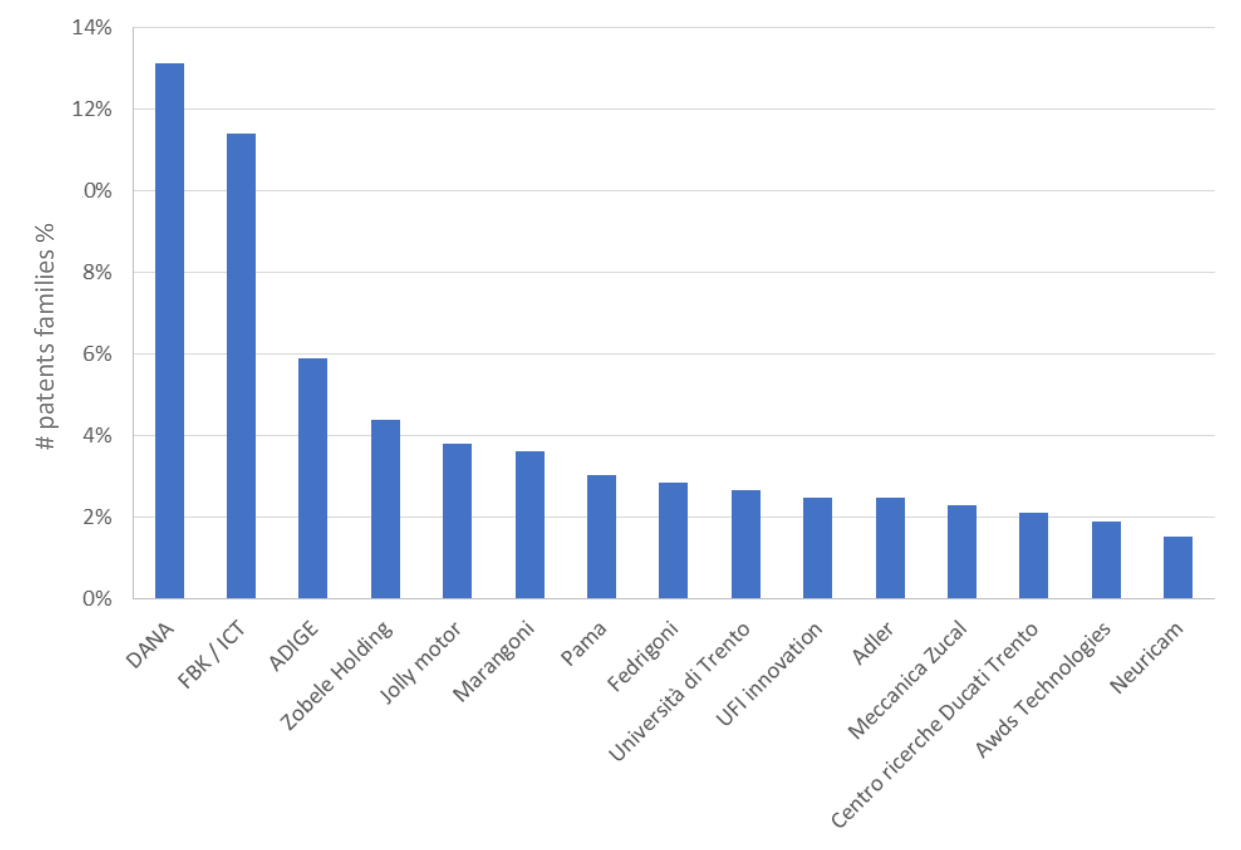
The mechatronics in Trentino



The players of the sector

- OEMs automotive
- Research centres
- Machinery
- Chemicals
- Paper industry
- …

