

Product Interoperability in the Enterprise Software Systems Industry: A Social Network Approach

Standard Making:
A Critical Research Frontier for Information
Systems

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Interoperability Standards in IT Industries

- Types of standards
 - Hardware level, network level, application level
 - Business process level (Examples: Semantic and workflow level standards such as ebXML BPSS, XLANG, WSFL, BMPL)
- Lack of interoperability at the business process level in the Enterprise Software Systems (ESS) industry
 - Buyers integrate different vendor products into a composite IT 'system'
 - High cost of integration
 - It is unlikely that uniform, industry-wide standards will emerge in the longer term.

How do vendors overcome the absence of unified standards?

- What does existing literature say?
 - Formation of implicit and explicit alliances (Saloner 1990)
 - Coalition formation and excluding rivals (Axelrod et al. 1995)
- Observation
 - An ESS vendor's alliances help to
 - Develop interfaces consistent with other vendors' products
 - Converge their interface designs with other select vendors
 - Vendors promote third party investments in adapters (e.g., consultants and integration tools)
 - However, alliances are not 'mutually exclusive' like competing coalitions
 - Alliance 'network'

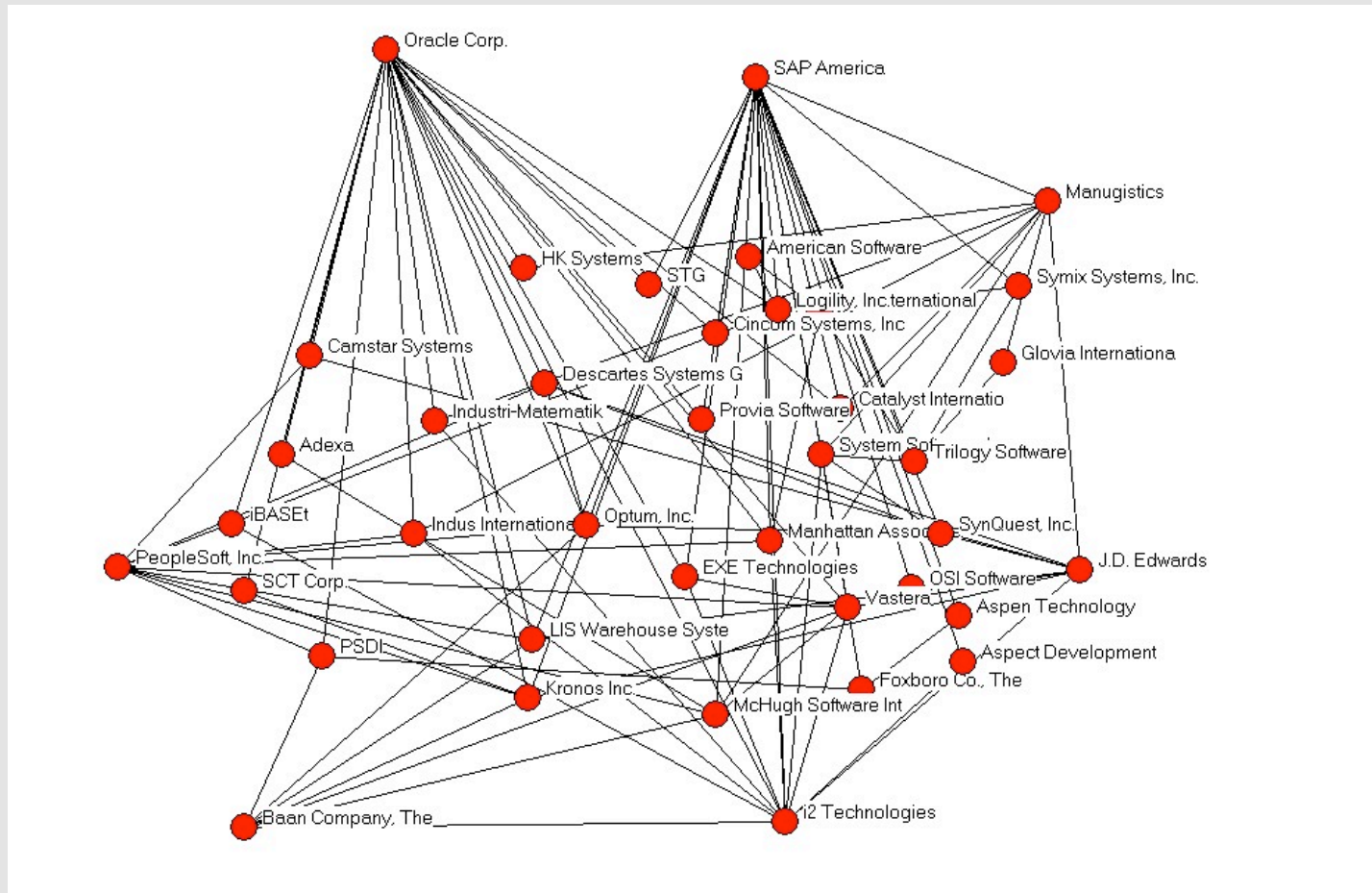
Strategic Benefits in the ESS Alliance Network

