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Inter-firm Collaboration as a Modernization Strategy: A Survey of Case Studies

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Overview

Inter-firm collaboration (IFC) has been explored by organizations seeking a vehicle for the industrial modernization of small and medium-sized manufacturers. This paper offers five models of the impacts of IFC networks based on a survey of 123 case studies. The models examine the association between impacts of IFC with variables describing the origins, activities, and structures of networks. Impacts are measured through aggregate assessments of business expansion, bottom line savings, increases in projects, increases in membership, and increases in other benefits. We find that business expansion is associated most strongly with factors related to the origins of projects. Increases in membership and other benefits are most strongly associated with structural factors. Finally, bottom line savings and increases in projects are most closely associated with both origin and structural factors.

Introduction

Networks of inter-firm collaboration (IFC) have grown in number and economic importance in recent decades. Following studies of their contribution to economic growth in Italy and other regional economies in the 1980s, public policies stimulating IFC networks became an accepted strategy for industrial modernization throughout the industrialized countries (Lichtenstein, 1992; O'Doherty, 1990; Pyke, 1994). By the mid-1990s hundreds of new networks had been launched around the world and their experiences documented in a growing body of case literature.

Much of the research to date has attempted to identify factors associated with the successful creation of IFC networks. This paper offers five models of the impacts of IFC networks based on data from over one hundred case studies. The models relate a variety of causal variables to an array of

impacts. In so doing, we explore the different kinds of impacts that networks can have on business activity and the factors that shape these impacts.

Inter-firm Collaboration and Modernization

Inter-firm collaboration has been explored by organizations seeking a vehicle for the industrial modernization of small and medium-sized manufacturers. Interest in IFC has come from both public and private sector organizations who share an underlying impetus – enhancing the competitiveness of the manufacturing enterprise through networking. The variety of IFC networks that have emerged over the past decade is impressive, covering all phases of business operations. Small manufacturers have used IFC networks to 1) acquire equipment, training, and consulting services; 2) gain access to new markets through the creation of new products or product lines; 3) improve business practices by sharing lessons learned among participating firms; and, 4) improve awareness of both market opportunities and business assistance resources within a region or industry. It is difficult to assess the number of IFC networks that have been created. However, a cursory review of the literature hints that there may be hundreds, if not thousands, of these networks worldwide. It is known that interest in IFC networks has not been limited to any one country, sector, industry. Furthermore, IFC networks have become a major tool used by business and technology assistance providers in both the public and private sectors.

A variety of approaches to IFC networks are being implemented today. Indergaard (1996) suggests that networks are being established following either a resource mobilization strategy or social mobilization strategy. The resource mobilization model brings together small

grants, small firms and professionals trained at facilitating networks (usually drawn from the private sector). The goal is to create a collaborative business opportunity. The social mobilization model uses grants to trade associations and regional service organizations targeted at specific industries to stimulate collaborative activity.

Both models share the fundamental assumption that co-operation among small manufacturers needs to be stimulated in some fashion. They argue that in most instances small firms do not have the capital (human or otherwise) to be able to forge an IFC network without assistance. Both models also agree on the catalysts for change: small incentive grants, expert advice on modernization, expert assistance on the social and business dimensions of networking, and trust among firms. Recent evaluations tend to indicate that both approaches to networking have produced successes (Indergaard, 1996; Rosenfeld, 1996; Shapira, et al., 1996; Sommers and Heg, 1995)

Case Studies of Inter-firm Collaboration

Not only is IFC unfamiliar to businesses and service providers; it is a relatively new field of study. As a consequence, our understanding of the factors that cause IFC's to be born, thrive or fail is nascent (Indergaard, 1996; Rosenfeld, 1996; Sommers and Heg, 1995). The development of indicators that measure events and outcomes is an emergent art. Under such circumstances, case studies offer the type of rich qualitative information so important to the development of theory and effective program evaluation.

Over time, agencies and not-for-profit organizations that use IFC networks to promote economic development have sponsored large numbers of case studies. They have been an important tool for the

promotion, education and evaluation of IFC networks (Kingsley, 1996). Most small firms have little or no experience conducting business through networks and are wary of committing precious resources to an endeavor so fraught with uncertainty. Similarly, most service providers, whether from the public, private or not-for-profit sectors, have little experience in either working with or forming networks of small firms. Case studies are proving to be the best, and sometimes only, means of demonstrating the mechanics and advantages of IFC.

