Distributed Problem-Solving Organizations and the Evolution of Open Innovation Strategies: A Quick Tour around the Whole Elephant

By

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“Three Questions to Ponder…” {This session’s organizers are problem-holders who pose challenges, but not rewards! }

Q1: What are the unique characteristics that define OSCS?

• At this stage, what Open Source Corporate Strategy isn’t is much clearer than what it is.

‘OSCS’ is a metaphorical allusion to “FLOSS-like” strategies of R&D management, that diverge from the model of a centrally managed, closed, proprietary corporate lab that is run as an integral component of the firm’s innovation processes.

• Saliently divergent management practices associated with the “OSCS” idea:
  o organized the use of distributed knowledge and information resources provided by external agents without contractual relationships to the firm
  
  o disclosing specific information about the firm’s innovation-goals and capabilities, and allowing “outsiders” freely to access information about its products or practices —rather than retaining exclusive control of the latter (as secrets or IP) in order to directly exploit them
  
  o spending one’s own resources to encourage contributions of effort from unmanaged external parties, whether by offers of direct pecuniary “rewards” for contributions that the problem-holder identifies as “valuable”, or by indirect reinforcing voluntary contributions by creating prospects of public recognition and peer esteem.
New, new things -- for managers? Are there useable signals in the aggregation of the “buzz” about open collaboration, collective intelligence, the ‘wisdom of crowds’ (Surowiecki), etc., now visible on the Internet?

- open collaboration environments (for FLOSS production -- e.g.: SourceForge.net, Freshmeat, Savannah, etc.)
- open content film production (“Film 2.0”, based on large “club” of contributor-sponsors who exercise “voice” on film storyline, design, etc. – e.g., Swarm of Angels)
- interactive learning environments (using multiplayer games design -- e.g. Seriosity)
- online professionals’ chat room with “thread” analysis, e.g., “physician knowledge ecosystem” – www.Sermo.com
- online “social book-marking” of web-content, e.g., del.icio.us
- shared repository of “map mashups” -- e.g., based on personalized Google Maps
- prediction markets (e.g., sporting events -- www.Betfair.com; Iowa election markets – www.biz.uiowa.edu/iem; HP’s internal sales forecasting
- news reporting and aggregation (e.g. Digg News, Reddit, OhMyNews)
- “crowdsourcing” (coined by J.Howe) as searching for new ideas for software, ranked by voting and rewarded by royalty shares if IP is assigned to a commercial innovator -- www.Cambriahouse.com
- “broadcast search” —offering cash prizes for solutions to specified applied science problems, e.g., InnoCentive
Q.2 How does OSCS relate to the theory of the firm?

- We shouldn’t slip into taking the ‘open source’ metaphor literally and begin talking about firms with strategies of distributed problem-solving as though they had been transformed into something so novel as to be no longer distinguishable from other organized modes of innovation and production, e.g., “FLOSS communities”

- There’s no need to radically revise (much less to abandon) the “theory of the firm” as a managed activity with recognizable boundaries, a reasonably well-defined objective function, and a capability for interactions with other kinds of ‘organizations’.

- **But their capabilities must include some that haven’t been much noticed:**
  - Designing a semi-decomposable “architecture” for their innovation project so that its technical engineering design sub-problems can be separated and “distributed” to “teams” that are not under continuous central management
  - Setting granularity of “manageable problems” and solution requirements suitable for external “solvers”
  - Establishing an appropriate communication structure
  - Arranging incentives or selecting among extant “reward systems” for solvers
  - Understanding and screening heterogeneous, novel “solutions”

*Remark:* The foregoing ‘capabilities’ are displayed by big distributed projects in “open science” research. Managers considering an OSCS approach to radical innovation should study the organizational practices developed by some of the larger successful *non-commercial* R&D projects -- e.g. *CERN’s ATLAS*
Q.2 How does OSCS relate to the theory of the firm?—continued

Characterizing the problem-holding firm’s “decision-tree” for the “make or buy” decision on research for innovation

- Identify Problem
  - Assign for Internal Solution
  - Assign for External Solution
    - Modularize for distributed external Solution
      - Prize
      - Reveal the problem & standard solution requirements via private network
      - Procurement contracts
        - negotiated bespoke-work via public platform
        - standard agreement with contractors
      - Out-source to independent research organization
        - Academic institution
        - Commercial Laboratory
Q.2bis: How does OSCS relate to a theory of the innovating problem-solving organization?

