

# The SAGE Handbook of Strategic Supply Management

## Strategic Alliances between Buyers and Suppliers: Lessons from the Medical Imaging Industry

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## Chapter 5: Strategic Alliances between Buyers and Suppliers: Lessons from the Medical Imaging Industry

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### Abstract

The previous chapter examined inter-firm relationships from a theoretical and conceptual perspective. In this chapter the authors examine more formal relationship coordination through alliances. Building on the strategic perspectives of industrial organization and the resource-based view of the firm, the more recent strategic perspective of relational advantage is explored. The chapter takes a practical approach to examine alliances designed to reduce costs in healthcare product innovation, specifically focussing on strategic alliances between global medical imaging corporations and hospital systems and multi-specialty physician clinics in the US. It looks at the historical development of buyer–supplier alliances in the healthcare industry and, through empirical research of the focal alliances in medical imaging, draws out lessons for industry and supply chain management research.

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### Keywords

Strategic alliances, medical imaging, hospital systems, buyers, suppliers

# Introduction

This chapter deals with three broad, interrelated issues. First, it analyzes fledgling alliances to unite buyers and sellers in the fragmented healthcare industry. Alliances seek to coordinate formally relationships left previously to the market in order to access complementary resources, share risks and rewards, share technology and innovation, and develop new capabilities. The alliances studied here seek to transform the buyer–supplier relationship from selling more product (supplier goal) and lowering unit product cost (buyer goal) to fostering new product development for sellers and developing solutions for buyers’ operational problems.

Second, it builds upon two traditional strategic perspectives that are based on industrial organization (Porter, 1980) and the resource-based view of the firm (Wernerfelt, 1984; Barney, 1991) to apply a third perspective that deals with relational advantage (Dyer and Singh, 1998). The alliances studied here constitute an important experiment to develop value chains (or value nets) which foster competition between rival buyer–seller dyads. For buyers, local market competition is transformed from buyer vs. buyer rivalry *to* competition based on each buyer's differential advantage derived from its supplier alliances. For sellers, competition is transformed from the seller's own product development and sales activity *to* the seller's enhanced innovation and sales due to its buyer alliances.

Third, it analyzes alliances designed to reduce the rate of increase in the cost of healthcare. Technology acquisition and utilization costs comprise the fastest growing component of healthcare expenditures in the US (Burns, 2005). Continuing product innovation in large capital equipment such as medical imaging threatens the capital budgets of hospital systems. Alliances can promote not only bundled purchasing of expensive equipment but also additional cost-saving elements such as bundled service agreements and technology upgrades. At the same time, the majority of hospitals lack electronic connectivity among their clinical departments. Information and data archival systems hold out the promise of clinical integration and faster decision-making.

The chapter explores these three issues by analyzing the emerging strategic alliances between large, global imaging companies (General Electric (GE), Siemens) and hospital

systems and multi-specialty physician clinics in the US. These alliances originated in the early 1990s and gathered momentum in the new millennium. The chapter's content is based on executive interviews conducted with both sellers and 17 large hospital and clinic buyers. In the [p. 109 ↓ ] following sections, we outline the functions performed by strategic alliances, the history of buyer–seller alliances in the healthcare industry, the focal alliances between imaging companies and US hospital systems, and the lessons learned for both industry firms and scholars of supply chain management.

## Functions Performed by Strategic Alliances

### General Literature on Strategic Alliances

A strategic alliance is defined as a collaborative organizational arrangement that draws on resources or governance structures from two or more firms. Such alliances have several important characteristics. The partnering firms remain independent; they nevertheless have some degree of interdependence or vulnerability; they consequently erect some form of shared governance to manage the alliance; and there is some uncertainty and lack of control over what the other partner to the alliance may do (Inkpen, 2001).

Strategic alliances have been viewed from multiple perspectives in the literature. First, they have been viewed in terms of access to complementary resources for firms to address the demands of discontinuous change in their environment; Teece (1986) addresses this issue from the point of view of commercializing innovation. A variation of this idea involves vertical alliances, whereby firms partner with suppliers and customers to create more effective extended enterprises; Dyer (1996) studies this in detail in the context of the automobile industry. A second perspective addresses questions of opportunistic behavior on the part of alliance partners, and the need for dealing with opportunism through superior contracting; Williamson (1981) originated this view, now known as the transaction costs perspective on alliances. Third, methods of reducing the failure rate of alliances have been studied; Kale et al. (2002) advanced the idea of relational capability or alliance capability to explain differential success of firms.

