



School of Business

**Finance and Economics Department
Working Paper 06-06**

**Network rules in International Technology Transfers within
Multinational Enterprises: Limitations on the Power of
Strange Attractors**

David N. McArthur

And

Scott C. Hammond

**Network rules in International Technology Transfers within
Multinational Enterprises: Limitations on the Power of Strange
Attractors**

by

David N. McArthur
Assistant Professor of International Business and Strategy
Utah Valley State College
800 West University Parkway, MS-119
Orem, UT 84058-5999

mcarthda@uvsc.edu
telephone: 801-863-7144
fax: 801-863-7218

and

Scott C. Hammond
Associate Professor of Business Management
Utah Valley State College
800 West University Parkway, MS-119
Orem, UT 84058-5999

hammons@uvsc.edu
telephone: 801-863-7183
fax: 801-863-7218

David McArthur is an Assistant Professor of International Business and Strategy at Utah Valley State College's School of Business. He received his Ph.D. in International Business and Strategic Management from the University of South Carolina, Columbia. His research has appeared in the *Journal of Business Research*, *R&D Management*, and elsewhere. His research examines how multinational firms move production technology between subsidiaries, outside technology sources, and customers. This includes the interdependence between units of that network and the differing ways that managers perceive their units' roles, act out their perceptions, and manage disagreement and change.

Scott Hammond is an Associate Professor of Management and Assistant Academic Vice-President at Utah Valley State College. He received his Ph.D. in Organizational Communication from the University of Utah. His research on social networks has appeared in *Emergence: Complexity and Organization (ECO)* and he has worked as a consultant for corporations, government and educational institutions, and non profit organizations.

The research on which this work is based was generously supported by the Center for International Business Education and Research (CIBER) at the University of South Carolina.

Network rules in International Technology Transfers within Multinational Enterprises: Limitations on the Power of Strange Attractors

Abstract: Self-organization occurs and may provoke chaotic behavior in the complex process of international technology transfers within multinational enterprises (MNEs). Formal or policy rules set overall direction and limit agents' discretion. Mid-level managers and technical staff working on transfers may be able to evade policy rules according to their own agendas, diverting effort and resources away from constructive technology transfer and adaptation, bifurcating the transfer process and duplicating structures within their discretionary space. Informal or network rules are developed as a part of the culture of organizations because they are socially constructed entities. Those network rules are communicated and used to try to limit the power of these "strange attractors" but not without costs to individuals and sub-units of the organization.

Introduction

Organizations are complex, socially constructed entities in which roles and rules are constantly “becoming” (Benson, 1977). MNEs, as international organizations, have even more complex workings than domestic firms. One of the bases of competitive advantage for MNEs is to deploy their capabilities (technologies) into different national markets. Transferring production technologies between nodes of the MNE network is a complex, often poorly understood process, and may result in chaotic behavior at both the subsidiary and individual levels of analysis.

Though top managers initiate the decision to expand internationally, mid-level managers make up the policy network that decides what that strategic decision means operationally. They also decide what roles they and their subsidiaries will play and what rules they’ll play by as well as what tolerances they’ll allow in the behavior of other peer managers involved in the policy network’s task.

Organizational leadership uses formal or “policy” rules to constrain the behavior of agent managers at middle levels as they interpret strategic decisions, form, join, defer, or leave policy networks, and develop and act on (or subvert) the tactical plans to implement the transfer. In international organizations superiors and peers may be geographically or technically distant giving rise to a potential agency problem (Jensen and Meckling, 1976; Fama, 1980; Fama and Jensen, 1983).

Members of the policy network who subvert the strategic goal of technology deployment act as “strange attractors” bifurcating or splitting the process from its normal course in an irreversible way. Peer managers within the policy network use informal or “network” rules to try to limit the scope or degree of their peers’ violation of organizational norms. The enforcement of

these rules by mid-level peer managers brings with it costs that make some actors hesitant to get involved with enforcement.