Indirect ties	<p>Benefits</p> <ul style="list-style-type: none"> • Access to user bases from compatibility (Katz and Shapiro 1985; Matutes and Regibeau 1988; Economides 1989) 	<p>Benefits</p> <ul style="list-style-type: none"> • Knowledge spillovers and information transfer (Holm, Eriksson et al. 1999; Ahuja 2000)
Direct ties	<p>Benefits</p> <ul style="list-style-type: none"> • Access to user bases due to compatibility (Katz and Shapiro 1985; Matutes and Regibeau 1988; Economides 1989) • Incorporating elements of the dominant design (Suarez and Utterback 1995) <p>Costs</p> <ul style="list-style-type: none"> • Licensing fees (Kotabe, Sahay et al. 1996) • Constructing and maintaining adapters (Farrell and Saloner 1992) 	<p>Benefits</p> <ul style="list-style-type: none"> • Transfer of reputation (Podolny 1993) • Knowledge spillovers and information transfer (Ahuja 2000; Argote and Ingram 2000), e.g., product architectures and new software technology such as web services or encryption. • Stimulating third party investments (Metcalfe and Miles 1994), e.g., by consultants and integration vendors <p>Costs</p> <ul style="list-style-type: none"> • Installing learning mechanisms such as product teams and alliance managers (Metcalfe and Miles 1994) e.g., joint product development teams, alliance manager and technology liaisons.
	Technical dimension	Social dimension

How do vendors benefit from their alliance network?

- How do we operationalize a vendor's benefits from its alliance network? Do these benefits accrue differentially to vendors based on the nature of their alliance network?
 - Network theory - “better connected firms” perform better
 - Social capital as “aggregate access to resources” (Adler & Kwon 2000)
 - Complements intrinsic capabilities
 - Social capital mechanisms
 - Prominence, brokerage, contagion.. (Burt 2000)
 - Strategic benefits of higher status in alliance networks
 - Semiconductor industry (Podolny 1996), wine industry (Benjamin and Podolony 1999), and technological performance (Hagedoorn and Duysters 2002)

Example of an Alliance Network



Model Proposition

- Higher socio-technical capital is associated with higher firm performance controlling for organizational size.
- *Alternative:* Higher number of partners is associated with higher performance controlling for organizational size.

$$\ln(\text{SOFTREV}) = \beta_0 + \beta_1 * \ln(\text{SIZE}) + \beta_2 * \ln(\text{STC}) + \beta_3 * \text{OUTDG}$$

Variables

- Firm performance as dependent variable
 - Software licensing revenue (SOFTREV)
- Independent variables
 - Socio-technical capital (STC) – measured as relative prominence in alliance network
 - Braun (1997) – A rational choice model of network status

Variables (cont'd)

- Out-degrees (OUTDG)
 - Number of alliances range from 0 -19
- Control variable
 - Organizational size (SIZE)
 - Haveman (1993)
 - Natural log of number of employees (Ahuja 1998, Ahuja 2000, Nambisan 2002)
 - Number of employees range from 23 to 41,000

Data

- 97 ESS vendors
 - Limitations with standard SIC classifications
 - Software licensing revenue for 1999 (SOFTREV)
 - Industry publications - Top 100 vendors list
 - SEC reports, One-source Business Browser
 - Employee size for 1999 (SIZE)
 - SEC reports, OneSource, Mergent, Gale
 - Alliance data for 1999 (STC, OUTDG)
 - Lexis/Nexis, company websites and news publications
 - STC and Outdegrees were computed from alliance data
 - 27 isolates (STC=0), 5 form a disjoint network, 65 vendors are connected through pathways of one or more links

Results

Descriptive Statistics

Variable name	Means	Standard Deviations	Log(SIZE)	Log(STC+1)	OUTDG
LREV = Log (SOFTREV)	4.08	1.15	0.822	0.499	0.328
LSIZE = Log(SIZE) [1]	6.2	1.36	-	0.424	0.292
LSTC = [Log(STC + 1)]	1.13	0.85		-	0.628
OUTDG	2.03	2.88			-

[1] Data on employee count for only 92 firms was available

Results (cont'd)

Regression: Software Licensing Revenue as Dependent Variable

MODEL	1	2	3
Lsize	0.696* (0.05)	0.672* (0.053)	0.63* (0.054)
OUTDG		0.038 (0.024)	0.003 (0.03)
LSTC			0.111* (0.046)
R ²	0.676	0.684	0.704
Adjusted- R ²	0.672	0.677	0.694
Number of observations	92	92	92

Contributions

- Theory integration
 - Social network literature
 - Making literature on standards empirically tractable
 - Overall composition of network portfolio is important
- Managerial implications
 - Network perspective to be adopted for constituting alliance decisions - indirect effects
 - Number versus quality
 - Strategic impact of alliances beyond that suggested by network literature or economics literature
 - Complementing intrinsic resources with alliance resources
 - Social dimensions of compatibility – ‘stickiness’ of socio-technical capital
 - Knowledge base of implementers
 - User perceptions of compatibility

Limitations & Future Research

- Cross-sectional data
 - Future longitudinal studies on standards evolution using social network method
- Heterogeneity among vendor products
- Separating out theoretical effects
 - Survey method
- Role of alliances with integration vendors, consulting firms (integrators) and user organizations