According to the academic literature, strategic alliances between firms can serve several functions. Perhaps the primary alliance function is to enable firms to access complementary resources and skills in other companies in fast and flexible ways (Teece, 1986; Dyer et al., 2001). In environments impacted by discontinuous change (such as a radical innovation), no firms have the appropriate resource profile to compete effectively. In such circumstances, firms seek partners with complementary resources to configure effective value chains. In this manner, firms can seek to create economic value without incurring the costs of acquisition or losing the time value of returns foregone as they attempt to build the required resources internally.

The idea of alliances providing access to complementary resources and capabilities (first proposed by Teece, 1986) has been generally accepted as a useful guide to decision-making. A challenge in the empirical context is for firms to find **[p. 110 ↓ ]** complementary partners with a good fit; in many instances firms have unique resource profiles and there are varying degrees of fit and misfit in these profiles. But as an ideal condition driving the formation of alliances, complementarity of assets and capabilities is certainly a useful guideline.

Although there are positive factors driving the creation of alliances, such as access to complementary technologies, products or market positions, implementation is often affected by concerns about opportunistic behavior on the part of an alliance partner. Examples of such behavior include misappropriation of intellectual property gained from the partner, or concerns about leakage of specialized knowledge to other operations of the partner. In instances where the alliance partners compete in other areas, there are concerns about the creation of a stronger competitor as a result of partnering with the firm. Williamson (1981) raised and addressed some of these concerns in his seminal work on alliances created in the face of transaction costs (costs associated with managing the transaction between the firms in the face of uncertainty and opportunistic behavior). The idea is that among the various forms of interaction between firms (an arms-length market transaction, an alliance, or an acquisition), decision-makers tend to incorporate an assessment of the costs of working with the partner in each arrangement. The main value of this perspective is to help the decision-maker recognize that alliances are choices between alternative modes of transacting between the firms, and that opportunism is to be recognized and dealt with in such transactions.

The third perspective addresses the processes through which a firm becomes a more competent or more desirable partner. There is evidence that a firm's stock price jumps with just the announcement of a new alliance, particularly if it has a well-established function to accumulate knowledge and expertise in managing alliances (Kale et al., 2002). The actual creation of such value occurs by means of other alliance functions. One of these functions is to improve coordination between firms previously engaged in arms-length market transactions. Thus, for example, firms may co-locate capital and/or human capital assets to increase productivity, reduce spatial and temporal frictions, and improve communication and product design. Another alliance function is to promote sharing between firms, e.g. shared risks, costs, and rewards. For example, some alliances entail equity investments in the partner's firm or mutual investments in a joint venture. Even if there are no financial investments, the partnership can promote sharing of knowledge assets in the form of research and development (R&D) alliances. In such non-equity alliances, there is managed cooperation to share technological or other innovative activities. Such cooperation can result in new product development, the development of new strategic capabilities, and knowledge transfers that promote learning from the other partner to improve internal operations or speed up strategic implementation activities. Finally, strategic alliances can serve more qualitative ends such as capitalizing on the partner's reputation, improving the firm's market position vis-à-vis competitors, and reducing competitive uncertainty.

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Results from empirical surveys of employers engaged in alliances confirm these rationales. According to a 1997 Coopers & Lybrand survey, a majority of employers mention that they enter alliances to help their firms to improve competitive position (77 per cent of respondents), increase sales of existing products (77 per cent), create new products or business lines (76 per cent), and improve operations or technology (71 per cent). A near majority state that alliances also help to improve employee skill sets (48 per cent) and decrease the cost of existing operations (44 per cent). Despite the above rationales and presumed benefits of alliances, their track record is quite mixed. Most studies report that roughly half of alliances end up failing (Kogut, 1989; Bleeke and Ernst, 1993; Madhok and Tallman, 1998). In fact, a study by McKinsey suggests that two-thirds of alliances experience serious problems in their first two years.

What explains the relative lack of success with alliances? The functions that alliances are to perform and the benefits they are to produce depend heavily on the participating firms' capabilities in working together. According to Dyer et al. (2001), the alliance partners must build a dedicated strategic alliance function that performs four key roles: improving knowledge management (e.g. create a focal point for alliance learning, share tacit knowledge), increasing external visibility (e.g. signal the alliance partner's capability to the marketplace), providing internal coordination (e.g. mobilize internal resources to support the alliance), and facilitating intervention and accountability (e.g. develop metrics to assess alliance performance). In a similar vein, Vantage Partners (Ertel et al. 2001) identified 10 alliance capabilities critical for success (e.g. dedicated alliance managers, audit alliance relationships, manage changes that affect the alliance, etc.). Finally, academic research on alliance effectiveness suggests that success is based upon investments in relational capital, the formation of conflict resolution mechanisms, and the presence of prior alliance experience (especially with the current partner).