Literature review

Network rules

The set of formal rules or “how things ought to be done” is also known as administrative heritage (Bjur & Zomorrodian, 1986). It is composed largely of strategy-driven rules. Informal rules are a large part of organizational culture, the “how things are done” of Schein (1985). These rules, administered in part interpersonally, peer-to-peer and in part by organizational structures such as direct-report supervisors, spending approval requirements, and inter-subsidiary technical councils (Feldman, 1984; Cohen, Vandello, Puente, and Rantilla, 1999). Functional network rules make it possible for a policy-making and policy-implementing network to deal with the ambiguity of the complex, unstructured tasks of technology transfer while distant from decision-makers. Network, or informal rules have become part of organizational cultures (Denison, 1990), national cultures (Hofstede, 1984), and even the international culture of states (Nadelmann, 1990) and are a subset of the norms that organizations and peers enforce. Since they are jointly constructed, these rules are only partly under the influence of the organization’s top management.

Violating formal rules and informal norms and rules carries the potential for sanction from both top management and peers. Katz and Kahn (1978: 47) mention that international organizations put policy rules of rotation in place to prevent geographically remote expatriates from “going native” and violating either policy or network rules because of reduced or confused commitment to the home office. Horne (2001) argues that ties among peers, especially those not violating network rules, are key. Strong ties are correlated to greater levels of support for peers to

sanction behavior that violates either policy or network rules, and in turn, influences the likelihood that such sanctioning will occur.

De Certeau's (1984) idea of network rules as pragmatic subversions by lower-level social members of the rules made by leaders and elites – subversive of rank and privilege but pragmatic because they were the ways common people got work done despite formal (policy) rules. For this view of network rules to hold in this research domain (an international technology transfer), there must be limits on the range and degree to which mid-level and technical managers may follow individual agendas. Thus, because of the geographically dispersed mid-level policy network that is put together in a MNE's international technology transfer, and because of the potential for agency problems, formal rules and structures are insufficient, peers must also help govern peers to keep the complex process on-track.

Top management, mid-level technical workers, and users comprised the policy network who jointly developed the network rules in de Cindio, Gentile, Grew, & Redofi's (2003) cybernetic case study of an Italian municipal internet network. They found that network rules were adaptive over time and that network rules when policed for violations and when protective of the less opportunistic, are both efficient and effective, and can be sensitive to and retain non-radicalized parts of the network. This suggests that complex systems may avoid chaotic, bifurcating, irreversible experiences through well-functioning network rules.

Policy networks

Following Hay (1998: 44) Pemberton (2003) defines a policy network as “(a) strategic alliance recursively reconstituted through the process and practice of networking.” These writers come from the perspective of British political science and public policy. Their main research domain, the British polity, is comprised (at least) of voters, specialized interest groups,

nationalized industry and industrial councils, labor organizations, and the central executive (Westminster). We propose that with it is organizationally analogous to the mid-level commercial and technical policy network of a MNE transferring production technology internationally. In our conceptualization, the MNE, like the British polity has a central executive making (or taking) decisions, operating subsidiaries possessed of varying degrees of autonomy, power, and tenure; staff organizations (acting somewhat like special interest groups); vendors whose fortunes are more or less tied to the subsidiaries' fortunes and the MNE's expansion; and customers, who, like voters, are the ultimate recipients of the product benefits (the policy outcomes). Indeed, the cases reported in this work had engineers, scientists, and commercial managers of the various subsidiaries of the MNEs, vendor firms' engineers and commercial managers, and supporting laboratory engineers and managers participating in the network whose parts designed, implemented, adapted, *and* resisted the transfer of production technology between units of the MNE.

Benson (1977) proposed that network rules are the "constitution" of the organization and are the rules that govern organizational participation and bring about compliance with organizational norms. Evans (2001) extends Benson's ideas to policy networks emphasizing the "complex nature of relations linking network members." The rules governing these networks are ever-changing and riddled with contradictions. Some of those contradictions consist of gaps in discretionary space or in enforcement in which the wide variety of actors that can be part of the policy network (Pemberton, 2003) follow their own, self-organized agenda.

