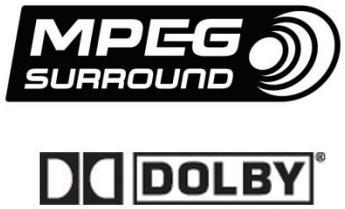
Who's pulling the strings?

The influence of network structure on standard dominance

26-3-2015

G. Van de Kaa

Research problem



Research objective and definitions

- To gain a better understanding of the influence of the characteristics of the network of a standard on the chances that standards achieve dominance
- Standards organization vs industry wide standards network

Theoretical perspectives on standards battles

Literature stream	Representative studies
Evolutionary economics	Utterback and Abernathy 1975; Tushman and Anderson 1986; Anderson and Tushman 1990
Network economics	Farrell and Saloner 1985; Katz and Shapiro 1985; Arthur 1989; Liebowitz and Margolis 1994
Institutional economics	Willard and Cooper 1985; Cusumano, Mylonadis and Rosenbloom 1992; Garud and Kumaraswamy 1993; Khazam and Mowery 1994
Technology management / Standardization	Schilling 1998; Schilling 2002; Suarez 2004; Van de Kaa 2011
Standards battles for complex systems	Van de Kaa et al 2015a, 2015b, 2015c; Gallagher et al 2012

Mechanisms that explain the effects of network characteristics on standard dominance

- Relations provide access to:
  - complementary assets
  - complementary goods and installed base
  - novel information

Hypotheses

- Hypothesis 1: A standard that is supported by a standards organization that has a more influential position in an industry-wide standards network has a higher chance of achieving dominance
- Hypothesis 2: A standard that is supported by a standards organization that can successfully bridge structural holes in the industry-wide standards network has a higher chance of achieving dominance

Methodology

- Data collection
  - Database study from 2000-2011
  - Database consists of standards, actors, and standards organizations
  - Sample of 103 standards organizations and 644 complete observations.
- Data analysis
  - Social network analysis creating a bipartite network of standards organizations and firms to assess network variables
  - Statistical method: Generalized Estimating Equations

Variables

- Standard dominance: network size
- Influential position: eigenvector centrality
- Structural holes: betweenness centrality

Descriptive statistics

Variable	Mean	S.D.	Min	Max	1	2
1. Log Size	4.51	1.19	1.61	7.00		
2. Structural Holes	0.026	0.021	0.000	0.117	0.201**	
3. Influential Position	0.089	0.070	0.000	0.312	0.404**	0.329**

Generalized Estimating Equations Results

Variable	Model 1	Model 2	Model 3	Model 4
Structural Holes		11.75*	4.54	
		(4.89)	(4.92)	
Influential Position			6.60***	7.04***
			(1.45)	(1.26)
QIC	931.0	902.3	788.3	783.0
Difference in QIC		-28.7	-142.7	-148.0
QICC	931.1	894.5	773.5	776.6
Difference in QICC		-36.6	-157.6	-154.5

103 standards organizations, 644 valid observations

* $p < 0.05$

** $p < 0.01$

*** $p < 0.001$

Two-tailed test for controls, one-tailed tests for hypothesized variables

Year variables are not included

Hypotheses

- Hypothesis 1: A standard that is supported by a standards organization that has a more influential position in an industry-wide standards network has a higher chance of achieving dominance (accepted)
- Hypothesis 2: A standard that is supported by a standards organization that can successfully bridge structural holes in the industry-wide standards network has a higher chance of achieving dominance (rejected)

Contribution to the literature

- Standards battles / dominant designs
  - Support for the notion that the outcome of standards battles is not fully characterized by path dependency, but that standard supporters can influence the outcome
- Interorganizational relationships / social network literature
  - Standards networks in relation to standard dominance (Cusumano et al., 1992; Van den Ende et al., 2012)
  - Longitudinal network studies / Network dynamics (Soh and Roberts 2003)
  - The effect of a standards organization's influential position in an industry-wide standards network on standard dominance

Limitations

- Operationalization op standard dominance
- Focus solely on specific factors for standard dominance

Conclusion and discussion

- It appears that when standards are supported by standards organizations that occupy an influential position in the industry wide standards network they will have a higher chance of achieving dominance

- future research into the effect of networks on standard dominance
    - NWO projects

References (1)

•Utterback, J.M., Abernathy, W.J., (1975), A dynamic model of process and product innovation. Omega, 3(6), 639–656.
•Tushman, M., Anderson, P., (1986), Technological discontinuities and organizational environments. Administrative Science Quarterly, 31(3), 439-465.
•Anderson, P., Tushman, M.L., (1990), Technological discontinuities and dominant designs: a cyclical model of technological change. Administrative Science Quarterly, 35(4), 604-633.
•Farrell, J., Saloner, G., (1985), Standardization, compatibility, and innovation. The Rand Journal of Economics, 16(1), 70-83.
•Katz, M.L., Shapiro, C., (1985), Network externalities, competition, and compatibility. American Economic Review, 75(3), 424-440.
•Arthur, W.B., (1989), Competing technologies, increasing returns, and lock-in by historical events. The Economic Journal, 99(394), 116-131.
•Liebowitz, S.J., Margolis, S.E., (1994), Network Externality: An Uncommon Tragedy. The Journal of Economic Perspectives, 8(2), 133-150.
•Willard, G.E., Cooper, A.C., (1985), Survivors of industry shake-outs: the case of the U.S. color television set industry. Strategic Management Journal, 6(4), 299-318.
•Cusumano, M.A., Mylonadis, Y., Rosenbloom, R.S., (1992), Strategic maneuvering and mass-market dynamics: the triumph of VHS over Beta. Business History Review, 66(1), 51-94.
•Garud, R., Kumaraswamy, A., (1993), Changing Competitive Dynamics in Network Industries: An Exploration of Sun Microsystems' Open Systems Strategy. Strategic Management Journal, 14(5), 351-369.
•Khazam, J., Mowery, D., (1994), The commercialization of RISC: Strategies for the creation of dominant designs. Research Policy, 23(1), 89-102.

References (2)

•Schilling, M.A., (1998), Technological lockout: An integrative model of the economic and strategic factors driving technology success and failure. Academy of Management Review, 23(2), 267-284.
•Schilling, M.A., (2002), Technology success and failure in winner-take-all markets: the impact of learning orientation, timing, and network externalities. Academy of Management Journal, 45(2), 387-398.
•Suarez, F.F., (2004), Battles for technological dominance: An integrative framework. Research Policy, 33(2), 271-286.
•Van de Kaa, G., Van den Ende, J., De Vries, H.J., Van Heck, E., (2011), Factors for winning interface format battles: A review and synthesis of the literature. Technological Forecasting & Social Change, 78(8), 1397-1411.
•Van de Kaa, G., De Bruijn, J.A., (2015), Platforms and incentives for consensus building on complex ICT systems: the development of WiFi. Telecommunication Policy, 39580–589.
•Van de Kaa, G., De Vries, H.J., Rezaei, J., (2014), Platform Selection for Complex Systems: Building Automation Systems. Journal of Systems Science and Systems Engineering, 23(4), 415-438.
•Van de Kaa, G., Van den Ende, J., De Vries, H.J., (2015), Strategies in network industries: the importance of inter-organisational networks, complementary goods, and commitment. Technology Analysis & Strategic Management, 27(1), 73-86.
•Gallagher, S.R., (2012), The battle of the blue laser DVDs: The significance of corporate strategy in standards battles. Technovation, 32(2), 90-98.