A more encompassing framework is needed, including these elements:

**Fixed and parametric features:**

- **Problem-holder (PH):** [problem articulation capability | goals, market structure, line-of-business, organization and location]

- **Problem-solvers (PS):** [potential number, distribution of expertise | characteristics (soloists, ensembles, “conducted” organizations), goals, motives]

- **Communications structure:** Are there Intermediaries (platforms, brokers)? If yes: How do they structure informational flows and what do they bill for? If no: what kind of communication regime -- open (two-way “broadcast”)?, via symmetric & fully connected network?, asymmetric with PH→PS broadcast and PS→PH private?: PS→PS allowed, or excluded?
The organizers’ “Questions to ponder…”

Q.2bis: How does OSCS relate to a theory of the innovating problem-solving organization? -- continued

**Endogenously determined variates (given a communications structure):**

- **Problems chosen for external solution, \(X\):** (cognitive domain, complexity, granularity, degree of modularity, existence of standard solution methods, etc.)
- **Reward structure offered for required solution(s), \(R\):** (unique winners, or multiple winners? pecuniary prize vs. “royalties” from commercial exploitation? vs. “recognition”?; IP claimed by PH for commercialized “solutions”? for all submitted solutions? commerccar payment vs non-pecuniary)
- **Number of candidate solutions generated: \(N\)**
- **Expected value of “the” solution, \(E \{V(X, R | PH's characteristics)\}\)**

**Decision-process equilibrium for players:**

- For the **PH**: 
  \[
  [\text{Prob } X][E \{V(X, R)\}] \leq E \{\text{NetBenefit of InternalSearch for Solution}\}
  \]
- For all **N of the PS’s**: 
  \[
  E [R / N] \geq c \text{ (opportunity cost of the effort)}
  \]
- For a “brokering firm”: The “service fee” extracted from the **PH** and the **PSs** satisfied the above conditions are satisfied, and yields an expected profit on the broker’s platform investment \(\geq\) the normal rate of return.
Q 3. How can a firm benefit from an OSCS strategy?

If the strategy involves practices that in themselves are not commercially viable -- such as giving away a product, or revealing to rivals a cost-saving production method -- then there are basically three ways in which the profit-seeking firm would be able to sustain such behavior:

1) **Retaining monopoly power in the market for a good or service that is gross complement of the commodity that is being freely provided** (see Hirschleifer, 1972)
   
   e.g., many firms, and consultants make profits selling “distributions” FLOSS code, including documentation and customer support services; IBM and other firms interested in software and middleware security issues recently formed an “open research consortium with several university computer science departments, to do research without claiming any IP!

2) **Retaining monopoly power over a productive asset that is a strict complement of the method that is freely disclosed** (see Van Alstyne and Parker, 2000)
   
   e.g., Netflix owns its data on movie ratings, and can let others work with it to write a superior ratings algorithm (for a prize), because the algorithm without the dataset is not worth much, and nobody is going to reproduce the data to enter competition with Netflix. (Recall that owners of large pine-wood forests in the US were happy to openly promote the development of creosote treatment of softwoods, for telephone poles, railroad ties, etc., because a superior method of using a resource raises the wealth of the resource owner.

3) **Deriving positive externalities from the practices that other firms are induced to adopt by the action of the firm**

   The Sematech Project in the US involved IBM and TI contributing to the development of an industry standard for “stepper”s, and benefiting from the reduced fixed costs of that capital good, which lowered entry-costs of other firms into the merchant market for chips, where IBM, etc., were marginal buyers.
A stroll through “the elephant park”…finds a diversity of interesting creatures for economics and organizational science researchers to study

- **Reciprocated networked search** by expert problem-holding problem-solvers: von Hippel’s (1988) employed engineers who firms allow to “trade in trade-secrets”

- **Broadcast search** by problem-holding firms, organized by an intermediary or a “platform”: Lakhani-Jeppessen (2007) *InnoCentive*

- **Closed information brokerage platform** (“thread-spinning for thread selection”): Sermo promotes a monitored venue for expert conversations creating data that can be “mined” and packaged for sale: registered physicians ask and answer questions of each other (anonymously or openly), and the “threads” are sold to third parties with some “rewards” to winners of votes for “best contribution”

- **Inter-corporate R&D ventures** (Chesbrough, Hargadon, et al): may be JRVs among *PH-PSs*, or precompetitive research consortia – which typically must be able to modularize the problem for distributed solution; or, alternatively form a new central R&D group, or outsource to an independent R&D lab organization that is centrally managed

- **Intra-corporate, multi-locational R&D organizations** also need to manage parallel research teams, coordinate distributed work, and control information and workflows: they can imitate methods of large open science projects, such as CERN ATLAS experiment group (Tuertscher et al., 2007) and do this in a decentralized organization –if they can design a suitably modular architecture for the system.

- **Donators of code to open source communities** by firms in software services and grid services (e.g. IBM), permitting partial exit from software production and maintenance activities, while building services (and proprietary software) applications that are complementary to the FLOSS code base.