Pemberton (2003) shows that policy networks are complex, chaos-prone structures that may be characterized by rivalry between network members, subversion of strategic goals and the tactical plans undertaken to achieve them, and adversarial politics between factions. He examines

the case of the British government's failures from 1955 to 1966 to implement improvements to British economic policy due to subversion by policy network members' self-interest and discretionary space they could operate in. He argues that much of the policy network in his study is self-organized as interested parties join or leave the network to serve only self-interest.

Self-organization creates "strange attractors" in organizational systems

Management writers (Trice and Beyer, 1993: 259) have agreed that "informal leaders tend to emerge from within all social groups... to pursue goals and norms." But mid-level policy networks in MNEs, because of their diversity and geographic dispersion may have problems with these mid-level "leaders" pursuing their own agenda. This self-organization is an evidence of complex, nonlinear systems, which have the potential for chaotic behavior (Richardson, 2006).

Because self-organization is a force for instability (Thiéart and Forgues, 1995) stable systems must counter it with a force for stability in order to prevent system chaotic behavior. Policy and network rules are important parts of that counter-force.

Operating in their discretionary space (Montanari, 1978; Key, 1997, 2002) subversive mid-level managers who are part of the policy network to implement the technology transfer act as strange attractors and divert effort and resources needed in the phases of technology transfer into other, non-supportive areas or "basins of attraction" in which parts of the system duplicate themselves in smaller scale (Thiéart and Forgues, 1995). Failure of network and policy rules to control the power of "strange" attractors may result in sabotage of strategic plans by mid-level managers who don't agree thus demonstrating the emergence of self-referential agendas (Guth & MacMillan, 1986; Lempert, 2002).

Method

Qualitative methods, such as comparative case studies, are frequently used to explore the nature of processes in social phenomena (Duncan 1979: 424). This allows a great richness in the collection and analysis of data and can better reveal the dialectic (Benson, 1977) that characterizes policy networks in complex environments such as the present research domain.

In-depth, separate, semi-structured interviews were conducted with two managers who were in responsible charge of all or parts of the technology transfer from (Fulton) or to (Jefferson) their subsidiary from a sister subsidiary. The two cases reported here (disguised at the request of the respondents) are examples of technology transfers that become chaotic. Both were evaluated as unsuccessful as technology transfers by the respondents though they both had some measure of success. Selected from a larger study of technology transfers, these cases were selected because in failure the costs bring enforcement efforts to the top of respondents' minds where they are revealed.

The Fulton case resulted in only the idea being transferred, considerable resources, both financial and social, were wasted through duplication of effort. The Jefferson transfer eventually succeeded technically and commercially but both respondents evaluated it as a failure for the subsidiary because of wasted time and resources and residual ill-will within the MNE network.

This paper will briefly overview the cases and then show how network rules were used to try and limit the power of strange attractors as they self-organized and bifurcated the technology transfer process.

Cases

[Table 1 about here]

The Jefferson Company is a large multinational based in the Netherlands with manufacturing in the Netherlands, the UK, the USA, Latin America, and Asia. They have recently expanded by acquisition in the USA.

The recently acquired Jefferson USA plant manufactures synthetic rubber as does another nearby plant and several other international subsidiaries that were original to the Netherlands parent company. A key component of Jefferson USA's older production technology would soon become unavailable, forcing both plants of Jefferson USA to find an alternative. One European subsidiary, Jefferson Fine Chemicals, produced an alternative component and understood the technology of its use. This technology had been transferred to and proven in use in one of the sister plants in Europe previously.

The transfer of technology to the Jefferson USA plant was difficult, with little initiative shown by the technology-rich Fine Chemicals division, little help from the sister subsidiary using the technology in Europe, and considerable ill-will generated in Jefferson USA. That ill-will prompted Jefferson USA technical managers to spend considerable extra time and money retesting the technology as transferred from Fine Chemicals. Its completion delayed, the US subsidiary had to pay all the social, technical, time, and financial costs of adapting the new technology to the US production sites.

