
**WISSPAT™:
Patent based technology studies**

An introduction

**Prof. Dr. Holger Ernst
Dr. Jens Langholz**

July 2006

Strategic questions in technology management

- How strong is a company's technology position compared to the relevant competitors?
- Are there any newcomers or technological strong players that have not been identified so far?
- What are the dynamics in patenting of the technological strongest companies?
- Which patent strategies do the most important companies have?
- Which technological strengths and weaknesses does the company in focus have?
- In which technology fields (TF) are many new patent applications, i.e. which TF seem to be technological attractive? Are there any new technologies, that might be interesting for the future?
- Which technological emphases do the strongest players have? Are there any changes in the technology strategy of these companies over the last years?
- Is it possible to identify institutions or companies that might be interesting for a cooperation or an acquisition?

Analysis of patent databases

To answer these questions publicly available patent data is analyzed in detail.
Results are clearly displayed.

Pats ohne vorrecherche - Editor

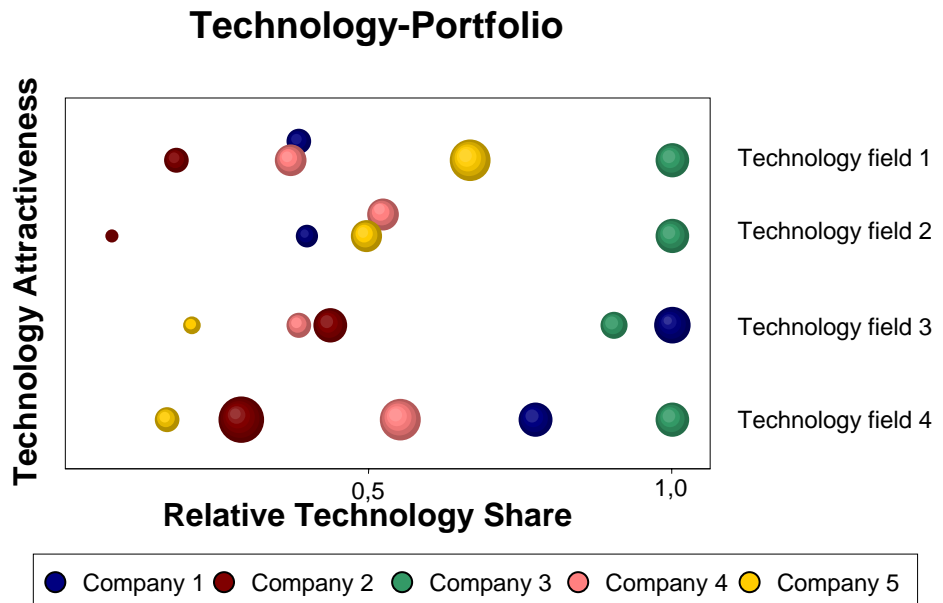
Dat Pats ohne vorrecherche - Editor

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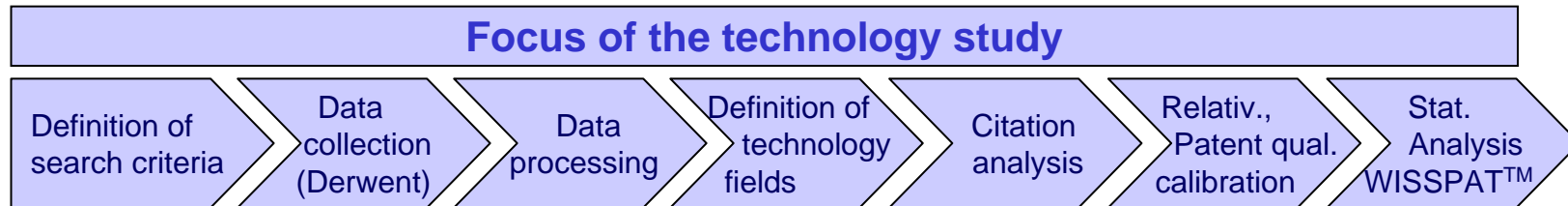
Dat Pats ohne vorrecherche - Editor

FS FA MC Datei Bearbeiten Format Ansicht ?

L19 AN DNN TI L19 AN DNN TI L19 AN DNN TI L190 ANSWER 63 OF 1297 WPIDS COPYRIGHT 2000 DERWENT INFORMATION LTD
 2000-256726 [22] WPIDS
 N2000-190882 DNC C2000-078355
 TI AN DC TI Glow protective band, for high voltage electrical machines, includes
 conductive antimony doped tin oxide filler.
 A21 A23 A85 E32 V06 X11 X12
 MUHRER, V; ROGLER, W; SCHAEFER, K
 (SIEI) SIEMENS AG
 27
 PI WO 2000013191 A1 20000309 (200022)* DE 27p H01B003-04 <--
 RW: AT BE CH CY DE DK ES FI FR GB GR IE IT LU MC NL PT SE
 W: CN CZ HU IN JP KR PL RU US
 DE 19839285 C1 20000427 (200025) H02K003-40
 WO 2000013191 A1 WO 1999-DE2559 19990816; DE 19839285 C1 DE
 1998-19839285 19980828
 PRAI DE 1998-19839285 19980828
 AB IC ICM H01B003-04; H02K003-40
 ICS H01B003-00; H01B003-08
 WO 200013191 A UPAB: 20000508
 NOVELTY - Glow protective band contains conductive antimony doped tin
 oxide coated filler.
 DETAILED DESCRIPTION - Glow protective band for high voltage
 machines is obtained by removing the solvent (at high temperature)
 from a fabric carrier material impregnated with:
 (A) a solution of thermosetting resin;
 (B) in a solvent which contains an antimony (Sb) doped tin (Sn)
 oxide coated inorganic filler, and optionally a hardener and/or
 accelerator.
 USE - The band is useful for high voltage electrical machines.
 ADVANTAGE - The conductivity in the glow protective layer is
 very precise and reproducible. It permits only a small increase in
 dielectric losses in electrical machine winding insulators. Windings
 can be made for these machines with dielectric losses within range of
 the DIN VDE 0530 (Part 1) standard.
 Dwg. 0/0
 FS FA MC CPI EPI
 AN DNN TI L19 AN DNN TI L19 AN DNN TI L190 ANSWER 64 OF 1297 WPIDS COPYRIGHT 2000 DERWENT INFORMATION LTD
 2000-250675 [22] WPIDS
 N2000-187967 DNC C2000-076450
 TI AN DC TI Multilayered decorative sheet used as e.g. cladding material - has
 concealment layer containing titanium dioxide and mica titanium fine
 powder partially coated with color pigment and titanium dioxide.



Procedure of a technology study



1. Definition of search criteria for data collection in the Derwent database (f.e. IPC-classes, key words in title/abstract, companies, selected years).
2. Data collection in the Derwent database.
3. Data processing: Necessary transformation of text information to indicators.
4. Definition of technology fields (TF) and criteria for assigning patents to TF.
5. Collection and analysis of citation information for the relevant patent families (Derwent patent citation index).
6. Relativization of the patent data, calculation of patent qualities and potentially calibration of the data (matching of economic assessment of patents with statistically determined quality indicators).
7. Statistical analysis of the patent data in EXCEL/WISSPAT™.

Derwent short extracts

The patent short extracts contain all necessary information.

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Datei Bearbeiten Format Ansicht ?

Dwg. 0/0
FS CPI EPI
FA AB
MC CPI: L03-C02C; L03-G05; L03-H04C
EPI: V05-M01A; W03-A08D; X26-A02D

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AN 2000-256726 [22] WPIDS
DNN N2000-190882 DNC C2000-078355
TI Glow protective band, for high voltage electrical machines, includes
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PA (SIEI) SIEMENS AG
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RW: AT BE CH CY DE DK ES FI FR GB GR IE IT LU MC NL PT SE
W: CN CZ HU IN JP KR PL RU US
DE 19839285 C1 20000427 (200025) H02K003-40
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PRAI DE 1998-19839285 19980828
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Dwg. 0/0
FS CPI EPI
FA AB; DCN
MC CPI: A12-E01; E31-M
EPI: V06-M08B; X11-J02B; X12-E; X12-E01B; X12-E01X

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AN 2000-250675 [22] WPIDS
DNN N2000-187967 DNC C2000-076450
TI Multilayered decorative sheet used as e.g. cladding material - has
concealment layer containing titanium dioxide and mica titanium fine
powder partially coated with color pigment and titanium dioxide.
    
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AN: Derwent accession number of the patent family

TI: Title of the patent family

DC: Derwent Classes

IN: Inventors

PA: Assigning companies with patent assignee code

PI: Patent information with national patents in this family

PRAI: Priority information of this patent family

IC: Technology classes of this patent family
(International Patent Classification)