Other assignees: ~ 150

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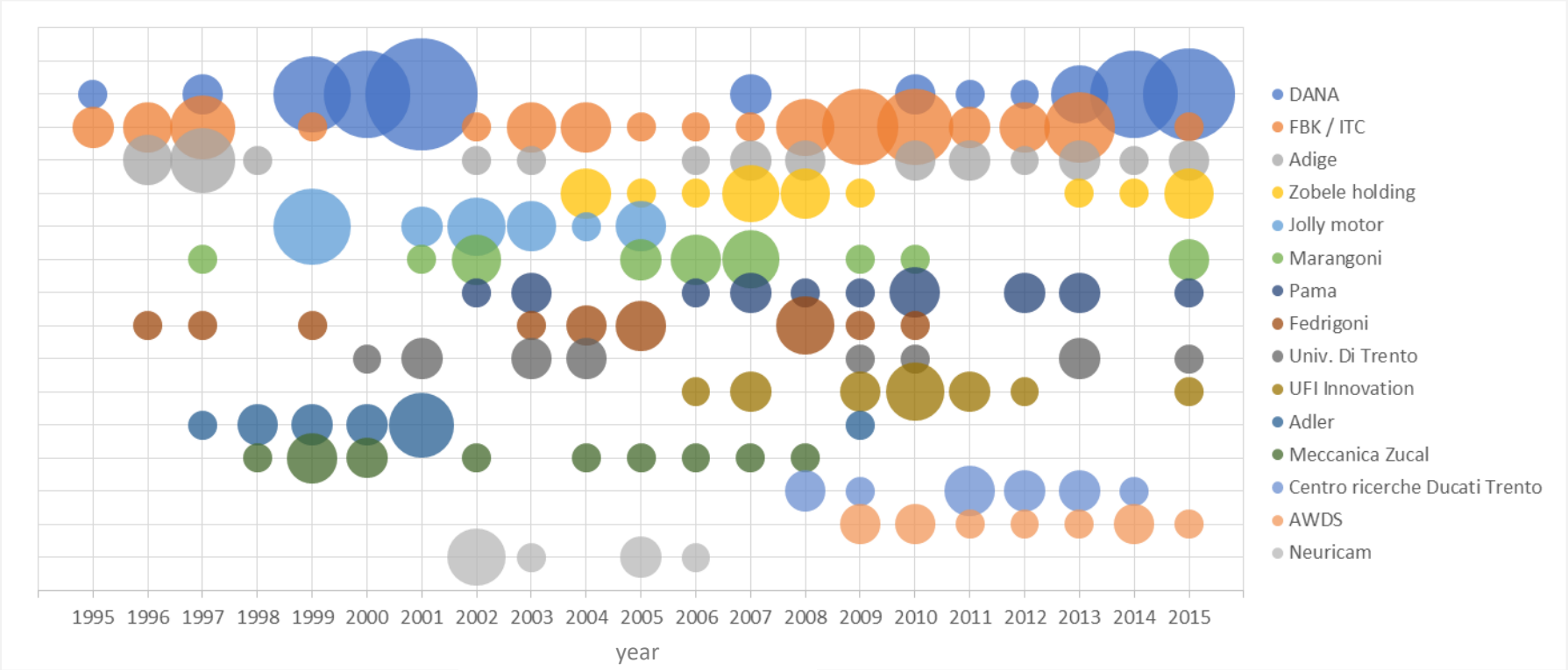
The mechatronics in Trentino

Innovators over time



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The mechatronics in Trentino

Technical fields

	Technical fields	# Patent families		# Patents	
1	Power transmission	125		599	
2	Sensor	66	110	262	538
	Telecommunication	32		141	
	Data Processing	32		135	
3	Machining system	108		535	
4	Land Vehicles	102		531	
5	Industrial process (paper, polymer, food)	51		388	