After the transfer, Fine Chemicals did become a steady supplier to Jefferson USA but this is not about the complexity of a supply chain relationship but rather about the chaotic behavior that developed in the MNE network during the technology transfer between subsidiaries.

Fulton Inc.'s Manufacturing Technology Research Center (MTRC) was the technology-sender in a transfer of a recently developed manufacturing technology to the wholly owned Fulton plant in Germany. The technology and equipment package was conservatively designed

so that it would be commercially viable (trading off unneeded accuracy for lower capital cost and service life). A domestic US plant had already received and used the new manufacturing technology and reported good results with it. Some adaptation of the process machinery was required to adapt to each subsidiary.

After listening to and accepting the idea behind the new process, the Germany subsidiary rejected the MTRC's process machinery package as inferior technology and engaged in a two-year long parallel development program that consumed a great deal of time and money. This parallel development effort culminated in a decision by Fulton Germany to reject the machinery part of the MTRC's technology for their solution. That solution, once installed, was not commercially viable and Fulton Germany was shut down at the next business downturn.

The German operating unit had a long and rich history. They had several excellent, Ph.D.-level engineers and had developed process improvements on their own. Though MTRC and all the operating subsidiaries belonged to an active technical policy network no other Fulton subsidiary was involved in the development of this new process.

Fulton had historically allowed subsidiaries considerable autonomy within the constraints of financial performance and product compatibility. This resulted in a mid- and senior-level technical policy network of peers who shared technical ideas and manufacturing solutions but each unit could decide how best to reach objectives. The MTRC had a consultative relationship with the operating units. They listened to requests from, coordinated development with, and convinced network peers to accept their solutions to problems and opportunities.

Analysis and Conclusions

Network rules arise and are communicated in several ways. As a component of the organization's culture which is transmitted through the content and values of symbols,

organizational language, narratives, and practices (see Trice and Beyer chapter 2, 1993).

Network rules are communicated along interactional ties between mentors and pupils and between peers as one side outlines the organizational procedures by which things get done and the values that govern the procedures.

[Table 2 about here]

In Table 2 Jefferson's VP tasked with receiving the new technology has been stymied in getting cooperation from the technology-sending Fine Chemicals subsidiary. Only when an expatriate President is sent from the Netherlands and he begins tutoring the VP did the Fine Chemicals unit begin responding to their needs. Tie strength, as increased by frequency of contact, is also part of this element of control by norms. Network rules are the rules that govern how units participate in the policy network, but the degree they are allowed to participate, with lower degrees of participation insufficient for the complex work of the technology transfer and adaptation.

Fulton's MTRC manager had long and extensive professional and friendship ties with the Germany subsidiary's technical people. He expected that his scientific data, the Germans' scientific training, and his friendship ties would persuade the Germany subsidiary to accept the technical package they were trying to transfer. He talked extensively with them over 18 months. He exerted considerable time and effort in communicating the network rules of how a scientific decision should be made.

He said, "You compare different parameters, that's the classical way to [decide]... because there is no perfect machine... all machines have tradeoffs." "We had run-offs where we'd take [their proposed] equipment and put it right by [our proposed] equipment and show

what each [technology's] strengths and weaknesses were. We did the whole thing.” The scientists from the Germany subsidiary responded that the MTRC's technology was inferior.

Each firm contains procedures or structures whose requirements and articulation shape network rules and the allowable discretionary space mid-level employees need to do the creative work involved in complex processes. The Fulton case highlights how network rules developed around plant autonomy and the charter of the MTRC – operating plants technology purchase orders were to be passed by the MTRC manager, who was to act as an expert “witness”. For the Germany Managing Director (MD) to ignore the disapproval of the MTRC manager is analogous to political intervention by the head of state in countries that separate the positions of head of state and head of the government. It is expected only in extremis and constitutes a violation of norms at any other time.

This suggests that network rules, their enforcement regimes, and the formal rules and procedures they may be “pragmatically subversive” of may need to be rationalized before disruptive events. This recommendation recognizes that network rules, as a component of culture, are shared and not fully controlled by leadership.