AB: English abstract to this patent family

MC: Manual Codes

Technology fields

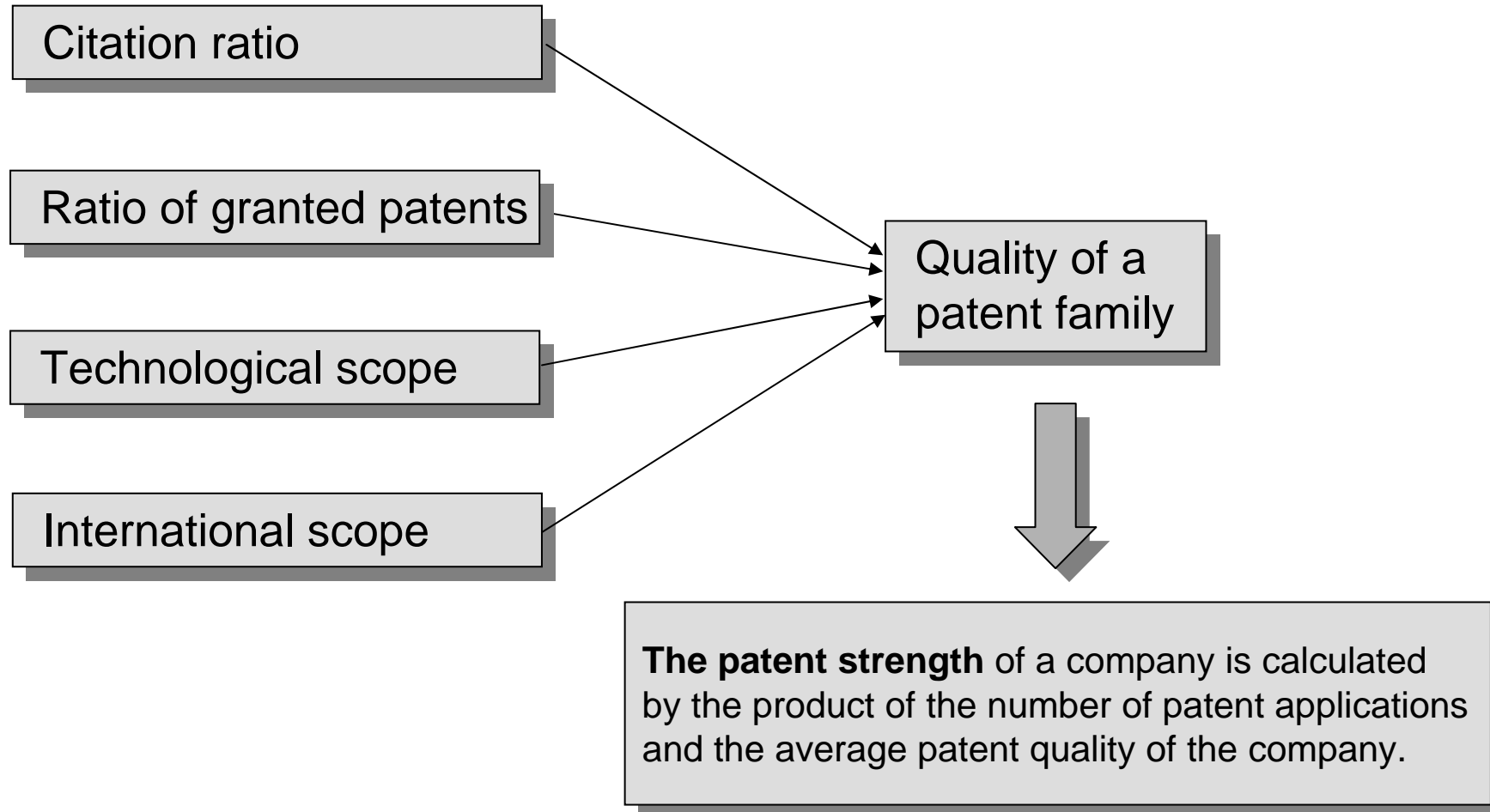
The definition of technology fields and the assigning of patents to these TF is a requirement for the execution of a technology study.

There are different approaches for assigning patent families to technology fields:

- a. Assigning of patent families to technology fields via International Patent Classification (IPC) or Derwent Classes (DC).
- b. Assigning of patent families to technology fields via key words in title or abstract of the patent documents.
- c. A combination of a. and b.

Patent qualities

Four indicators are considered equal in weight for the calculation of the quality of each single patent family.



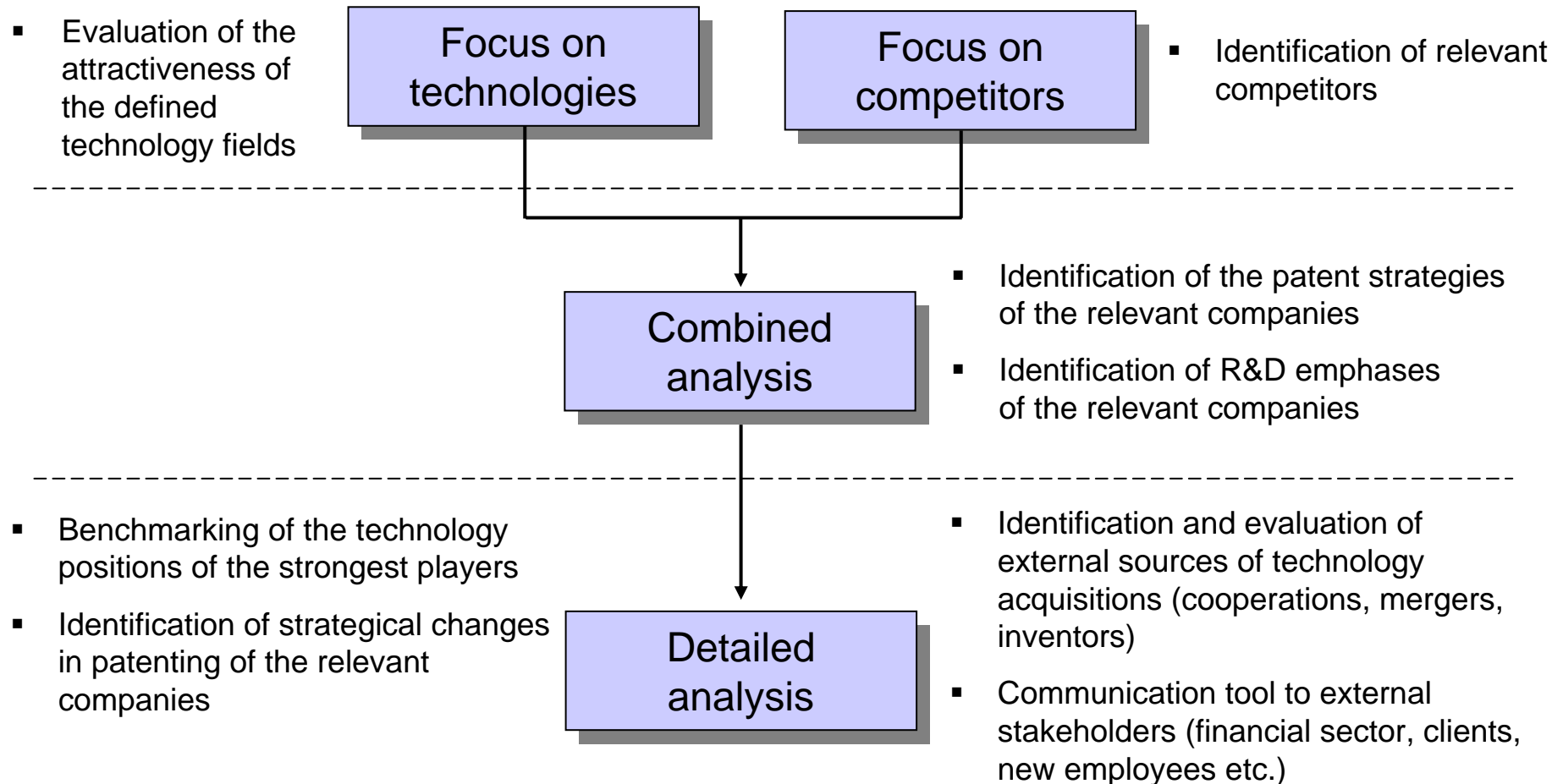
Calculation of patent quality indicators

Explanation of quality indicators

1. **Citation ratio** of a patent family: Number of examiner citations of a patent family in relation to the average number of citations of patents of the respective year.
2. **Ratio of granted patents**: Information if a patent of a family is granted (0/1) in relation to the average share of granted patents.
3. **Technological scope** of a patent family: Two indicators are considered equal in weight:
 - a. **Number of different IPC sections (first digit)**, which are named in the patent family, in relation to the average number of IPC sections.
 - b. **Number of different IPC classes** of a patent family **overall** in relation to the average number of IPC classes.
4. **International scope** of a patent family: Two indicators are considered equal in weight:
 - a. **Information** if a patent family is applied for in the USA, Europe and Japan (0/1) in relation to the share of „Triade“ patents of the respective company.
 - b. **Number of patents in a patent family** in relation to the average number of patents in a family of the respective company.

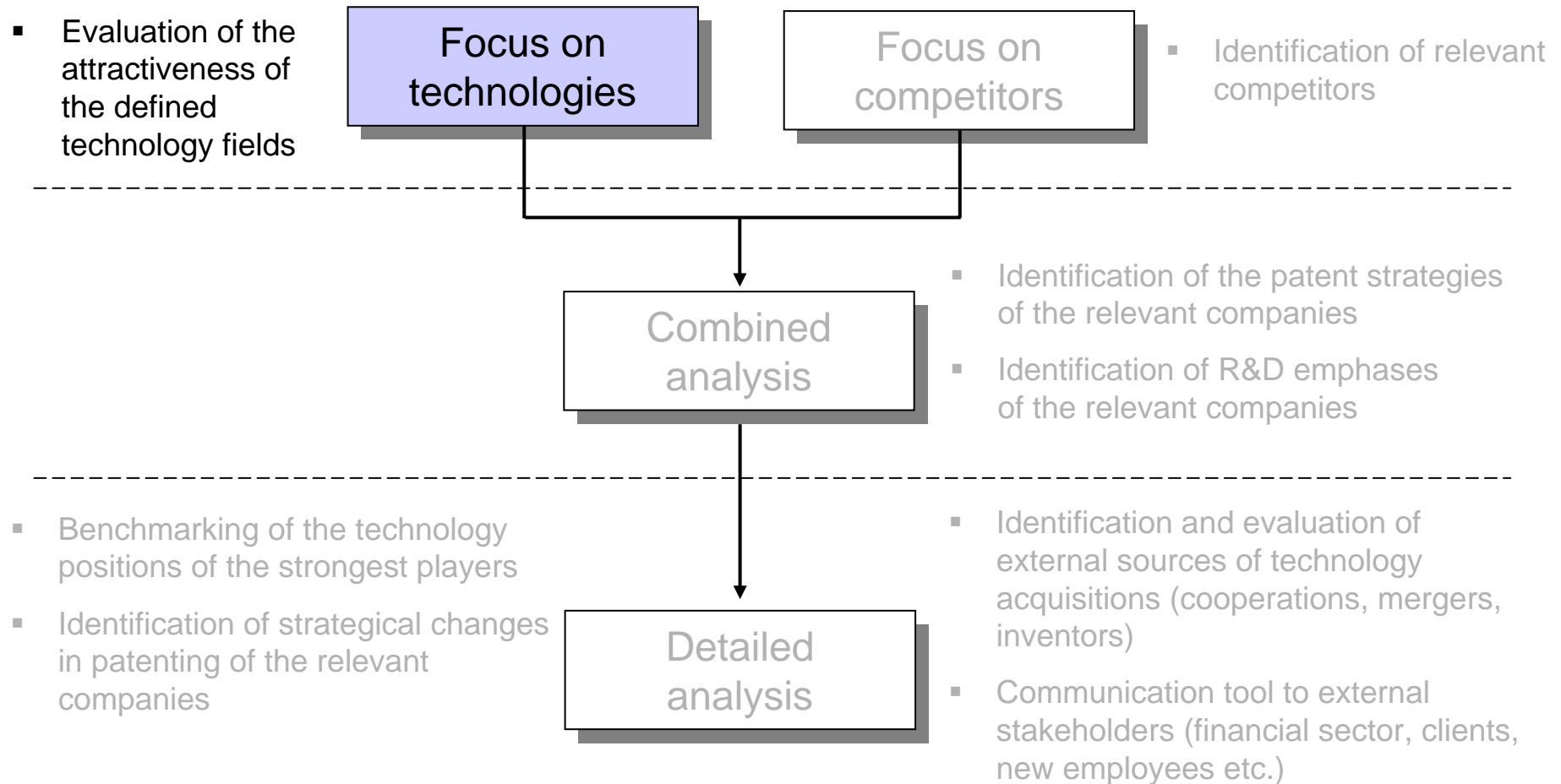
WISSPAT™ - Technology management

WISSPAT™ offers different perspectives to analyze the patent data:



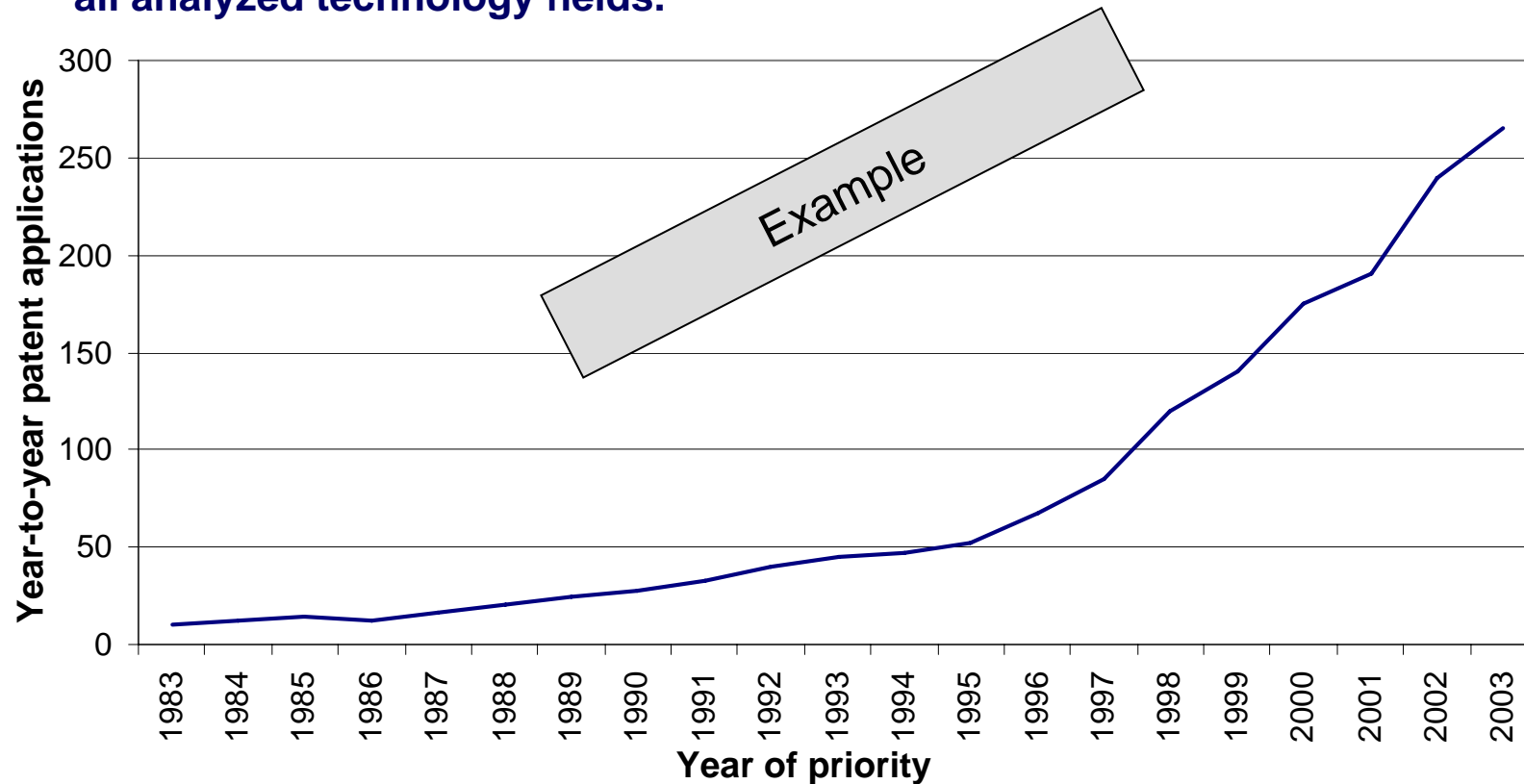
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WISSPAT™ offers different perspectives to analyze the patent data:



Overall patent applications

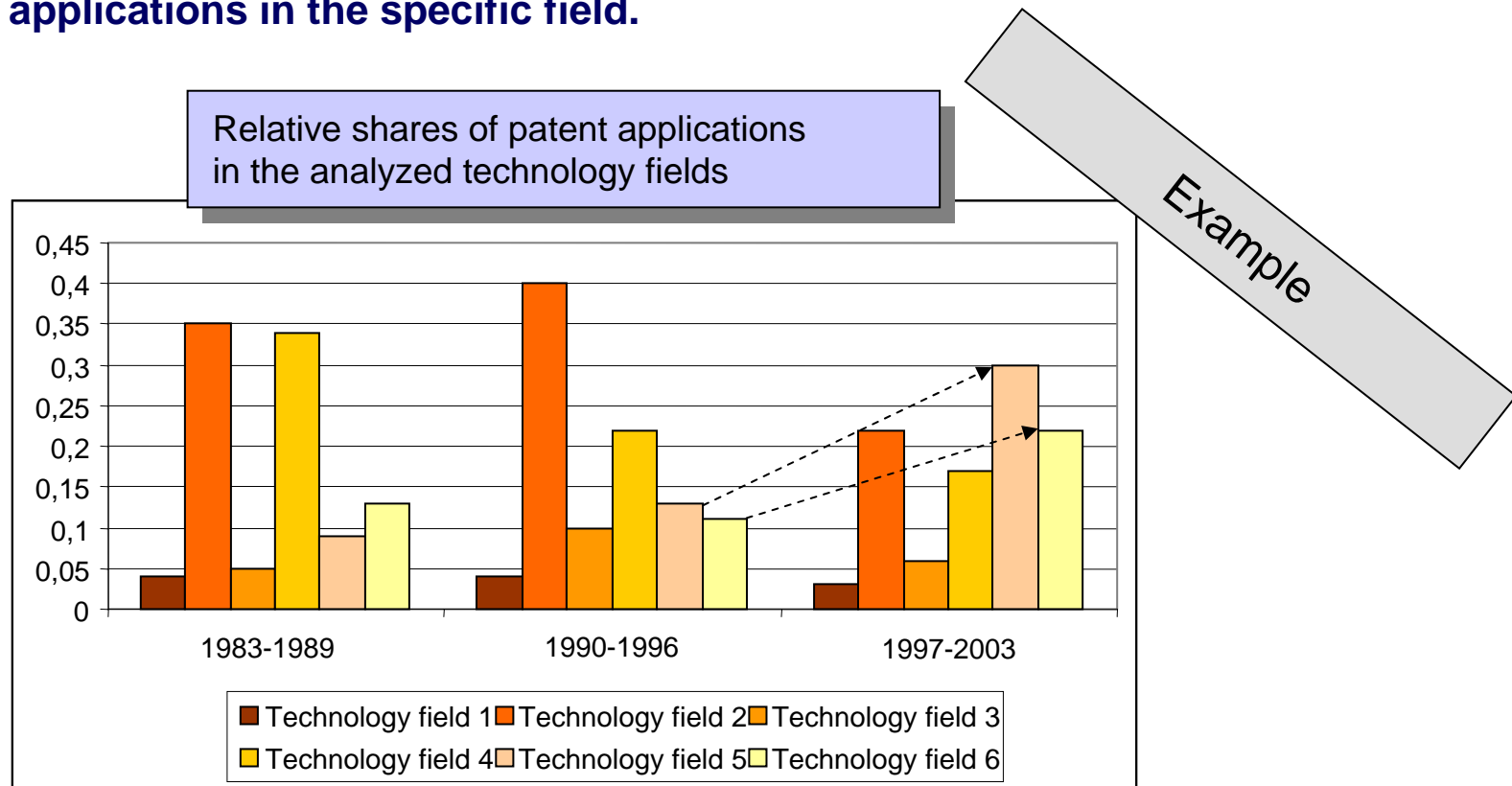
This graph displays the development of the year-to-year patent applications in all analyzed technology fields.



- Up to 1995 the number of patent applications is growing continually.
- Since 1996 the annual number of patent applications increases significantly: In 2003 there are more than five times as many patent applications as in 1995. This is an indicator for an intensified R&D in the last years.
- Patent applications for the year of priority 2004/5 are up to now not completely registered in the database. These data are not displayed.

Identification of attractive technology fields

The technology attractiveness is calculated as the relative growth rate of patent applications in the specific field.

