# Technology Transfer and Technological Learning through CERN's procurement activity

**Based on a study from Autio E., Bianchi-Streit M., Hameri A.-P.**
**CERN-2003-005**

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Global Watch Mission CERN 28-30 June 2004

# Economic Impact of Big-Science Research

## BACKGROUND STUDIES

- **Every 1 CHF invested in international research organizations' procurement budgets generates 3 –3,5 CHF when used to buy high-technology supplies from their industries**

**(CERN (Schmied 1975; Bianchi-Streit et al. 1984); ESA (Brendle et al. 1980; Bach et al. 1988))**

**CERN Study: Estimated Utility generated by 1987 from purchases (1973 to 1982) was equivalent to 60% of the Organization cost .**

**Estimated effects on company turnover related to CERN were based on new products, commercialization, R&D, production and management techniques improvements and quality.**

**For Electronics, optics and Information technologies Utility/Sales ratio = 4.2**

# Object of the Study

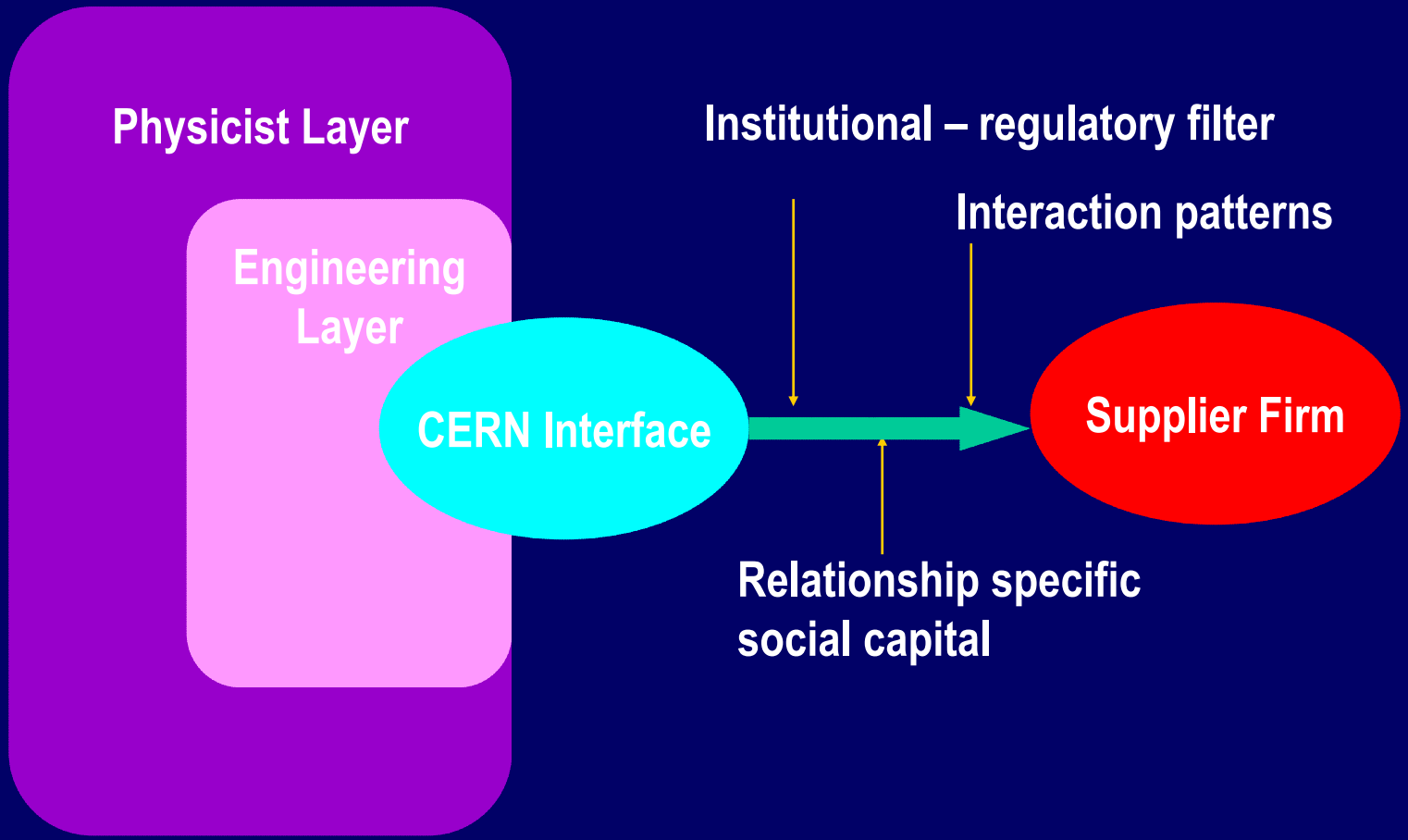
LHC: Budget ~3 milliards CHF Accelerator + 1.5 milliards CHF detectors
(20% from CERN) About 16 years from conception to operation.

## CERN LHC Procurements

Often very demanding technological specifications
Significant challenges (Magnets,Vacuum,IT, Detectors)

- How big is the learning ?
- How the Big Science environment contribute to it?
- What influences the learning?
- Organizational outcomes;
- Performances outcomes;
- Market learning;
- Social capital and cognitive diversity in the relationship.