Typically these studies have a very short life as a management tool, after which they receive little further attention. However, in large numbers they can become the data for another research methodology, the case survey method (described below). This study is based on 123 such case studies.

We analyze case studies written by authors with four types of institutional affiliations: universities, consulting organizations, state agencies, and USNet/Regional Technology Strategies, Inc. (USNet/RTS).¹ Case studies were evenly distributed across the different types of authors. USNet/RTS is separated from other types of consulting organizations because they account for a large block of the cases that typically provide the richest details about networks.

There are distinct differences among the authors. State agencies were by far the quickest to begin writing about networks. The typical state case was written less than two years after the network was created. It

also tends to be very short (one or two pages in length) and designed for promoting networks to small manufacturers. The other types of authors (academics, consultants and USNet/RTS) were more likely to begin writing after a longer interval. However, each had a distinctive approach. USNet/RTS was the most likely to write longer, detailed cases. Only 19 of the cases in the survey are over five pages in length. However, USNet/RTS accounted for 63% of these. Academic authors were likely to highlight several short cases in a single research article. While consultants have the longest time interval between initiation and case write-up, this reflects a bi-modal distribution. The median difference is three years. Consultants, like state agencies, are more likely to produce very short case studies (one to three pages in length).

The data suggests that there have been three significant periods in the recent history of IFC's and case writing. First, few case studies have been written about networks initiated before 1989. Then from 1989 through 1991 the pace of case writing and, perhaps, IFC network creation increased significantly. These years each saw ten documented network initiations, on average. Finally, 1992 experienced a sharp peak at thirty-one documented initiations, and subsequent years remained at about eight per year before tapering back down again in 1995.

To some degree the dates of case initiation reflect trends in public policy and the economy. In the 1970s, and into the 1980s, the US economy faced increasing economic competitiveness pressures. As awareness rose of the potential that IFC held for competitiveness, network initiation began. This growing awareness is manifested in the data up to 1989 which shows a small number of networks being created. Then in 1989 federal and state programs to support inter-firm networks

¹ USNet is a consortium of several state economic development organizations, co-sponsored with the National Institute on Standards and Technology, designed to promote inter-firm collaboration. Regional Technology Strategies is the primary contractor responsible for the administration of USNet. Over the past several years many case studies have been developed as a part of this initiative.

began to have an affect. This marks the beginning of a period when government policy joined with on-going economic trends to yield the sharp increase in network initiations that lasts through 1992. However, the distribution of initiation dates also reflects when different case authors are writing. For example, the majority of cases from state agencies were written in 1993. The majority of academic cases are written in 1991 and again in 1996. Consultants and USNet/RTS authors are steadier, consistently producing case studies over the 1992 to 1997 time period.

There are limitations to this collection of cases. Almost uniformly the studies we examine employ a process model, charting a flow of activities from the initiation of the network to an impact. However, with a few notable exceptions, the cases are quite narrow and rely upon a single voice in providing evidence concerning the network. The focus is almost exclusively upon the attributes of network. Despite these limitations the case studies are nonetheless sufficiently rich in detail to allow for extraction of data for the case survey method.

Surveying Case Studies of IFC Networks

The case survey method mixes two methods, survey and case study. Instead of conducting a survey directly in the field, investigators apply their survey questionnaire to a collection of case studies. The method has proven particularly useful under conditions where (Larsson, 1993; Yin & Heald 1975): (a) case studies are a major method of research and evaluation; (b) the unit of analysis is an organization or group of organizations; and (c) a broad range of variables and contexts are of interest. All of these conditions are common to studies of IFC networks.

The four basic procedures for case survey analysis include:

1. Selection of a group of existing case studies relevant to the evaluation question.
2. Designing a coding scheme for systematic conversion of qualitative case descriptions into quantified variables.
3. Use of multiple raters to code the cases and measure their inter-rater reliability
4. Statistical analysis of the coded data.

Each of these steps was applied to the case studies of IFC networks. Five case selection criteria were employed. The first criterion was that the networks had to be defined by participating small manufacturing firms as inter-firm collaborations. This distinguishes IFC networks from the more general network studies where the researcher imposes a definition of the network. Second, the network had to be designed for some commercial or competitive purpose to benefit the firm. Thus, case studies of both soft and hard networks were included in the survey. Third, the case had to describe in sufficient detail the structure of the network and an outcome of the network either in terms of material benefits (or lack thereof) or changes in organization learning and behavior. Fourth, case selection was not limited to networks formed at the impetus of, or in association with, a public program. Fifth, case selection was limited geographically to those found in the heavily industrialized countries of Europe, North America, and Asia. No systematic exploration was made of case studies in languages other than English. To do so would introduce an unwarranted cost to the development of the case survey. These criteria do not specify whether the unit of analysis in the case must be a firm in the network, the network, or a region in which several networks are described. In fact, all