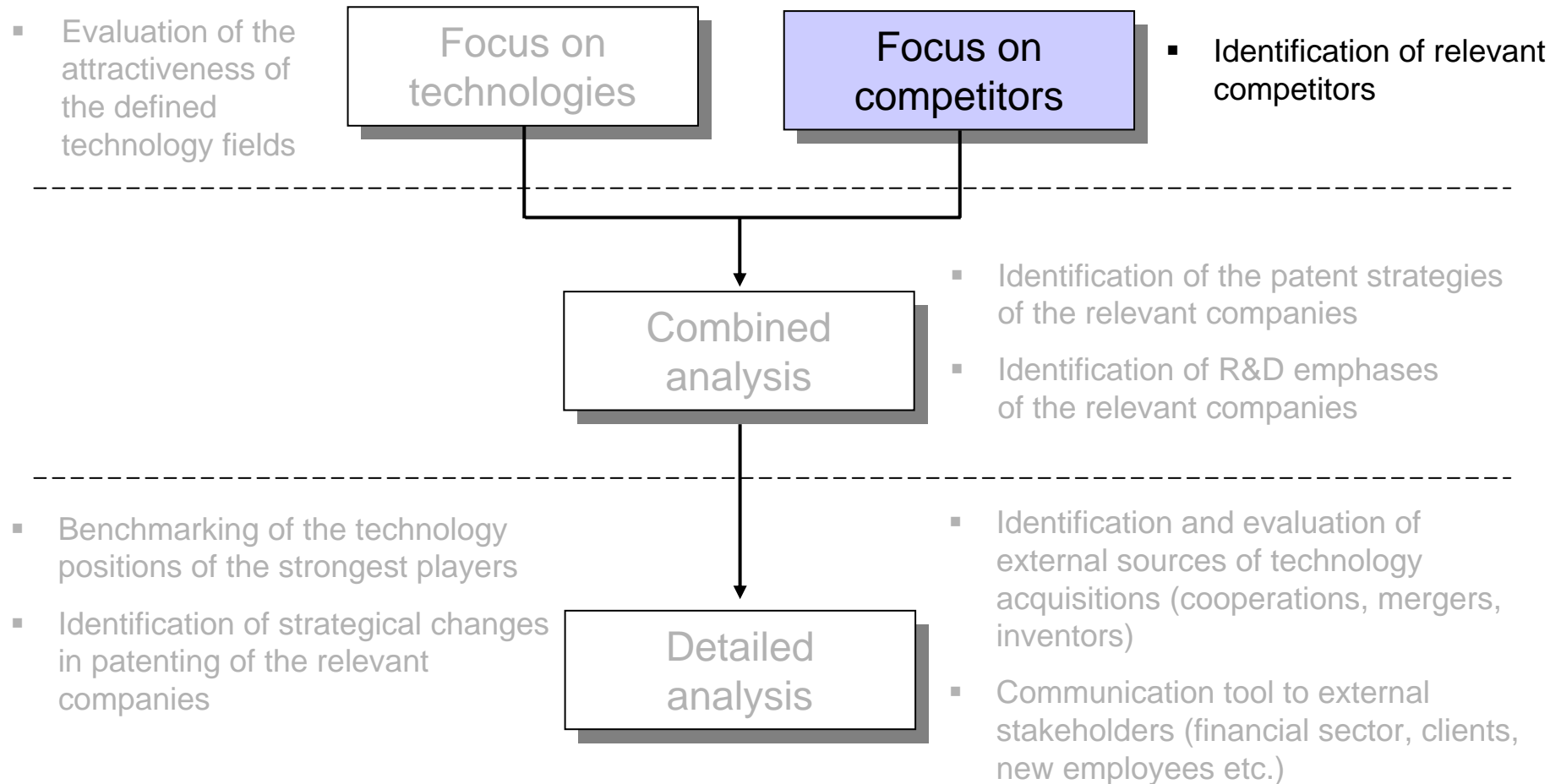


conclusion

- At present the attractiveness of the technology fields 2 and 4 is low.
- The highest attractiveness show the technology fields 5 and 6: This could be an indicator for new technological applications in these two fields.

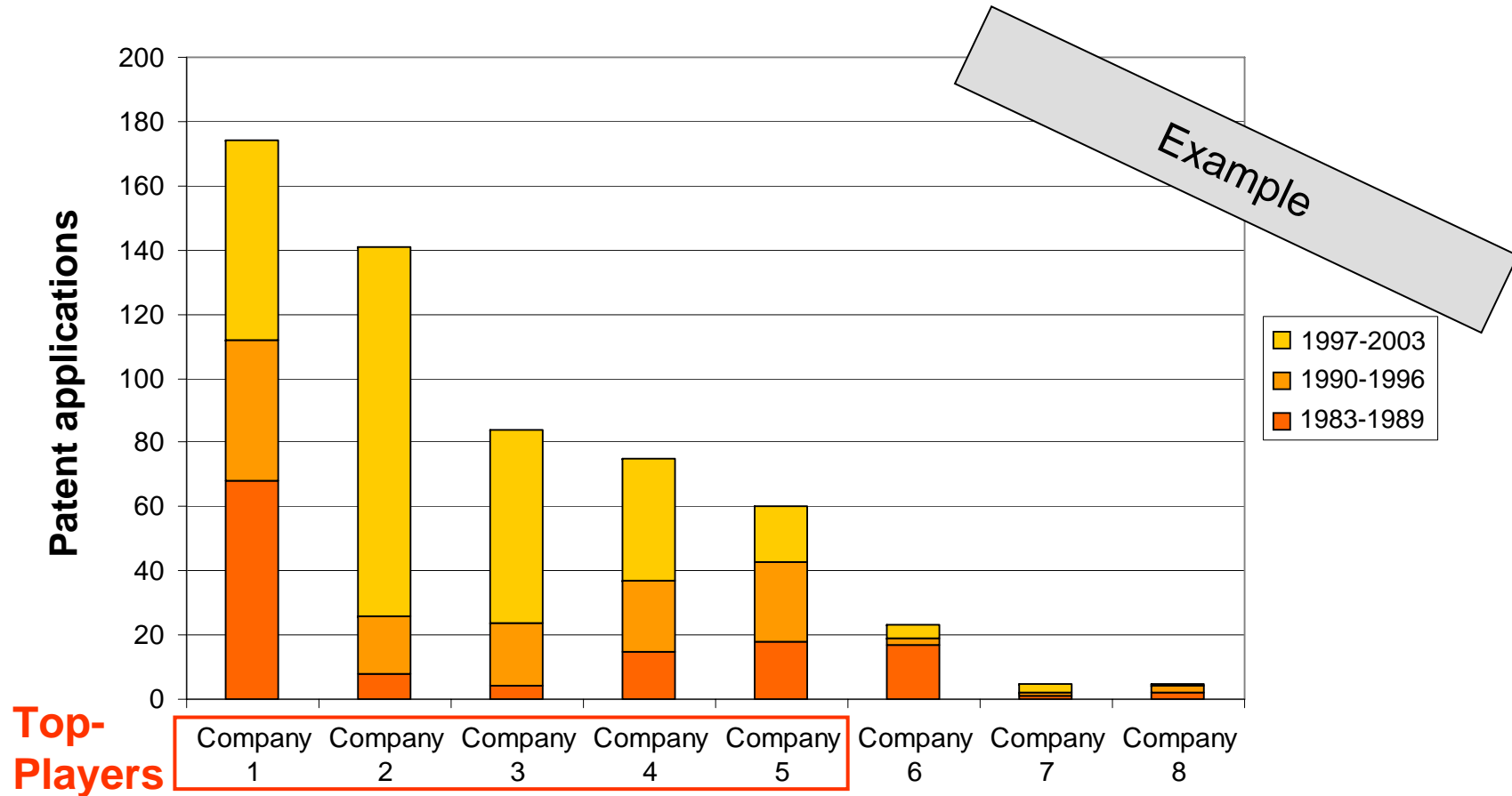
WISSPAT™ - Technology management

WISSPAT™ offers different perspectives to analyze the patent data:



Identification of dominant players

Which companies are the strongest patent applicants?



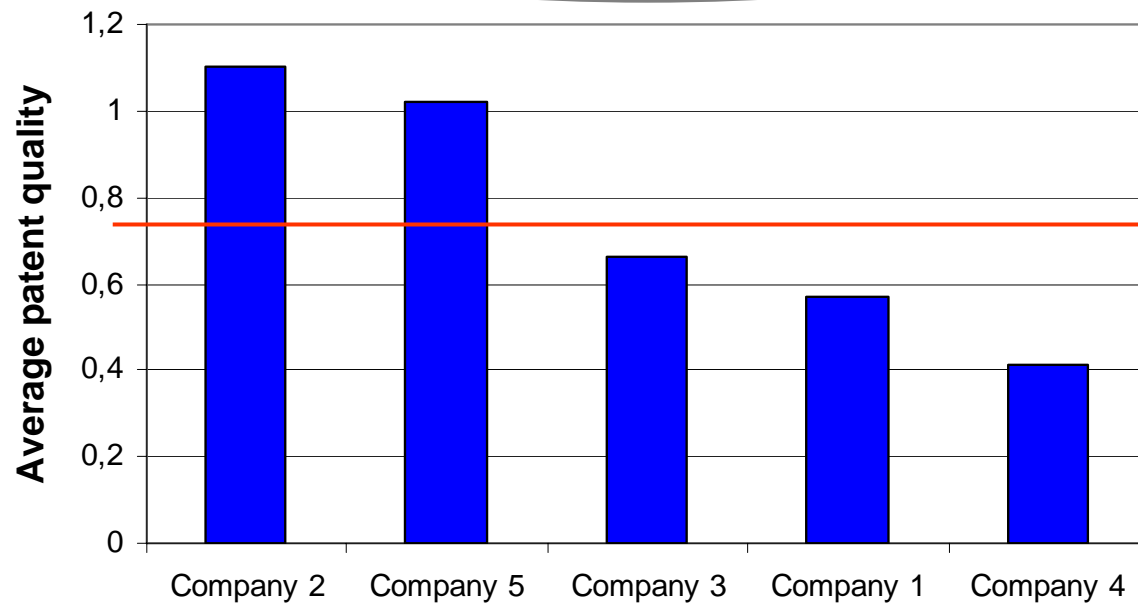
conclusion

- Company 1 is overall the most important patent applicant, but many of these patents have been applied for between 1983 and 1989.
- Since 1997 Company 2 and 3 are the most active players.
- The patents of Company 6 originate predominantly from 1983 to 1989.