[Table 3 about here]

Network rules are used to control the power of strange attractors in these cases according to the greater organizational characteristic of the system. In the case of Fulton Corporation, with high degrees and a long history of operating unit autonomy, strong scientific capability in the subsidiaries, and a relatively short history with the MTRC, network rules were to be enforced through persuasion, peer pressure, and diplomacy. These, less forceful enforcement means, demanded continued application over time.

By contrast, Jefferson was characterized by sudden, acquisition-based growth that left subsidiaries without significant understanding of the network rules and few ties along which to learn them. In Jefferson's more atomistic MNE network of subsidiaries, power was the "coin of the realm." It was denoted by the attention of headquarters, and was gained by expectations of future earnings. Jefferson USA had little power and could gain little attention from those at Fine Chemicals who could have helped them avoid costly mistakes in adaptation. The lack of help and the abrasive way their questions were handled by Fine Chemicals managers agitated the technical staff at Jefferson USA and agendas of mistrust emerged. The USA technical staff self-organized around a large project that duplicated the work of Fine Chemicals and cost several man-years.

The norms or network rules in Jefferson's MNE network allowed powerful subsidiaries to avoid helping technology-receiving units pay the costs of adapting the technology to the new setting. This norm was counter-balanced by aggressive tie-building with headquarters, with Fine Chemicals, and with other sister subsidiaries allowed the established subsidiaries avoid chaotic operations. Tie-building with a European operating subsidiary and with Fine Chemicals (Table 2) eventually helped work out the commercial issues of supply but was too long developing to reduce the cost of technology adaptation or the development of ill-will in the US technical staff.

Networks with new members may benefit from measures to increase network democracy and institutionalize network rules against excessive use of power by network members.

[Table 4 about here]

Horne (2001) and others point out the costs of enforcing network rules or norms may make those in a position to do so hesitant or unwilling to do so, though her research is limited to individual persons and not organizations. Table 4 suggests that organizations such as

subsidiaries, acting through the agents of their managers, may perceive not only individual, personal costs of enforcing network rules, but also unit costs that they are unwilling to pay also

In Fulton's case the MTRC manager was emphatic that he had paid a personal price in his labor of enforcing the norm of scientific rationality on the Germany subsidiary. His epilogue on using network rules and their enforcement in his MNE to resist strange attractors who were diverting unit resources into illogical, self-organized "attraction basins" was that, "...it doesn't always work." This suggests that policy networks (certainly in international technology transfers within MNEs) should begin their work after assessing what the network rules relevant to the task are within members of the network and work to establish explicit network rules, enforcement regimes that distribute costs fairly, and rewards for those that pay personal or unit costs of enforcement.

The data also reveals that organizational units in both Fulton and Jefferson who would have been in a position to help enforce network rules on those violating them refused to do so. We infer that the costs of enforcement, whatever they were, were too high for the non-transferring operating subsidiaries to pay. Horne (2001) discusses the threat of retaliation as one possible cost that deters sanctioners. The Jefferson case, with its power-denominated culture, seems consistent with this thinking but that is something for future research to investigate.

[Table 5 about here]

Chaotic behavior in complex systems is believed to be irreversible (Richardson, 2006) leaving an organization that has experienced a bifurcation and chaotic behavior changed and unable to return to the former state. Since organizations are social systems and hence always "becoming" bifurcation and irreversibility must be relaxed somewhat. Certainly the data in Table 5 suggests that these two failed technology transfers left their MNEs changed. Jefferson USA has

mastered and adapted the technology, built power through realized earnings, and built technical ties to sister operating subsidiaries but has gone through a bifurcating event and mistrust still clouds the air regarding the Fine Chemicals division.

Fulton Germany and Jefferson USA both spent time and resources on self-organized bifurcations that duplicated at a smaller scale the already existing structures and technologies within the policy network. Those costs are separate from the costs of using the network rules to try to balance against the strange attractors.