# Theoretical Model



# Method and Sample

CERN purchases from 1997 to 2001

- Altogether 6 806 suppliers for a total procurements of 2 132 MCHF
- Analyzed the list to select companies (high-technology or non standard products)
- Companies with total orders less than 25 kCHF discarded
- 629 Companies selected (9%) representing 1 197 MCHF in procurement budget (56% of the total budget)
- 154 Companies fo a total of 178 projects (~30%), no evidence of bias within the group of respondents

Survey questionnaire: six languages, 22 countries

# Technological and Economic Impact

- As many as 38% reported having developed new products as a direct result of the supplier project
  - 13% started new R&D teams because of the CERN project
  - 14% started a new business unit
  - 17% opened a new market
  - 42% increased their international exposure
  - 44% indicated technological learning
  - 36% indicated market learning
  - 52% would have had poorer sales performance without CERN
  - 41% would have had poorer technological performance

# Technological Learners...

- Are younger (mean difference 14 years*)
- Have longer projects (m.d. 10 months*)
- Did experience change in project specifications*
- Interacted with CERN more frequently during the project***
- Developed more relational social capital in the relationship*
- Had a greater number of previous projects with CERN*
- Had a more R&D intensive project**

* p < 0,05; ** p < 0,01; *** p < 0,001; 2-tailed significances

# Associations

- Technological uncertainty - with market learning and commercial competences development
- The number of new product - with suppliers previous experience with CERN, technological and market novelty and project flexibility
- Company investment in CERN relationship- all type of relationship outcomes
- Structural social capital and relational social capital are determinats of relationship outcomes
- Relational social capital (trust, personal contacts, liking, reciprocity in relationship) and cognitive social capital (shared language and vision) – high strategic outcomes

# Others important factors in the relationship

- Absence of opportunism
- Balance of power
- High cognitive diversity

# Conclusions

The technological learning impact was significant

- Respondent companies have developed 183 new products

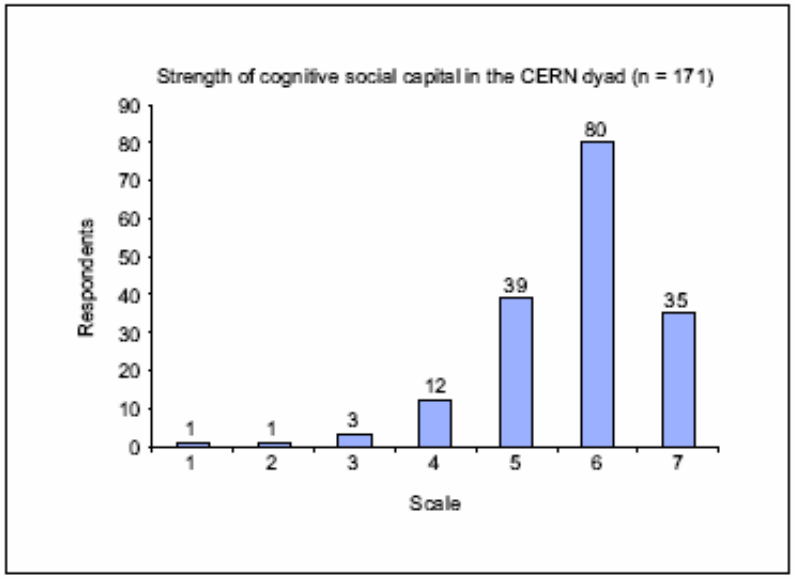



Fig. 37 Cognitive social capital built into the relationship

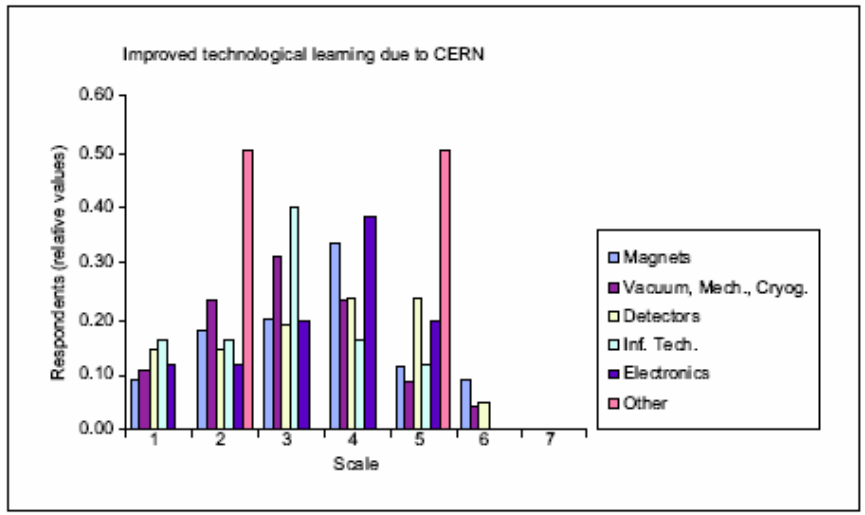



Fig. I.4 Technology learning due to CERN project/procurement per technology domain

# Recommendations for High-tec Projects

- Consider building on established supplier relationships
- Consider coordinating these projects in a way to maximize knowledge exchanges
- Develop partnership or Consortia mode of collaboration

**to be adressed also:**

- Upstream collaborations (pre-project phase)

VALUED BY COMPANY

- Importance of Knowledge Transfer and Knowledge Management both from procurements and TT conventional activities