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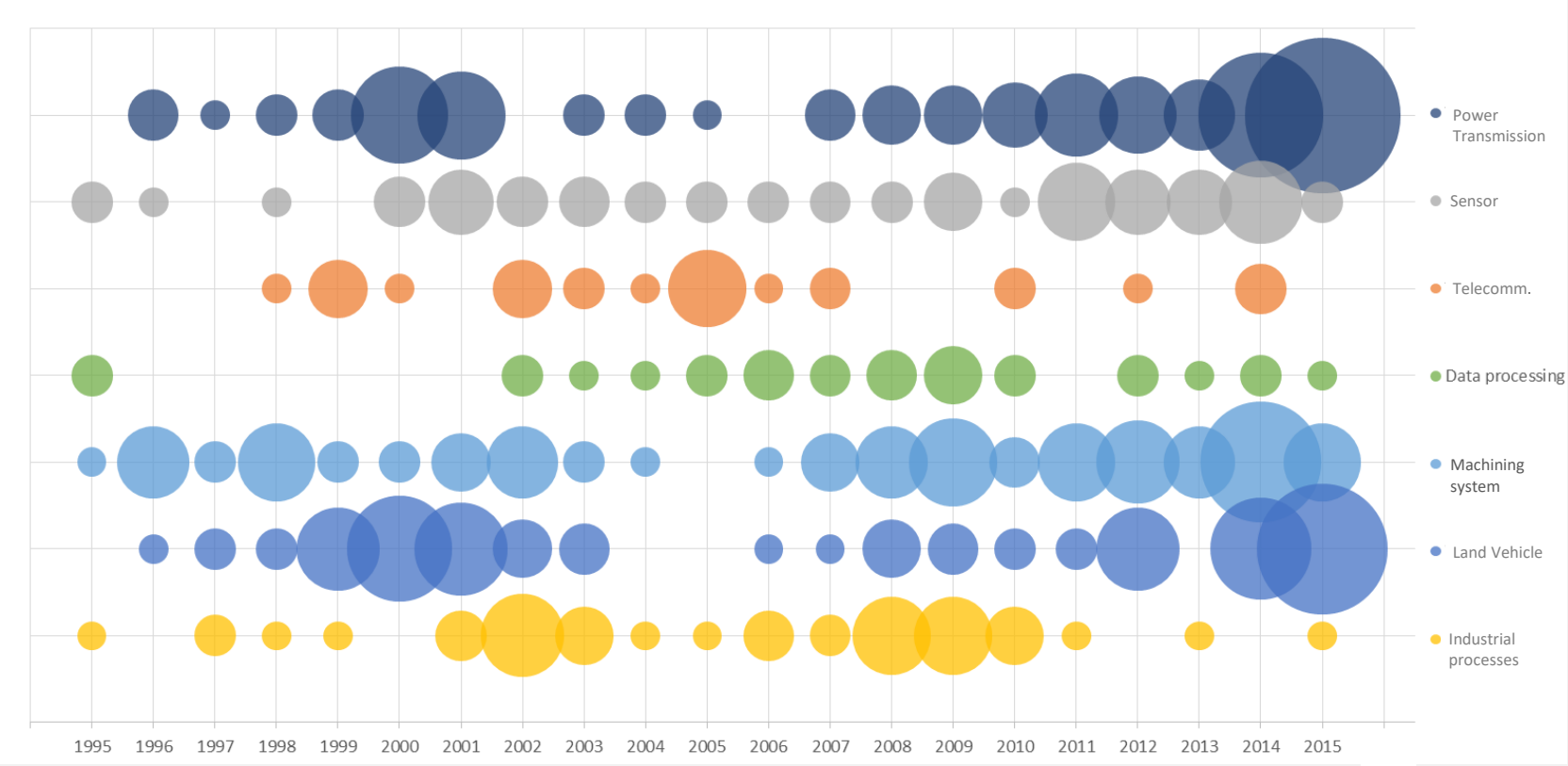
The mechatronics in Trentino

Technical fields



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Conclusions

- Unfocused know-how
- Increase of the activity in the last 10 years
- Prevalence of applied technologies
- Big network of cooperation