Patent quality

The patent quality is calculated by the citation ratio, the ratio of granted patents, the technological and the international scope of the patent families.

Patent quality for the Top-5 companies:
Analysis for all technology fields



Example

Average patent quality for the
Top-5 Companies = 0.76

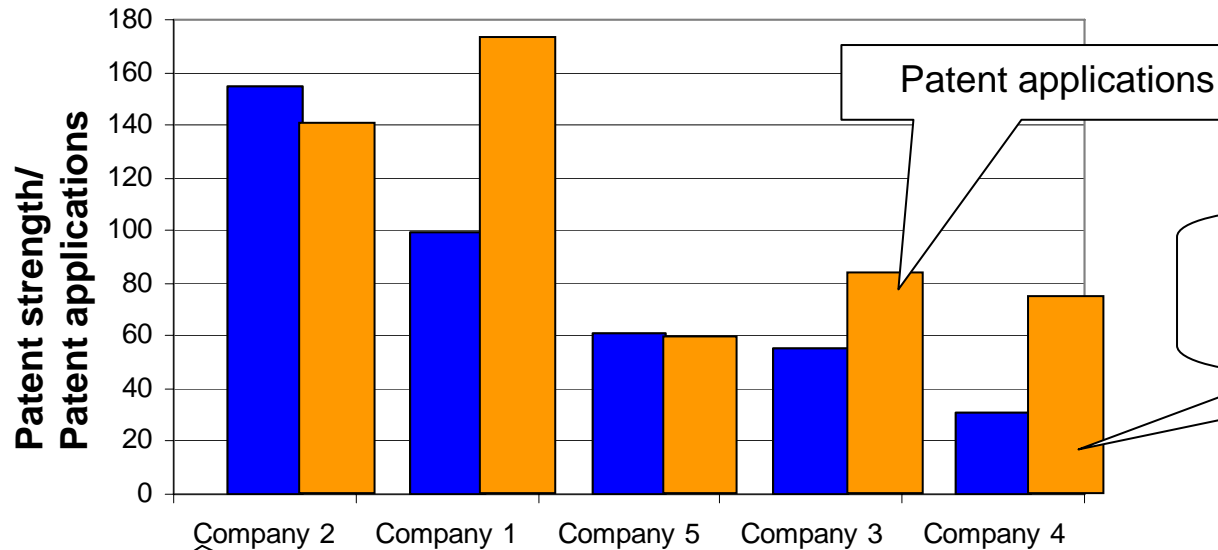
conclusion

- Company 2 and 5 have high values for the average patent quality.
- On the other hand the average patent quality of Company 4 is very low.

Patent strength

The patent strength of a company (blue) is calculated by the product of the patent applications (orange) and the average patent quality of the company.

Patent strength for the Top-5 companies



Example

Due to low average patent quality
Company 4 falls back to fifth
position in patent strength.

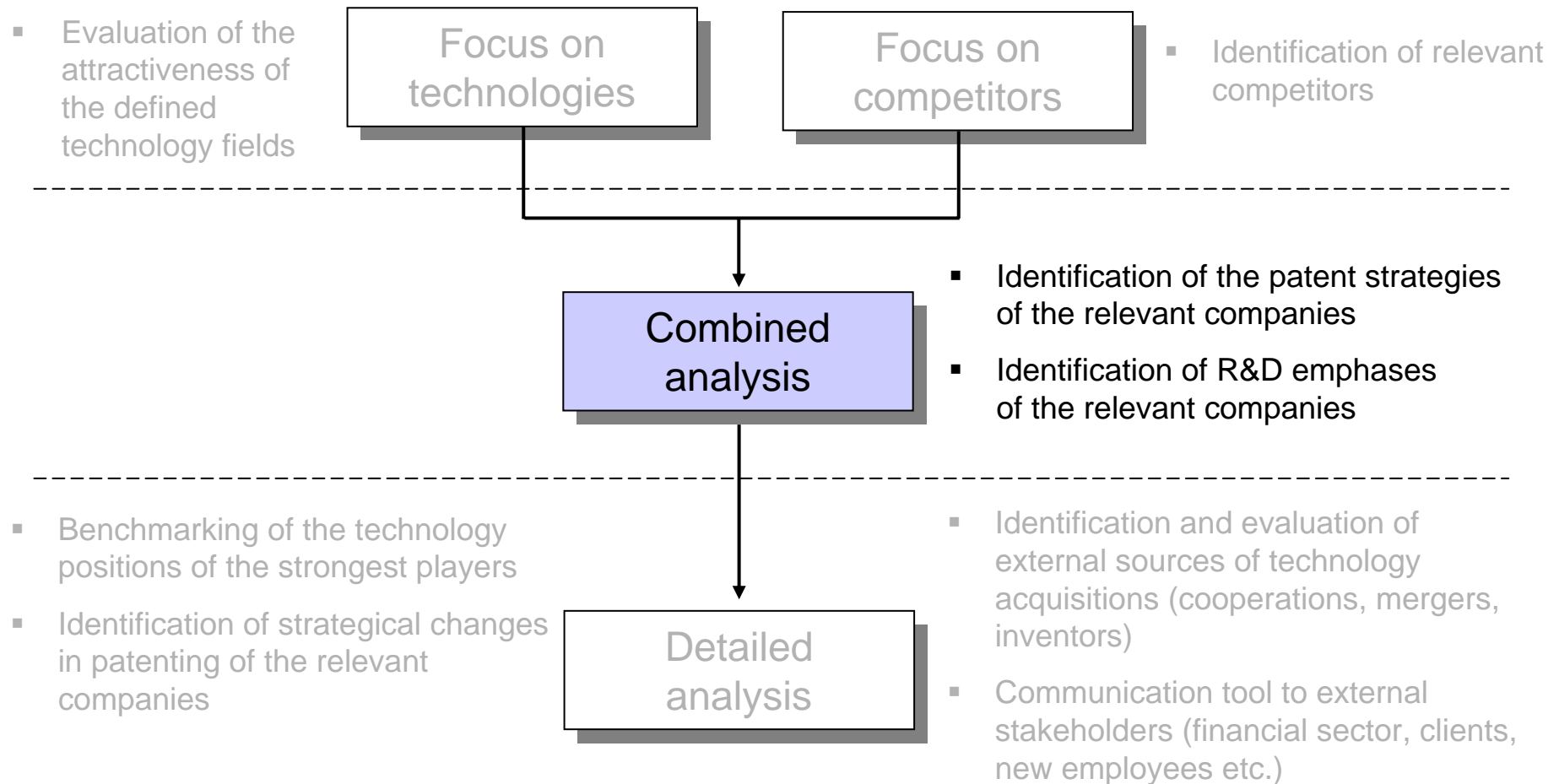
Because of a high average patent quality
Company 2 improves to first position in
patent strength.

conclusion

For the analysis of the technological strength of a company the simple count of patent applications is not sufficient! The **quality** of the company's patents plays a decisive role.

WISSPAT™ - Technology management

WISSPAT™ offers different perspectives to analyze the patent data:



Patent strategies of the Top-players

Different indicators give insight into the patent strategies of these companies.

Microsoft Excel - kennzahlen v5

WISSPAT Initialize Data Choose Options View Raw Data Development over time Analysis of Key Indicators Portfolio Analyses

C10 = 135

Example: TF 6

	A	C	D	E	F	H	I	J	K	L	M	O	P	S	T
1	Visualize Spidernet	Technology Region Period	Gesamtdaten			Benchmarking			Internationality			technology strategy		patent quality	
2			Quick Check												
3															
7															
8															
9	Company	patent applications	avg patent quality	patent strength	technology share	collaboration intensity	relative patent position (PA)	relative patent position (PS)	EP	US	JP	RD emphasis	activity profile	citation ratio	intern. Scope
10	Total	135	0,7	90	100%	6%	280%	230%	0,42	0,38	0,84	21%	1,0	0,400	0
11	Company 1	22	0,5	11	16%	0%	45%	25%	0,71	0,63	0,89	13%	0,4	0,150	0
12	Company 2	49	0,7	34	36%	5%	100%	100%	0,67	1,00	1,00	35%	1,3	0,300	0
13	Company 3	20	0,8	16	15%	0%	41%	32%	0,11	0,06	0,78	24%	1,5	0,650	0
14	Company 4	8	0,3	2	6%	0%	16%	7%	0,00	0,00	1,00	11%	0,8	0,200	0
15	Company 5	11	1,5	17	8%	9%	22%	27%	0,80	0,60	0,60	18%	1,6	0,750	0

Patent strategies of the Top-players




Different indicators give insight into the patent strategies of these companies.

The screenshot shows an Excel spreadsheet titled 'Microsoft Excel - kennzahlen v5'. The spreadsheet is divided into several sections. A callout box points to a cell containing 'Example: TF 6'. Another callout box contains the text 'The patent indicators can be visualized in spidernets.' The spreadsheet data is as follows:

Company	patent applications	activity profile	citation ratio	intern
Total	135	1,0	0,400	0
Company 1	22	0,4	0,150	0
Company 2	49	1,3	0,300	0
Company 3	20	1,5	0,650	0
Company 4	8	0,8	0,200	0
Company 5	11	1,6	0,750	0