three types of cases were included in this study.²

The second step in the case survey method involves the design of the coding scheme for the survey. Five types of variables were defined. All quantitative variables were nominal measures indicating whether a particular attribute was evident in the case. There are four types of quantitative variables examining the origins of the network, the collaborative activities of the firms, the organizational structure of the network, and the impacts of collaboration (see **Table 1** for a list of these variables). The fifth type of variable assessed the major factors that contributed to the network's success, as well as the factors that hindered operations. Each coder provided a brief narrative description of success and hindrance factors for each case.

The case survey method requires the use of multiple coders who proceed in parallel to apply the survey to the case studies. Three coders each scored all 123 IFC network cases. Their completed surveys were then compared for agreement. The coders were in agreement 89 percent of the time across all variables. For general questions the agreement was slightly higher at 92 percent. Questions about specific traits registered 87 percent agreement. These scores are sufficiently high to indicate that the data is a reliable representation of the case studies.

The final step in this method consists of analysis of the resulting data. The IFC network data were analyzed using descriptive statistics and measurements of association. Frequency distributions and

cross tabulations were also analyzed for each of the different types of variables. Chi-square statistics were used to relate impacts to the origins, activities and structures found in IFC networks. Lambda statistics were used in conjunction with cross tabulations to determine the direction of the influence.

The next sections report the findings of this research. For purposes of clarity we *italicize* the names of the variables.

Modeling Impacts

The model used in this analysis reflects the causal assertions put forth in the literature and in policy regarding the launching of IFC networks. One consistent theme is that there are significant barriers to the initiation of networks among small manufacturers. It is argued that firms require common stimuli and traits to successfully develop a network (Lichtenstein, 1992; Pyke, 1994). But they also need an honest broker to help them develop trust among one another and identify the resources critical to a network operation (Hatch, 1988; Rosenfeld, 1995). The ways in which a network navigates the initial stages of operation can have a profound consequence on its success. A second theme is that networks are organized for different purposes. In particular, a distinction is drawn between "hard" networks designed for a specific business endeavor and "soft" networks oriented towards information sharing and human resource development (Cragg and Vargo, 1995). The type of impacts a network can produce varies according to these goals and activities. Finally, it is argued that the outcomes of networks are shaped by how they are organized (Hausler, Hohn, Lutz, 1994; Malecki and Tootle, 1996).

What is not well specified is the variety of impacts that may be produced by a network. We employ two types of measures of impact: business activity by the IFC network, or growth in the IFC network.

² Another concern is deciding what to do if there is more than one case study describing an IFC network. This was an issue with roughly 10% of the cases surveyed. The rule used in this study was to survey the case with the greatest amount of information. This position is consistent with most case study surveys that attempt to summarize the different cases into a single observation.

These variables are nominal measures through which the coder makes an aggregate assessment of the type of impacts found in a case. Impacts are recorded in 97 of the 123 cases. **Table 2** lists the number of cases achieving each kind of impact.

Two variables measure business activity. *Bottom line savings* measured whether or not a network had any effect on firm's profitability. In one-third of the cases, networks produced such contributions for the bottom line of participating firms. *Business expansion* measured whether or not the network generated some new line of revenue-generating activity for the members (e.g. new products or services.) In 46 percent of the cases a new business was launched.

Four variables measured network growth. Networks could experience an *increase in projects*, indicating that the initial project was followed by additional projects. They could also experience *increase in membership* if the number of participants in the network increases over time. *Other benefits* were recorded if there was an expansion in the benefits that participants derived from the network. Finally, they could experience *growth in investment* if members contribute additional resources beyond those agreed to in the foundation of the network.

Impacts are sensitive to the author of the case. For example, USNet/RTS cases were much more likely to report the impacts produced by a network, whereas studies authored by state agencies were the least likely to report impacts. This is largely due to the different purposes for which the narrative was written. USNet/RTS cases were longer and more detailed as befits the needs of training and evaluation. State agencies produced case studies designed for the promotion of networking.

There is a relationship between these impacts. *Bottom line savings* were strongly

associated with each of the growth impacts. However, *business expansion* was associated solely with a growth in the number of projects a network pursues. *Project increases* played a pivotal role in the success of a network. This impact was associated with all other types of impacts. While it was important, the direction of influence between *project increases* and other impacts was statistically ambiguous.