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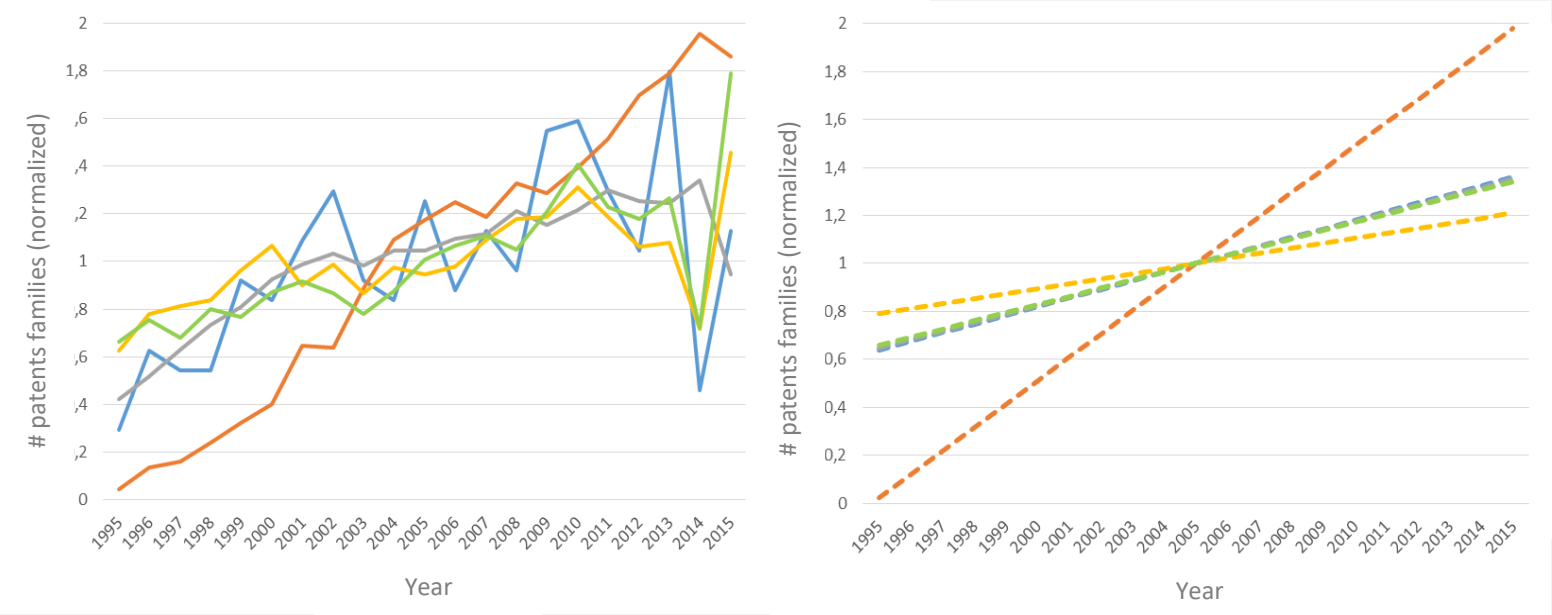
Benchmarking



Absolute numbers
vs
increase rates

	# Patents	# Patents families
Province of Trento	2630	526
Singapore	90817	19842
Upper Bavaria, Swabia, Stuttgart	802942	140479
Lombardy	130201	24606
Veneto	55845	10187

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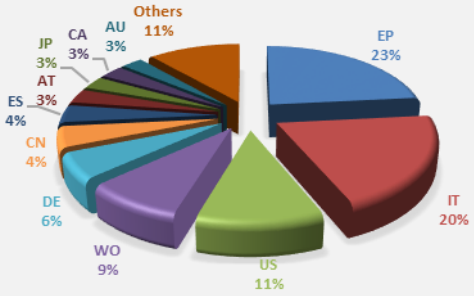
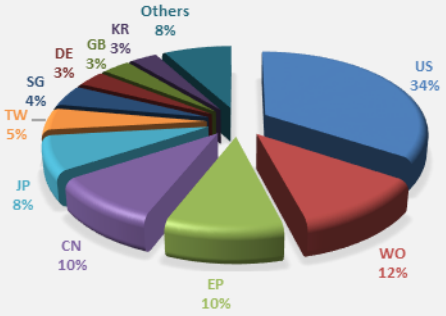
Benchmarking