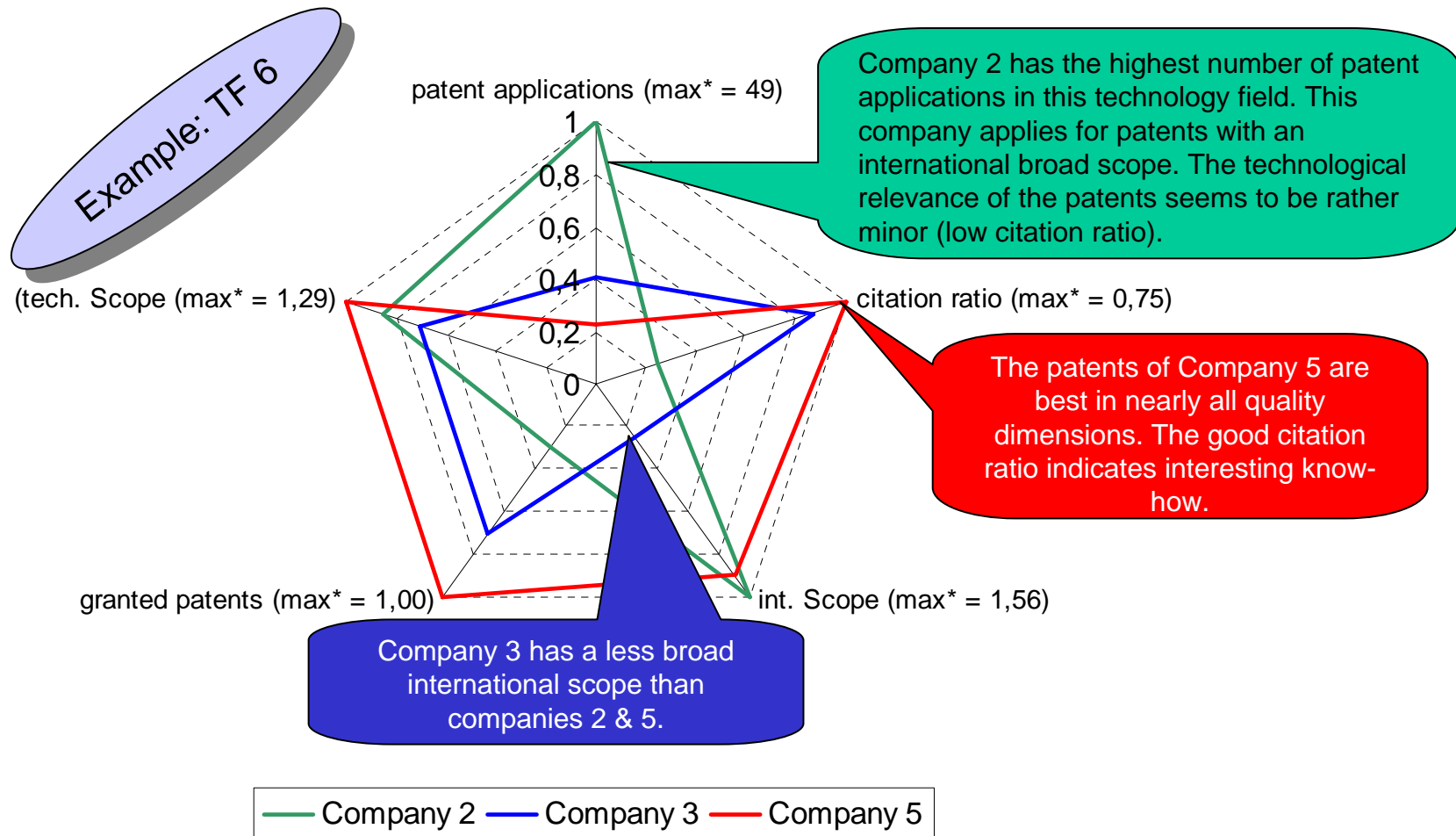
Spidernets

The patent indicators can be visualized in three different spidernets.

Quick Check: 	Internationality & Technology strategy: 	Patent Quality: 
<ul style="list-style-type: none">• Patent applications (total number of a company's patent applications)• Average patent quality (measured as an aggregated index consisting of various indicators of patent quality)• Patent strength (measured by multiplying the total number of patent applications with the average patent quality)• Technology share (measured by dividing a company's number of patent applications (in a technology field) by the number of all companies' patent applications (in a technology field))• Collaboration intensity (measured by dividing the count of collaborative partners by the total number of patent applications of the company)	<ul style="list-style-type: none">• Percentage EP patents (measured by dividing a company's number of European patent applications by the total number of a company's patent applications)• Percentage US patents (measured by dividing a company's number of US patent applications by the total number of a company's patent applications)• Percentage JP patents (measured by dividing a company's number of Japanese patent applications by the total number of a company's patent applications)• R&D emphasis (measured by dividing a company's number of patent applications in a technology field by the total number of a company's patent applications)• Activity profile (measured by dividing the technology share by the overall patent share)	<ul style="list-style-type: none">• Patent applications (total number of a company's patent applications)• Citation ratio (measured by dividing the average number of citations received by a company's patent applications by the number of citations received by an average patent application in the industry)• International scope (measured by dividing the average international scope of a company's patent applications by the international scope of an average application in the industry)• Granted patents (measured by dividing the company's average share of granted patents by the average share of granted patents in the industry)• Technological scope (measured by dividing the average number of different IPC-classes mentioned in a company's patent applications by the number of IPC-classes mentioned in an average patent application in the industry)

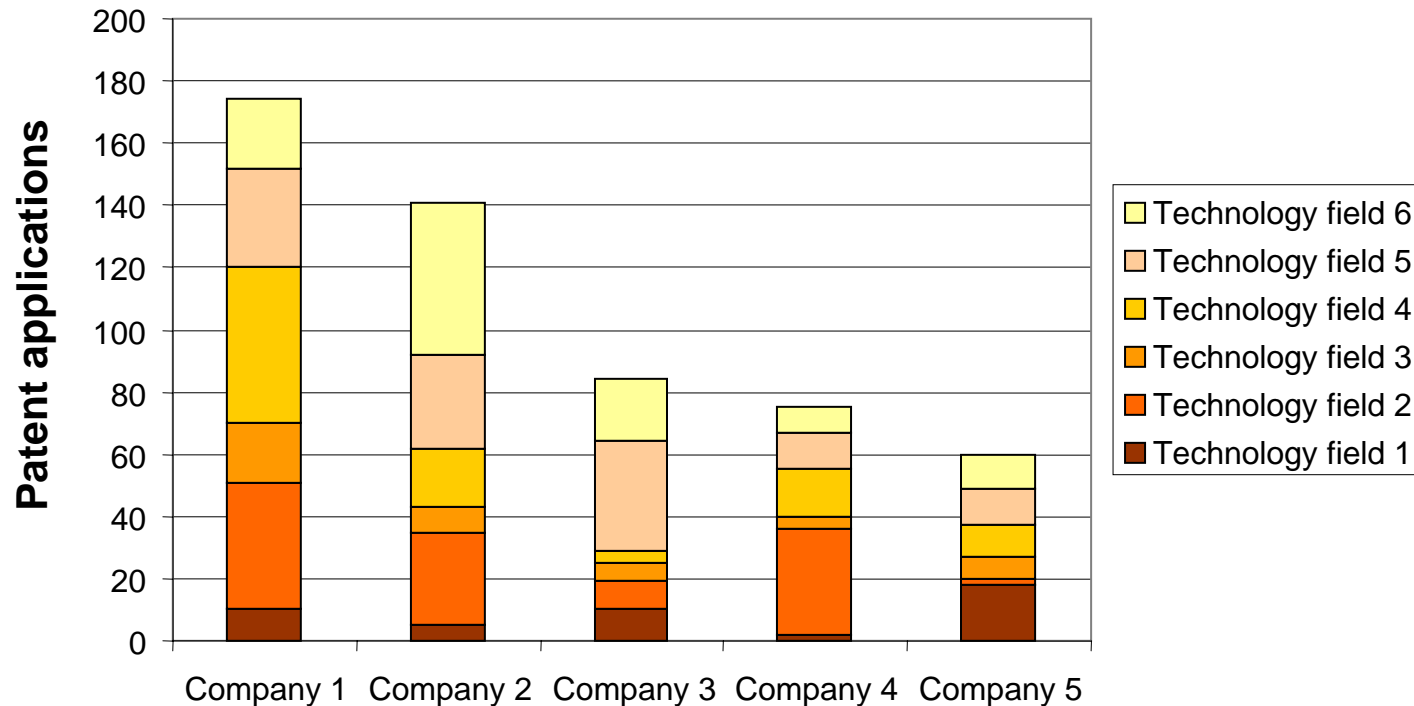
Spidernet patent quality

As an example this graph displays a „patent quality“ spidernet for three selected companies.



Technological emphases of the strongest companies

Which R&D emphases do the strongest players have?