The Factors of IFC Networking: Findings

We examine five models relating IFC networks and impacts. However, there are similarities among these models that make them amenable to clustering into three distinct groups. The models of network impacts are suggestive of several strategies for the effective operation of IFC networks. Not surprisingly, these strategies differ according to the impact that is being pursued. The following are lessons that are drawn from both the statistically significant factors and the hindrance and success factors described in the previous section.

Business expansion presents distinctive managerial challenges to an IFC network. The factors associated with this impact differ from those found in the other impact models. **Table 3** summarizes these factors.

In expanding a business the network must be focused on the commercial endeavor and organized as a for profit operation. There must be a clear market opportunity that brings the partners together. Strong private sector leadership is critical. But what is even better is a strong commitment from each of the participants. Preferably the partnership should be forged among the chief executive officers of the respective organizations. Great attention should be paid at the front end of the project to whether partners have comparable and complementary skills. Procedures for

qualifying network members are helpful in the expansion of a new business and should be applied ruthlessly. Similarly, there must be a clear understanding of each organization's responsibility in the network. It helps if partners already have customers in common.

However, there is less need to spend a great deal of time on the structure of the network. Legal standing as a for-profit enterprise seems to be more important than formalizing the network organization. It is best if the source of on-going monies is from the private sector. However, a mix of on-going funds from the public and private sectors also has a positive, if somewhat less effective, association with business expansion.

In contrast, for growth impacts such as *other benefits* and *increase in membership*, structural variables are critical. **Tables 4** and **5** provide a summary of these findings. The pursuit of these goals requires the creation of a central organization that has a dedicated staff. Networks that employ a flat organizational structure will likely fail to achieve the desired growth. Strong administrative leadership is required to coordinate the efforts of network members. Greater ambiguity can be tolerated in the creation of the network as the members negotiate the extent of activities in which they will engage. However, clear responsibilities and goals need to be specified early on so that the network can cohere.

These impacts tend to be associated with "soft" activities of information sharing, human resource development, and responding to community needs. Requiring members to "buy-in" to the network has been found to create a stronger commitment towards working with each other. Impacts are more likely to be achieved when the on-going funds for the network come from the private sector or foundations. Public funding is

almost never the sole source of on-going funds. Rather they are used as leverage for private sector funds.

Bottom line savings and project increases are affected by a wider range of factors and appear to be a hybrid between these two extremes. Origin and structural factors influence both as is seen in **Table 6** and **7**. Networks seeking these impacts tend to be striving for sustained collaboration. To achieve this end it is important to have positive experiences early in the life of the network. The leadership of a trained broker has been found to be of particular help in networks seeking bottom line and/or project growth impacts. However, it is best that this individual be drawn from the private sector. Public sector initiation by a state agency is more often associated with cases that result in failure. Interestingly, both are associated with previous collaborations, but not in the anticipated direction. For both impacts, previous collaboration does not increase the likelihood of success. Both impacts are helped when there is a strong central organization running network activities and when the sources of on-going funding are from the private sector.

The two types of aggregate impacts - - business activity and network growth -- also differ in some significant ways. Networks seeking a bottom line impact are, in most cases, trying to reduce and control their costs. They are similar to networks expanding a business in a preference for being organized on a for-profit basis. These impacts are more likely to be associated with seed funding that comes from the private sector or foundations. Like other growth impact, project growth is more likely to be facilitated by the presence of a staff dedicated to network activities.

Lessons About the Promotion of Networks

A mixed message emerges from these case studies regarding the role of the public sector in promoting IFC networks. On the one hand, the fact that so many networks have been formed is an indicator of success. The strategy of using small grants to link small firms together through the efforts of network experts seems to produce the desired result. A few of these networks are even beginning to sustain themselves as evidenced by the growth in the number of projects they pursue collectively. Further, there is strong evidence that public sector organizations effectively disengage from the network once it is up and running.

On the other hand, the evidence from the cases indicates that public agencies should avoid being the primary initiator of networks. In such cases, the likelihood of achieving a successful impact is low.

On the surface, the findings appear to suggest that public agencies should avoid initiating networks at all. In most cases, networks built through such efforts fail to record any impact. However, this negative relationship reflects a bias in the case studies themselves: the cases authored by state agencies as a rule do not provide detail on impacts. State agencies write case studies within a year and a half of the initiation of the network and so are less likely to be in a position to report results.