Longer lasting than the cash costs of chaos are the social costs in exhausted careers, ill-will for those who've broken what policy network members believe to be the rules of participation, and the loss of trust and confidence in the mid-level policy network and the amount of discretionary space allowed them by centralized leaders.

References

- Benson, J. K. (1977). "Organizations: A Dialectical View," *Administrative Science Quarterly*, ISSN 00018392, 22 (1): 1-21.
- Bjur, W. E. and Zomorrodian, A. (1986). "Towards Indigenous Theories of Administration: An International Perspective," *International Review of Administrative Sciences*, ISSN 0020-8523, 52 (4): 397-420.
- Cohen, D., Vandello, J., Puente, S. and Rantilla, A. (1999). "'When You Call Me That, Smile!' How Norms for Politeness, Interaction Styles, and Aggression Work Together in Southern Culture," *Social Psychology Quarterly*, ISSN 01902725, 62 (3): 257-275.
- de Certeau, M. (1984). *The Practice of Everyday Life*, Berkeley: University of California Press, ISBN 0520047508.
- de Cindio, F., Gentile, O., Grew, P. and Redolfi, D. (2003). "Community Networks: Rules of Behavior and Social Structure," *Information Society*, ISSN 01972243, 19 (5): 395.
- Denison, D. (1990). *Corporate Culture and Organizational Effectiveness*, New York: The Free Press,
- Duncan, R. B. (1979). "Qualitative Research Methods in Strategic Management," in Schendel, D. E. and Hofer, C. W. *Strategic Management: A New View of Business Policy and Planning*, Boston, MA: Little, Brown, & Co., pp. 424-447.
- Evans, M. (2001). "Understanding dialectics in policy network analysis," *Political Studies*, ISSN 00323217, 49 (3): 542-550.
- Fama, E. F. (1980). "Agency Problems and the Theory of the Firm," *Journal of Political Economy*, ISSN 00223808, 88 (2): 288-307.
- Fama, E. F. and Jensen, M. C. (1983). "Separation of Ownership and Control," *Journal of Law and Economics*, ISSN 00222186, 26 (2, Corporations and Private Property: A Conference Sponsored by the Hoover Institution): 301-325.
- Feldman, D. C. (1984). "The Development and Enforcement of Group Norms," *The Academy of Management Review*, ISSN 03637425, 9 (1): 47.
- Guth, W. D. and MacMillan, I. C. (1986). "Strategy Implementation Versus Middle Management Self-interest," *Strategic Management Journal*, ISSN 01432095, 7 (4): 313-327.

- Hay, C. (1998). "The Tangled Webs we Weave: The Discourse, Strategy, and Practice of Networking," in Marsh, D. *Comparing Policy Networks*, Buckingham: Open University Press, ISBN 0335196470, pp. 33-51.
- Hofstede, G. (1984). *Culture's Consequences: International Differences in Work-Related Values*, Newbury Park, CA: Sage, ISBN 0803913060.
- Horne, C. (2001). "The enforcement of norms: Group cohesion and meta-norms," *Social Psychology Quarterly*, ISSN 0190-2725, 64 (3): 253-266.
- Jensen, M. C. and Meckling, W. H. (1976). "Theory of the firm: Managerial behavior, agency costs, and ownership structure," *Journal of Financial Economics*, 3 (1): 305-360.
- Katz, D. and Kahn, R. L. (1978). *The Social Psychology of Organizations*, New York: John Wiley and Sons, ISBN 0471023558.
- Key, S. (2002). "Perceived Managerial Discretion: An Analysis Of Individual Ethical Intentions," *Journal of Managerial Issues*, ISSN 10453695, 14 (2): 218.
- Key, S. (1997). "Analyzing managerial discretion: An assessment tool to predict individual policy decisions," *International Journal of Organizational Analysis* (1993 - 2002), ISSN 10553185, 5 (2): 134.
- Lempert, R. J. (2002). "A new decision sciences for complex systems," *Proceedings of the National Academy of Sciences*, ISSN 082081699, 99 (supplement 3): 7309-7313.
- Montanari, J. R. (1978). "Managerial Discretion: An Expanded Model of Organization Choice," *Academy of Management Review*, ISSN 03637425, 3 (2): 231.
- Nadelmann, E. A. (1990). "Global prohibition regimes: the evolution of norms in international society," *International Organization*, ISSN 00208183, 44 (4): 479-526.
- Pemberton, H. (2003). "Learning, governance and economic policy," *British Journal of Politics & International Relations*, ISSN 13691481, 5 (4): 500-524.
- Richardson, K. A. (2006). "Complex systems thinking and its implications for policy analysis," in G. Morcol (ed.), *Handbook of Decision Making*, New York, NY: Marcel Dekker.
- Schein, E. H. (1985). *Organizational Culture and Leadership*, San Francisco, CA: Jossey-Bass, ISBN 0875896391.
- Thiétart, R. A. and Forgues, B. (1995). "Chaos Theory and Organization," *Organization Science*, ISSN 10477039, 6 (1, Focused Issue: European Perspective on Organization Theory): 19-31.
- Trice, H. M. and Beyer, J. M. (1993). *The Cultures of Work Organizations*, Englewood Cliffs, N.J: Prentice Hall, ISBN 0131914383.