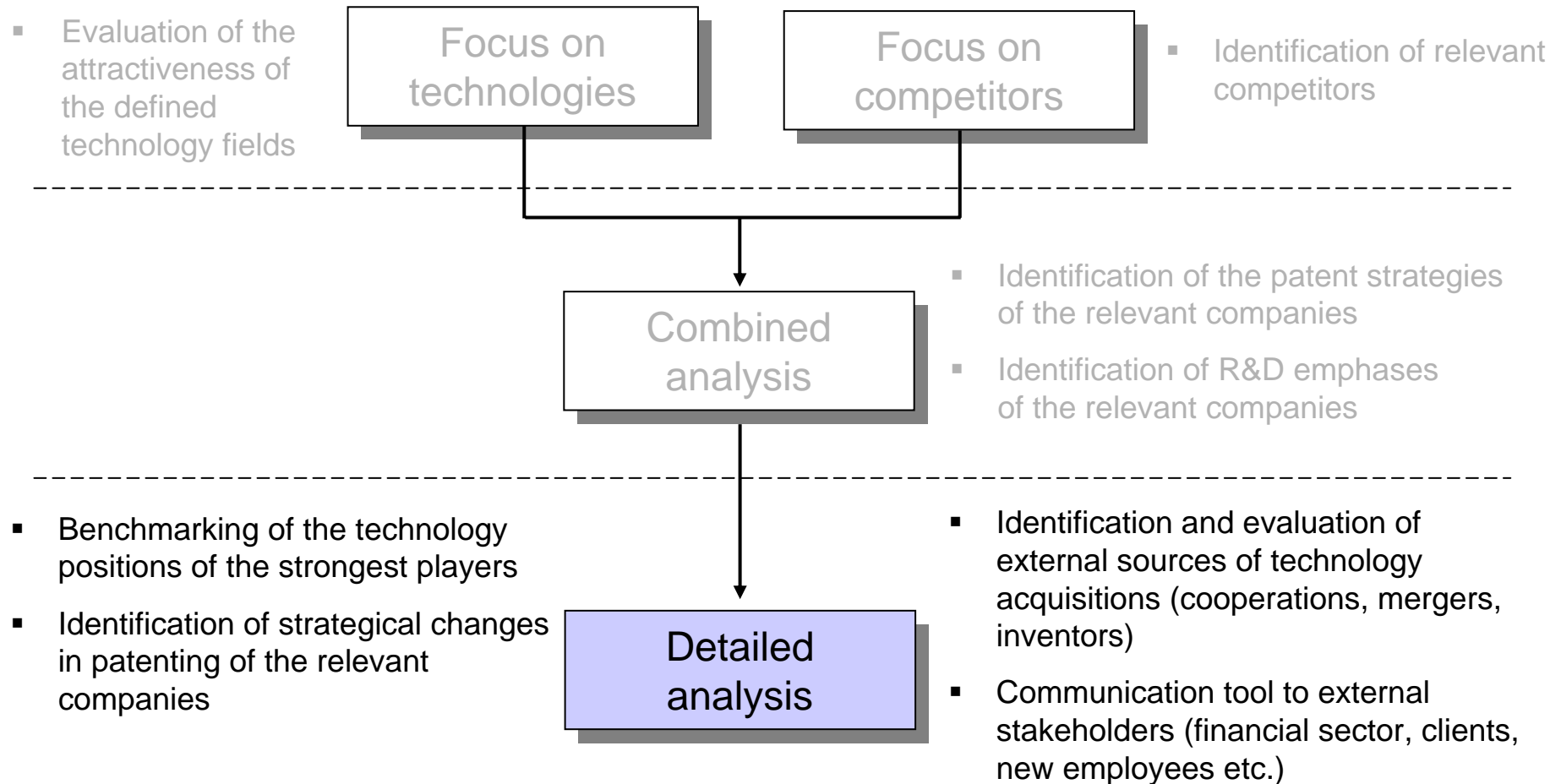


conclusion

- The Top-players are performing R&D in all analyzed technology fields.
- Company 2 has a strong focus on the technological attractive TF 6!
- Company 3 has a high patent share in the attractive TF 5 – does this company have special applications in this field?
- Company 4 has a good position in technology field 2.

WISSPAT™ - Technology management

WISSPAT™ offers different perspectives to analyze the patent data:



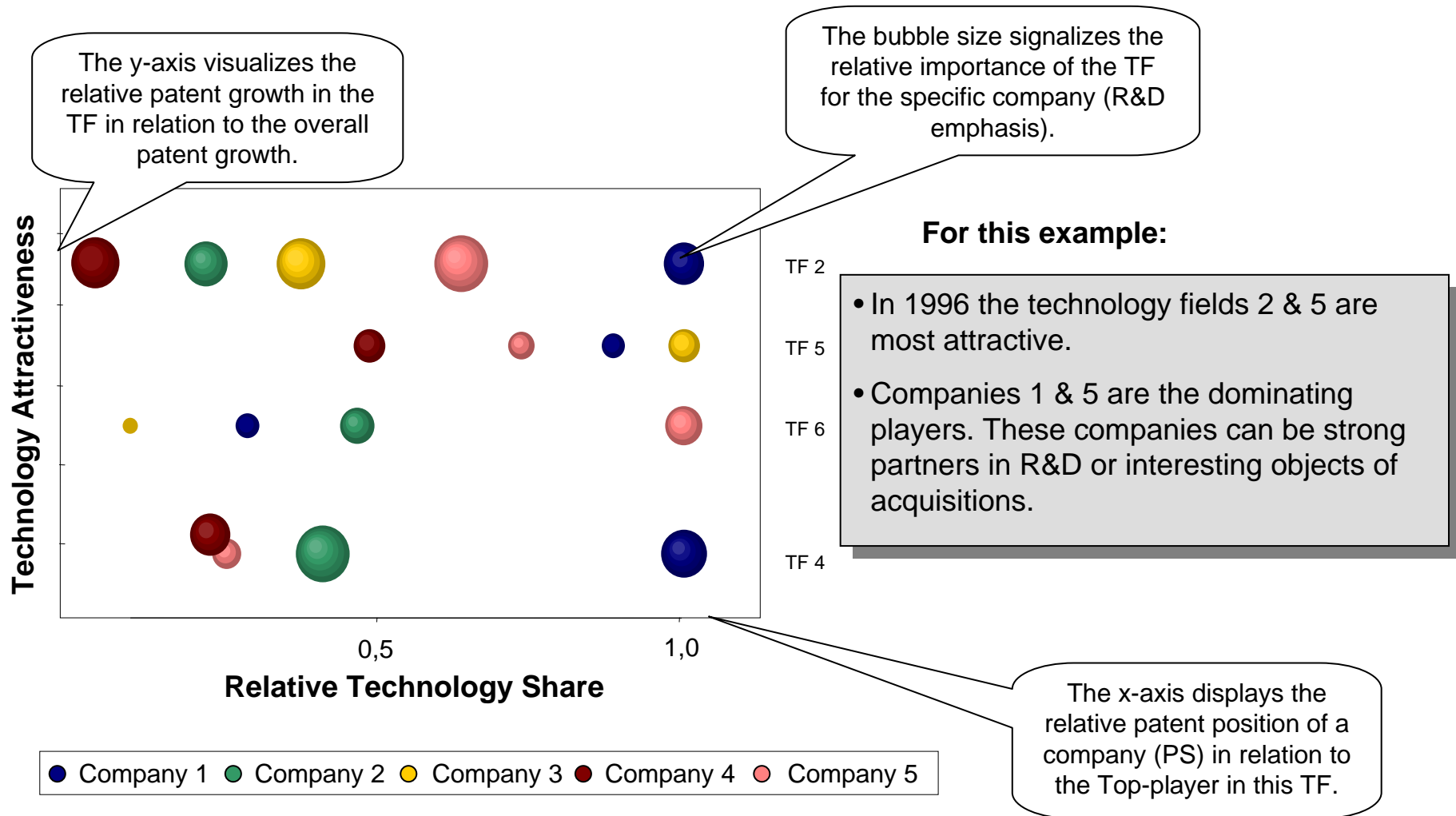
Technology portfolios

The condensed graph of patent data in technology portfolios includes three different perspectives:

1. External benchmark to the competitors
(Relative Technology Share)
2. External benchmark to the technology
(Technology Attractiveness)
3. Internal benchmark to the R&D emphases

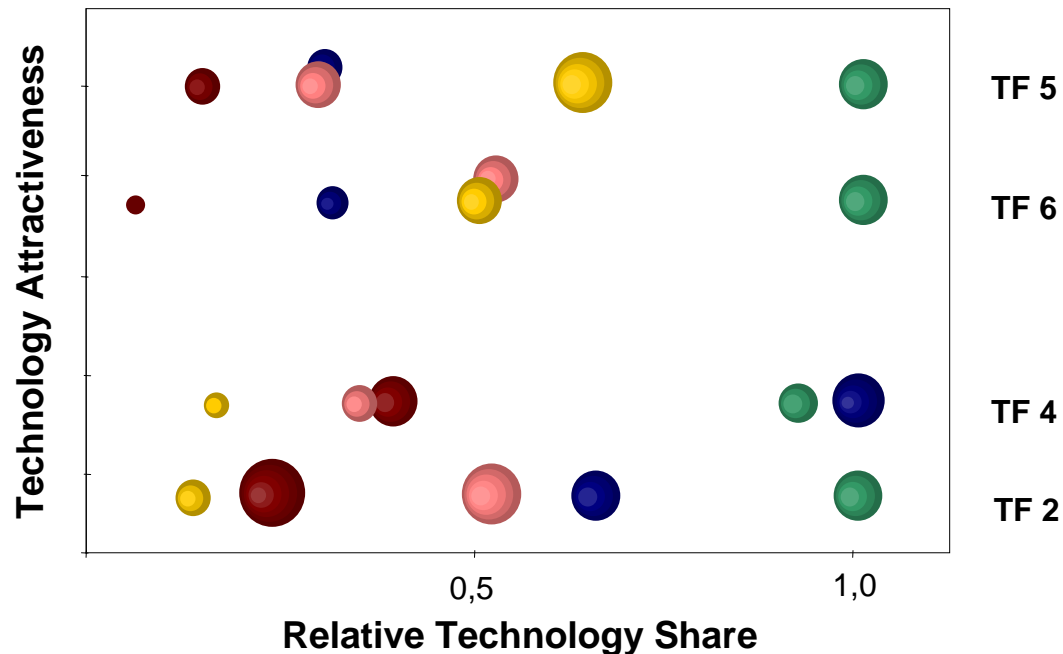
Technology portfolio

This technology portfolio summarizes the strategic positions of selected players in various technology fields in 1996.



Technology portfolio

In 2003 Company 2 has significantly improved its position in all analyzed technology fields.