This study is less ambiguous in recommendations regarding the management strategies for promoting IFC networks. Perhaps most importantly, this study finds that the factors that produce successful networks vary with the type of impacts being sought. This argues for flexibility in the implementation of programs to account for these different objectives.

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Table 1: List of Variables

Origins	Activities	Structures	Impacts
Stimulating problems: Defense conversion Declining markets Stimulating opportunities: Collective efficiencies Market opportunities Bases of firms' commonalities: Same industry Shared customers Shared suppliers Proximity Technology Defense conversion Initiator: Private sector: Private firm Private consultant Key supplier Key customer Public sector: Local agency State agency Federal agency University Technical college MEP Not-for-profit: Geographic location Previous collaboration Seed funding: Public Private Mixed public/private Foundation Unknown	Information sharing Business contacts Direct cost reductions Quality development Human resource development Marketing or sales Facilities sharing Product, process development Community needs Other impacts Activities: Software Hardware	Types of participants: All private firms Public and private Size of participant firms: Medium or large All small firms Mix small/ large Number of participants Source of on-going funds: Public Private Mixed public-private Foundation Network structure: Central Hub Flat organization Unknown Network staff Frequency of interaction Type of lead organization Legal status of network	Bottom line savings Business expansion Increase in projects Increase in membership Increase in investment Other benefits

Table 2. The Number of Cases Reporting Impacts and Their Authors

	Business Expansion	Bottom Line Savings	Project Increase	Membership Increase	Other Benefits
Cases reporting Impacts	57	41	67	46	55
% USNet/RTS	37%	46%	36%	33%	45%
% State Agency	21%	5%	10%	11%	18%
% Consultants	28%	24%	33%	37%	24%
% University	14%	25%	21%	19%	13%

Table 3. Business Expansion Model

Factors		χ^2	Significance	Direction of Influence	
Origin Factors	Market Opportunities	11.906	.001	+	
	Shared Customers	11.837	.001	+	
	Private Firm Initiation	9.588	.002	+	
Activity Factors	Information Sharing	8.780	.003	-	
	Marketing and Sales	13.683	.000	+	
	Hardware	8.445	.004	+	
Structural Factors	Sources of Funds	17.486	.002	+	Private Sector
	Legal Status	16.566	.001	+	For profit

Table 4. Increase in Membership Model

Factors		χ^2	Significance	Direction of Influence	
Origin Factors	Local Agency Initiation	7.814	.005	+	
	State Agency Initiation	8.401	.004	-	
Activity Factors	Human Resource Activities	10.903	.001	+	
Structural Factors	Frequency	10.770	.005	+	
	On-going Funding	29.797	.000	+	
	Source of Funds	29.103	.000	+	Mixed & Foundations
	Network Staff	19.863	.000	+	
	Network Structure	12.396	.000	+	Central Organization

Table 5. Other Benefits Model

Structural Factors	χ^2	Significance	Direction of Influence	
Size of Participants	12.054	.002	+	Mixture of Sizes
On-going Funding	20.669	.000	+	
Source of Funding	24.864	.000	+	Private and Mixed
Network Staff	9.044	.011	+	
Network Structure	18.157	.000	+	Central Organization

Table 6. Bottom Line Savings Model

Factors		χ^2	Significance	Direction of Influence	
Origin Factors	Shared Suppliers	9.164	.002	+	
	Initiators	28.540	.000	+	Firm and Not for Profit
	Private Sector Initiation	8.699	.003	+	
	Public Sector Initiation	11.466	.001	-	
	State Agency Initiation	9.359	.002	-	
	Previous Collaboration	15.760	.000	-	
	Seed Funding Source	19.306	.001	+	Private Sector
Activity Factors	Direct Cost Reduction	7.142	.008	+	
Structural Factors	On-Going Funding	13.260	.001	-	
	Source of Funds	26.178	.000	+	Private Sector
	Network Structure	21.336	.000	+	Central Organization
	Legal Structure	11.736	.008	+	For Profit

Table 7. Project Increase Model

Factors		χ^2	Significance	Direction of Influence	
Origin Factors	Firm Initiated	9.594	.002	+	
	Public Sector Initiated	7.307	.007	-	
	State Agency Initiated	14.176	.000	-	
	Previous Collaboration	13.753	.001	?	
Structural Factors	On-going Funding	25.615	.000	+	
	Source of Funds	30.241	.000	+	Private, Foundation, Mixed
	Network Staff	9.896	.007	+	
	Network Structure	24.716	.000	+	Central Organization