Table 1
Cases

Foreign technology-sending units			Technology being transferred		Respondents were in US technology-receiving units		
Name	Firm Size	Sending unit's home country	Product	Technology stage	Tie to the MNE ^a	US unit new or established	Respondents positions at time of transfer
Jefferson	Large	Netherlands	Synthetic rubber mfg process change	New, but proven	WOS	Established	Technical Director Production Mgr

Respondents were in US technology-sending units			Technology being transferred		Foreign technology-receiving units		
Name	Firm Size	Respondents positions at time of transfer	Product	Technology stage	Tie to the MNE ^a	Foreign unit new or established	Foreign unit's host country
Fulton	Large	Mgr - Manufacturing Technology Research Ctr Chief Engineer MTRC	computer circuit board mfg process	New, but proven	WOS	Established	Germany

^a WOS = Wholly owned subsidiary

Table 3
How network rules are used

<i>Cases</i>	<i>Issue</i>	<i>Data from Respondent(s)</i>
Fulton	Fulton's system was characterized by unit autonomy so network rules were to be enforced by persuasion, peer pressure, & diplomacy over time	<ul style="list-style-type: none"> • "... my edict was "Make them all 'do the right thing'" but "Oh, by the way, you can't force them to do the right thing you've just got to influence them to do the right thing" • "...remember I said I spent countless hours trying to influence them?" • "I really thought that with some of the diplomatic skills that I had I could influence them." • "These same guys are my best friends. I mean, I go to Germany and I don't ever miss looking them up and spending time with them and drinking a beer with them."
Jefferson	<p>In Jefferson's power-denominated network...</p> <p>...the network rule or norm is used as a club by the technology-sending unit to avoid helping with the costs of adapting the technology.</p>	<ul style="list-style-type: none"> • "At that time [Fine Chemicals] was the most profitable division of the company. They had some proprietary technology and they were making a lot of money. • They were the high profile [unit]. They were getting all the money, all the movers and the shakers. Everybody wanted to be in Fine Chemicals. They were going to sell these [products] to the pharmaceutical industry around the world and that's where all the guilders were.
		<ul style="list-style-type: none"> • "This is what happens when you buy it from your own company [they say,] "This is what we got." "They use it over here like that." "What's wrong with y'all?" "Why can't you use it?" • Interviewer: So while you had [the VP overseeing] your overall project here ... there was nobody over there? "Nobody over there." Interviewer: And [being] a vendor is not enough? "That's right, in this case the vendor was not enough even with what we had. They had experience that would have saved us some money." • Interviewer: Was there ever a point where you brought some of them over to [the Jefferson USA plant]? "Yes." Interviewer: Tell me about that. "We never saw the technical people." Interviewer: You never saw the technical people? "Never. To this day, I never saw the people from Fine Chemicals."