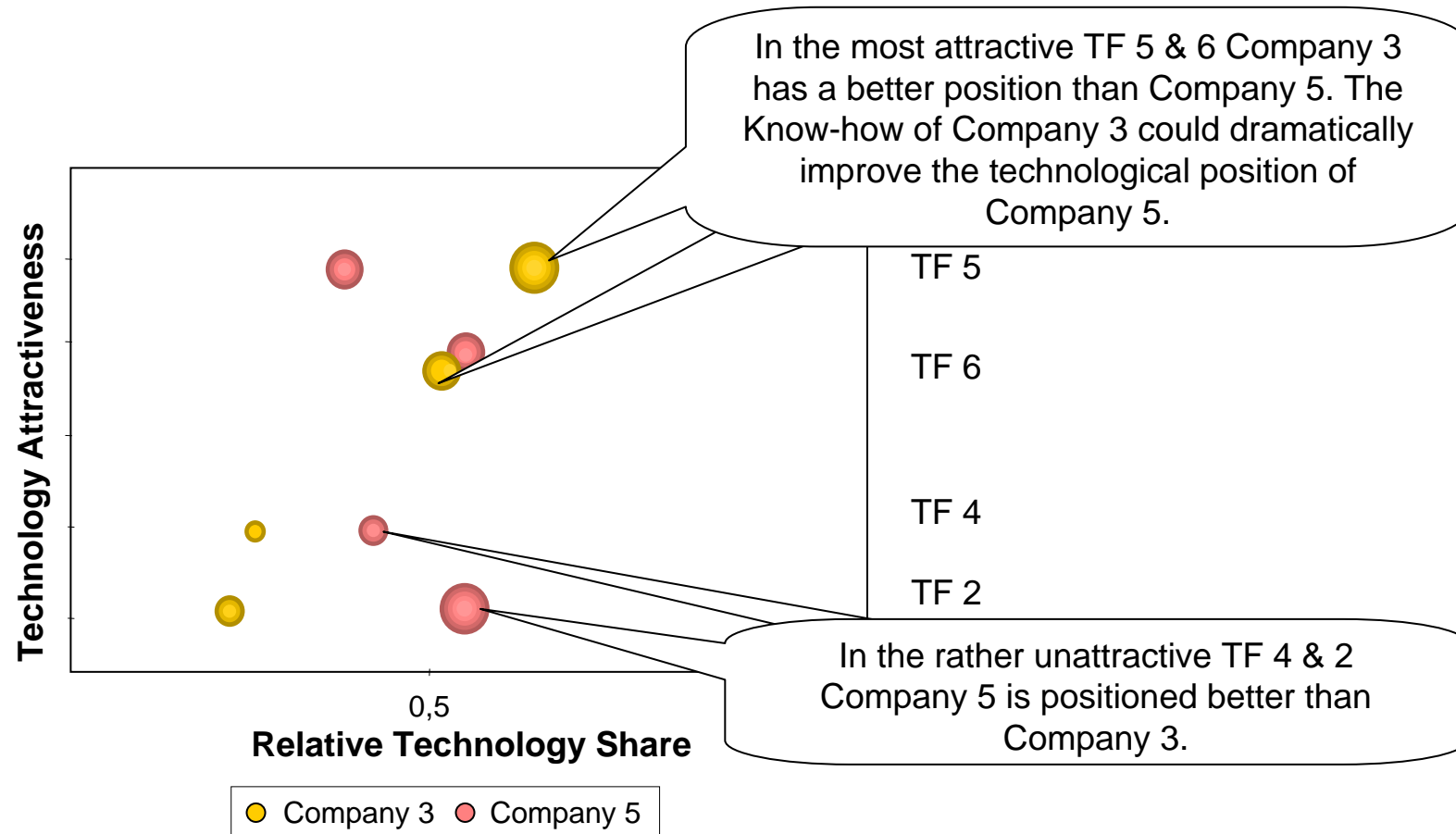


- In 2003 Company 2 is dominating in all TF – with the exception of TF 4, here Company 1 is in an equally strong position.
- Company 1 focuses on the „wrong“ technology fields – fields with low relative growth of patent applications (TF 4 & 2).
- On the other hand Company 3 emphasizes the attractive technology fields 5 & 6.

● Company 1 ● Company 2 ● Company 3 ● Company 4 ● Company 5

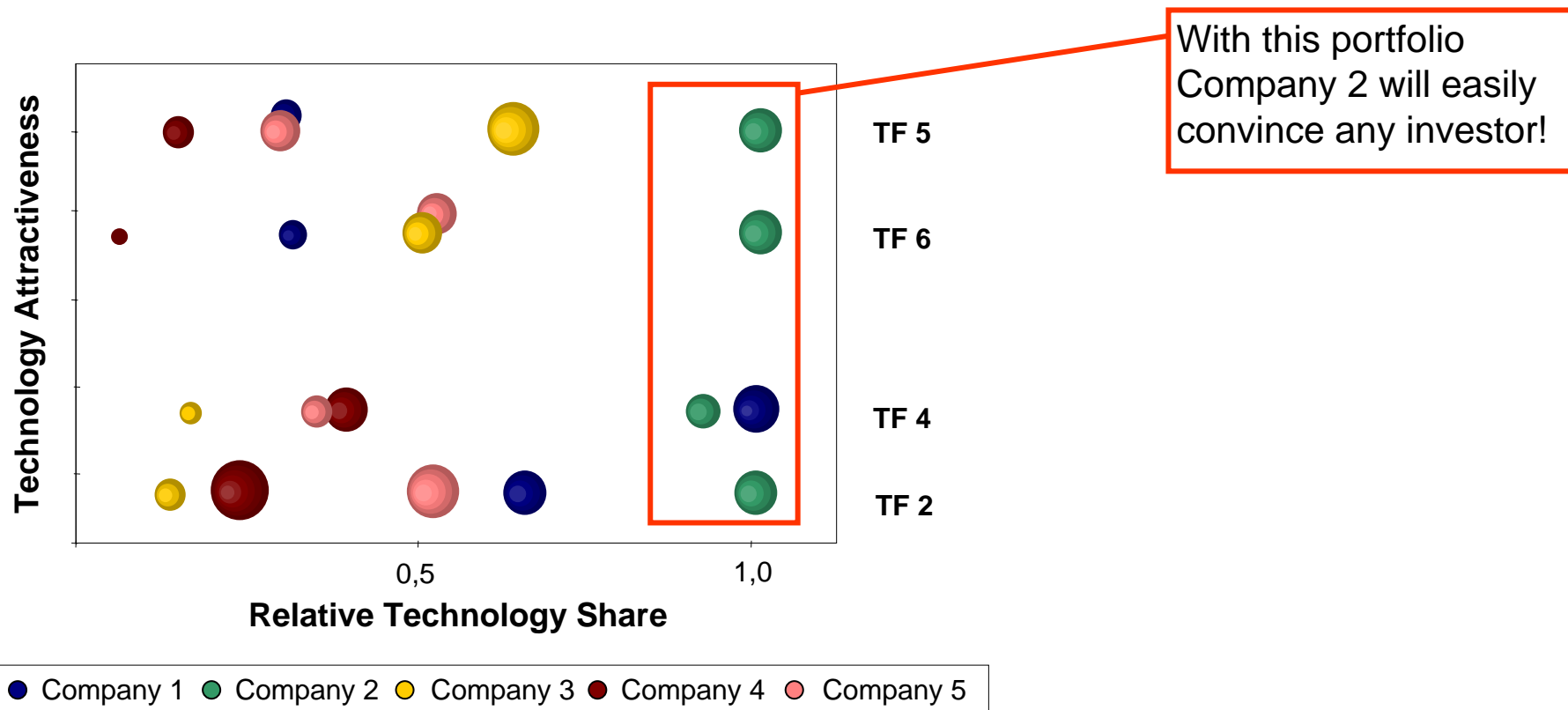
External acquisition of technology

Let us assume, Company 5 is interested in improving its position in this area of technology: As displayed in the technology portfolio, Company 3 is an excellent partner for a strategic alliance.



External communication of technological know-how

A technology portfolio is an excellent marketing tool for the external communication of your company's technological knowledge.



What is unique about WISSPAT™?

- WISSPAT™-based consulting projects are focussed on strategic aspects of technology management.
- It's much more than the bare counting of patent applications: Each patent family is analyzed in view of the international and technological scope, the legal status and the citation ratio*.
- It's specific: The database, the technology fields and rules for assigning patents to these TF can individually be defined.
- It's flexible: The procedure is modular and adjustable to the defined objectives of the technology study.
- It's quick: Projects can be carried out in just a few weeks.
- It's efficient: The value/cost ratio is excellent.
- It is not a black box – you see in detail what we do!
- It offers a lot more: At the end of the project you receive a patent database that allows to answer additional strategic questions quickly by yourself.

* Scientific studies show that the quality weighted patent strength of companies correlates significantly with the company performance.

References

Some of our clients are:

MERCK

degussa.

cognis

SIEMENS



B/S/H/



Thank you for your interest!

Selected Publications

Ernst, H. (1997), The Use of Patent Data for Technological Forecasting: The Diffusion of CNC-Technology in the Machine Tool Industry, in: *Small Business Economics*, Vol. 9, No. 4, 1997, pp. 361-381.

Ernst, H. (1998), Patent Portfolios for Strategic R&D Planning, in: *Journal of Engineering and Technology Management*, 1998, Vol. 15, No. 4, pp. 279-308.

Ernst, H., Leptien, C., Vitt, J. (2000), Inventors are not alike: The Distribution of Patenting Output among Industrial R&D Personnel, in: *IEEE Transactions on Engineering Management*, Vol. 47, No. 2, 2000, pp184-199.

Ernst, H., Vitt, J. (2000), The Influence of Corporate Acquisitions on the Behaviour of Key Inventors, in: *R&D Management*, Vol. 30, No. 2, 2000, pp105-119.

Ernst, H. (2001), Patent Applications and Subsequent Changes of Performance: Evidence from Time-Series Cross-Section Analyses on the Firm Level, in: *Research Policy*, Vol. 30, No. 1, 2001, pp. 143-157.

Ernst, H., Soll, J.H. (2003), An Integrated Portfolio Approach to Support Market-Oriented R&D Planning, in: *International Journal of Technology Management*, Vol. 26, Nos. 5/6, pp. 540-560.

Ernst, H. (2003), Patent Information for Strategic Technology Management, in: *World Patent Information*, Vol. 25, Issue 3 , pp. 233-242.

Selected Publications

Ernst, H., Fabry, B., Soll, J.H. (2004), Enhancing Market-Oriented R&D Planning by Integrated market and Patent Portfolios, in: *Journal of Business Chemistry*, Vol. 1, Iss. 1, pp. 2-13.

Ernst, H., Conley, J.G., Omland, N. (2006), Antecedents of Patent Management Proficiency and its Impact on Firm Performance, Working Paper, Vallendar/Evanston.

Ernst, H., Conley, J.G., Omland, N. (2006), Patent Strategies and their Impact on Value Creation: A Contingency Approach, Working Paper, Vallendar/Evanston.

Fabry, B., Ernst, H., Langholz, J., Kösters, M. (2006), Patent Portfolio Analysis as a Useful Tool for Identifying R&D and Business Opportunities – An Empirical Application in the Nutrition and Health Industry, in: *World Patent Information*, Vol. 28, pp. 215-225.

Contact Information

Prof. Dr. Holger Ernst

Lehrstuhl für Betriebswirtschaftslehre, insb.
Technologie- und Innovationsmanagement
Wissenschaftliche Hochschule für
Unternehmensführung (WHU)
Burgplatz 2
D-56179 Vallendar
Tel.: ++ 49 (0)261-6509-241
Fax: ++ 49 (0) 261-6509-249
E-Mail: hernst@whu.edu
Internet: www.whu.edu