



Hierarchy, Network and Market: Governance of Collaborative Innovation in Chinese Hi-Tech Companies

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Overall project background

- Project title: "Entrepreneurial Capacity to Exploit Opportunities, New Product Development and Firm Performance: A Comparative Study of UK and Chinese High-Tech Firms" (March 2008-Feb 2010)
- Rationale:
 - to understand how UK high-tech firms can enhance their capability of identifying technological and business opportunities and improve new product success rate either single-handedly or through international collaboration;
 - to investigate what UK and Chinese high-tech firms can learn from each other and what the potential for collaborative innovation lies.
- Economic and Social Research Council, UK
- Research team

Objectives of this paper

- A dynamic view to study Chinese high-tech firms' choices of collaborative networks in the innovation process.
- Initial findings of qualitative data from an exploratory case study of four Chinese high-tech companies (pharmaceutical and medical devices industries)
- Ongoing case study data collection

Theoretical background: hierarchy, market and network

- Transaction cost theory
- Resource based view
- Network theory

Theoretical background: transaction cost theory

- Williamson (1975), hybrid (network) forms of organization provide alternative governing structures as opposed to market and hierarchy,
- **hierarchy** (in-house R&D): high governance costs
arms-length **market** relationship (purchase of patents): uncertainty
- **Network** (Equity JV, licensing or franchising): combined strengths effectiveness and efficiency of governance cost
access to tacit knowledge

Static view: the network diversity ?
high-tech companies in innovation process ?

Theoretical background: resource-based view

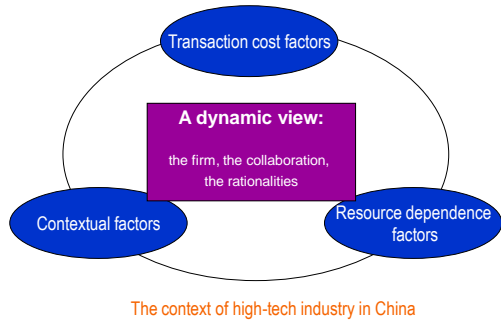
- Networks as the outcome of firms' search for resources that are **not perfectly mobile or imitable** in order to generate competitive advantage (Barney, 1991)
- Firms cannot access critical skills by purchasing, as these resources are largely **know-how based**, and often **not tradable**
- **Competition** may forever alienate firms from these scarce resources

The rationales of choice of different forms of network in different phases of innovation process?

Theoretical background: network theory

- Complementary and supplementary resources engender **interdependency** between the partners in a network relationship
 - Five forms of network:** Powell (1990)
tacit knowledge based network (e.g. craft industry), project based network (e.g. film and recording industries), industrial district, strategic alliance and partnership, and vertical dis-aggregation.
 - Child and Faulkner (2005): **five types** of network: equal-partner networks, unilateral agreements, dominated network, virtual corporation and strategic alliance.
- Explain different forms of network in terms of power
- The economic efficiency that various forms of network may offer, a key feature of network that is widely acknowledged?

The research framework



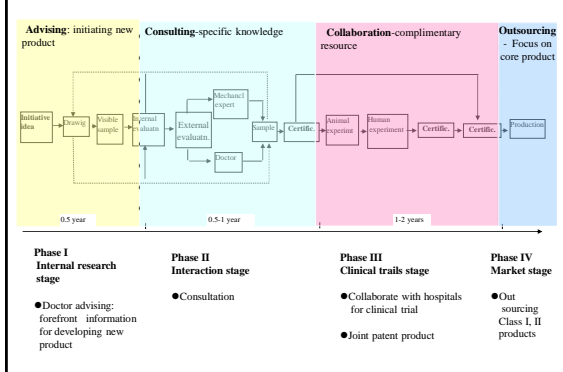
Methods

- Four case study companies
- Two to six semi-structured interviews with senior managers in the top management team or managers of the new product development/business development team
- Qualitative data
- Content analysis: the firm, the collaboration, the rationalities

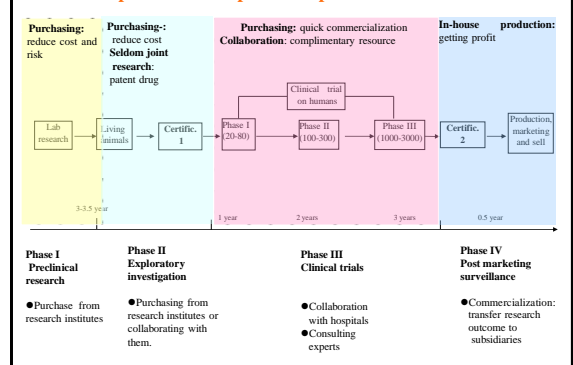
Case study companies

	Pharma	Diagno	MediSpinal	MediJoint
Industry	Pharma (development & manufacturing of drugs)	Pharma (development of diagnosis & treatment)	Class III medical devices (internal & external spinal fixture)	Class III medical devices (joints)
Year of incorporation	1938	1994	1996	1998
Ownership	Publicly listed company with 50% state ownership	Independent, private	Independent, private	Independent, private
Employees (2008)	10,500 (300 in the Research Centre)	50 (9-10 in R&D)	150 (20 in R&D)	50 (3-4 in R&D)
Sales turnover (2008)	RMB¥4.6 billion in 2007	RMB¥20 million	RMB¥30 million	RMB¥10 million
R&D intensity	3-4%	50%	10%	25-28%
R&D staff ratio	3%	20%	13%	6%

New product development in medical devices firms (China)



New product development in pharmaceutical firms



Key forms of network

- Loose friendship network
- Collaborative partner network
- Lead-operator network

Rationales 1

- **Loose friendship network:** phase I & II
 - Medical devices: I: friends of founders-initiating new products
 - II: friends of founders in mechanical and medical field-evaluating prototype of new products
 - Pharmaceutical: I&II: key source of entries in deciding the purchasing of semi-finished research outcomes
- Rationales:
 - Trust:** defuses uncertainty and risk, trust reduces transaction costs by 'replacing contracts with handshakes' (Adler, 2001)
- Complements the firms' resources:** eg. C3 founder-mechanical, friend-medical

Rationales 2

- **Collaborative partner network:** phase II & III
 - A new product is proceeding to **clinical trials** stage in both industries. Firms in both industries cooperate closely with **hospitals** (some times co-owner of patent product)
- Rationales:
 - Resource dependency
 - Regulation: certificate
 - Disadvantage: protection of research

Rationales 3

- **Lead-operator network:** phase IV
 - part of class I and II products manufacturing are **out sourced** to sub-contractors: do not fall in firms' strengths, or require extra investment in specific equipments, or bring out pollutions
- Rationales:
 - help firms **concentrate** on research and core production;
 - speed up** the commercialization process;
 - reduce** the manufacturing cost;
 - control and allocate** the resources at the best place.

Market and hierarchy

- **Pharmaceutical:**
 - Market:** phase II or III
 - purchase Certificate 1 (licenses) or semi-research outcomes, continue the rest of research until a new drug is proved effective and legal for the sale.
 - rationales: shorten the research process; speed up the product commercialization; mitigate the high failure rate of new drug research.
 - Hierarchy:** transfers all the research outcomes to their own subsidies for production,
- **Medical device**
 - Market:** purchase part of class I or II products
 - Hierarchy:** in-house research for patent products and keep core part of class I and II, and whole production of class III within their hierarchy structure.
 - rationales: void leaking secret information; strengthen competitive advantage.

Collaborative innovation: dynamic choice