Table 4
The costs of peer enforcement of network rules

<i>Cases</i>	<i>Issue</i>	<i>Data from Respondent(s)</i>
Fulton	<p>Network rules may not be sufficient in some cases and are perceived as “costly” to the peers trying to enforce them.</p> <p>Sometimes peers are unwilling to pay the costs of assisting in enforcement.</p>	<p><u>Personal cost:</u></p> <ul style="list-style-type: none"> • "...from day one I spent countless hours trying to influence them [the Germany subsidiary]. ... Technology transfer is one of the most difficult things I've ever been involved in." • [Referring to his final “showdown” with the scientists from Fulton Germany, the MTRC Manager said,] “My boss was there, my Sr. VP was there, and he was visibly chest-fallen when I said that. Because he knew that I'd given up. It just wasn't worth it... my life's too short to keep fighting that war.”
		<p><u>Subsidiary cost:</u></p> <ul style="list-style-type: none"> • [Speaking of the US subsidiary that had put the technology in use] “They weren't about to go [to Germany] and waste any of their mental or emotional cycles fighting ... They weren't going to argue the case.”
		<p><u>Efficacy</u></p> <ul style="list-style-type: none"> • “The reason my group was formed in 1990 was to get a handle on the fact that each plant was trying to do its own thing. But again, I was formed outside that general manager structure. I was formed as a support organization so my edict was "Make them all do <u>the right thing</u>." but "Oh, by the way, you can't force them to do the right thing you've just got to influence them to do the right thing." Again, that was appropriate; I'm not saying that was inappropriate. I'm just saying it doesn't always work.” [Emphasis in original tape]
Jefferson		<p><u>Subsidiary cost:</u></p> <ul style="list-style-type: none"> • [our sister company in Europe that uses this technology] “... they didn't want to get into that. They had their particular problems dealing with Fine Chemicals. ...they weren't interested in ours.”

Table 5
The costs of violations of network rules

<i>Cases</i>	<i>Issue</i>	<i>Data from Respondent(s)</i>
Jefferson	Violations of network rules results in costs to the violators and to their subsidiaries. While the cash costs of bifurcating a process may be paid off, social costs may be longer lasting.	<p><u>Bifurcation costs:</u></p> <ul style="list-style-type: none"> • “The first step was mistrust... we had to go through our own evaluations at the bench. Then we had to go through our own evaluations at the pilot plant scale. ... Then we had to go through evaluations in the plant. ... [T]his was a full blown study. I don’t know what it costs, but there were man-years put in on this thing at the bench.” • “[Any knowledge and ideas from us] gets reinvented in the Netherlands. Interviewer: What do you mean by “reinvented?” “Well, the same kind of thing we did with that [technology transfer].” Interviewer: So they don’t take anything you say? “They don’t take it and do it. It’s reinvented.” <p><u>Social costs:</u></p> <ul style="list-style-type: none"> • “...they were our sister company. We felt that they were shoving it down our throat. So our technical community rebelled against that and we had some pretty heated arguments back and forth, you know.” • [Speaking of the feelings of mistrust and ill-will left from the technology transfer from Fine Chemicals] “I’d say those attitudes are still problems here today.” Interviewer: Still? “Yeah. If we had to work with Fine Chemicals today we’d have to have some sort of clear-the-air meeting or we’d have to start with fresh people that weren’t involved, but something would be necessary.”
Fulton		<p><u>Bifurcation costs:</u></p> <ul style="list-style-type: none"> • “Germany, probably ...worked on this the whole time we did just about. Germany probably put in 2 to 4 man-years. ... [we put in] over 10 man-years, cause [the Chief Engineer] started this thing 3 years beforehand” <p><u>Social costs:</u></p> <ul style="list-style-type: none"> • “In this particular case the senior VP who was over all those General Managers... decided it was their decision. He's the same guy who later closed them down so... you can argue and argue that was a political thing he did. He was letting them sort of create their own fate. I'm not saying that this decision closed them down, but I'm saying that this decision was endemic of behavior that later resulted in closure of manufacturing [at the Germany plant].”