Patents distribution in the different jurisdictions

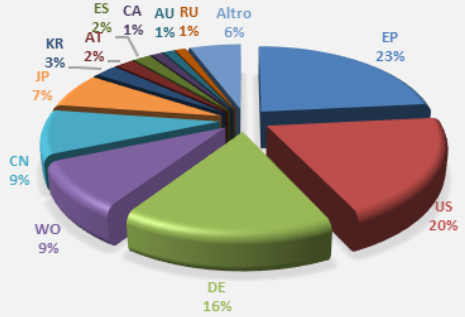
Province of Trento



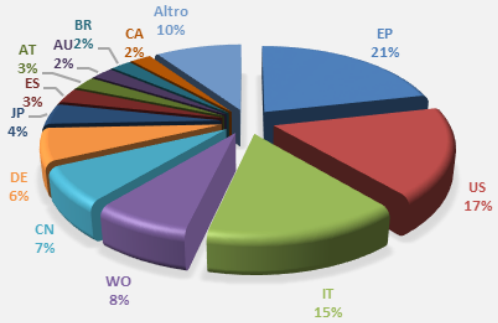
Singapore



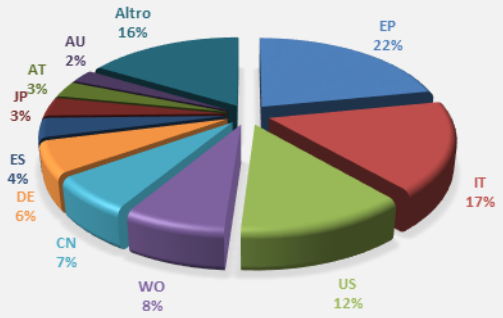
Upper Bavaria, Swabia, Stuttgart



Lombardy



Veneto



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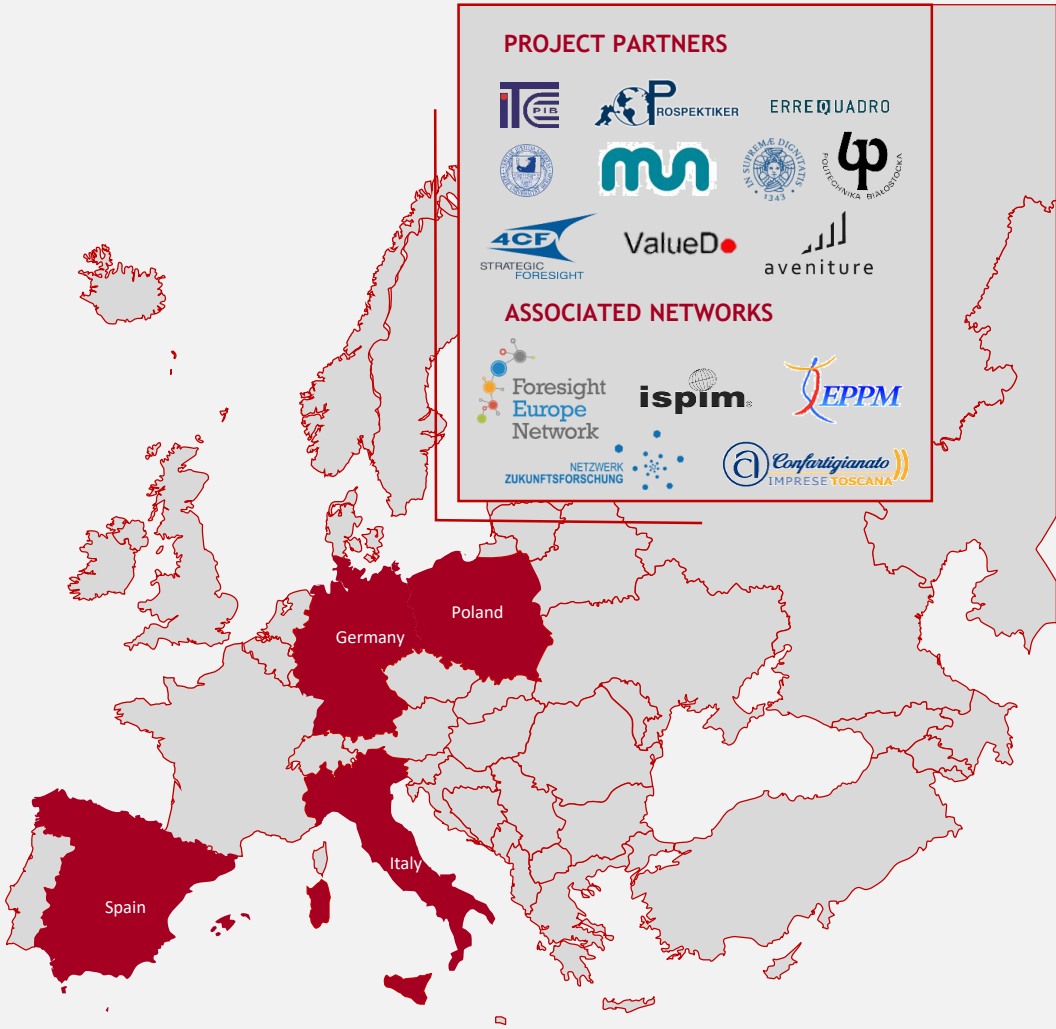
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