## Literature on Buyer–Supplier Alliances

Alliances between buyers and suppliers (i.e. adjacent upstream and downstream firms in a supply chain) are a subset of general strategic alliances. The literature on such alliances is industry-specific. For example, Dyer (1996, 2000) investigated alliances between US automakers and their component suppliers. Sims et al. (2001) analyzed Eli Lilly's alliances with small pharmaceutical and biotechnology firms that supply many of its new molecules. Despite the industry focus, the findings from these studies parallel one another and the results summarized above.

Chrysler formed alliances with a reduced number of suppliers that promised greater volume in exchange for lower input prices. However, the alliances went much further than simply group buying. Chrysler also involved suppliers in product development and process improvement, getting them to take responsibility for product quality, for inventory reductions, and just-in-time delivery of parts. [p. 112 ↓ ] To do so, Chrysler moved away from competitive bidding of contracts and gave suppliers the equivalent of long-term contracts (the life of the auto model). It then developed mechanisms to work with suppliers to reduce procurement (transactions) costs, lower total costs, and share the savings. To do so, Chrysler incorporated the suppliers' engineers on its own product



development teams, made visits to its suppliers' sites, developed a joint advisory board and common email system, and established annual meetings with all suppliers. For their part, suppliers adopted Chrysler's software systems and made investments in assets dedicated to the relationship with the automaker.

Eli Lilly formed alliances with its suppliers to develop new capacities, capabilities, and resources. It fostered alliance success by institutionalizing such activities in an office of alliance management, a dedicated alliance management team, and a formalized alliance management process. The process included educating the firm about the alliance, developing the alliance's governance, tools to gain consensus on the alliance's strategic intent, tools to select the appropriate alliance partners, efforts to foster strong interpersonal relationships across partnering firms, metrics to measure alliance health on an ongoing basis, and a database to codify the alliance lessons learned.

## Buyer–Supplier Alliances in the Healthcare Industry

Buyer-supplier alliances are a recent phenomenon in the US healthcare industry. Evidence suggests they are neither widespread nor successful. During the late 1980s, product sellers attempted to develop an array of strategic alliances with hospital systems. Some large diversified sellers (e.g. Johnson & Johnson, Baxter) developed product bundles for their large hospital customers in an effort to cross-sell products and develop one-stop-shopping convenience. Such 'prime vendor' contracts simplified contracting with umbrella agreements, reduced the number of suppliers with which a buyer needed to contract, reduced the amount of buyer time and effort spent on contract negotiation, and promoted greater stability in buyer–supplier relationships by promoting longer-term contracts. They served the supplier's interest by increasing overall sales and by tying together the sale of higher- and lower-volume products (i.e. increasing the sales of products with lower market share).

In a similar vein, group purchasing organizations (GPOs) that negotiated large volume contracts for supplies at discounted prices on behalf their hospital members developed 'national contracts' with one or two suppliers. Such contracts, known as sole-source

and dual-source agreements, sought to channel as much committed buyer purchasing through a small number of suppliers at lower cost. These contracts were also longer-term in nature and served to increase stability in buyer–supplier relationships. Suppliers viewed them as a vehicle to engage their clinician (not just hospital) customers over the longer term (Cassak, 1989a). [p. 113 ↓ ] The GPO buyers viewed them as a vehicle to leverage the resources of their supplier partners to develop a wide range of services that could reduce costs and increase productivity of their hospital members (Cassak, 1989b).

Both efforts – prime vendor contracts and sole-source national contracts – sought to transform buyer–supplier contracting. Traditionally, this contracting was conducted on a transactional basis whereby buyers promised higher purchase volume for lower unit cost. The contracts were typically one year in length, were competitively bid, and were line-item focussed. In contrast, the new contracts aspired to a partnership-based model whereby price was merely a starting point and the ultimate end was value-added for both sides, e.g. reduced transactions costs for buyers and access to the supplier's solutions and capabilities, and a broader array of products and services rendered by the supplier.

These efforts reached their pinnacle with the formation of Columbia/HCA in 1993–1994. Columbia/HCA was at once the largest (investor-owned) hospital system and the most aggressive GPO. Due to its ownership of hospitals and a centralized information system, the system closely monitored all supply invoices and enforced purchasing discipline among its hospital members. It embarked on a strategy to rationalize all purchasing through sole-source contracts which promised suppliers their highest levels of hospital compliance in return for markedly reduced prices. Columbia/HCA sought to extend such contracts across multiple product lines, and to incentivize suppliers to help its member hospitals to reduce their costs over time. Columbia/HCA also combined the existing practices of product bundling with sole-sourcing to develop bundled, sole-source contracts.

Typically, hospital and GPO contracts focussed on the more commodity type medical-surgical products such as drapes, linens, gloves, etc., made by diversified suppliers. These contracts encountered problems when they attempted to extend to encompass 'physician preference items' (PPIs) such as medical devices where clinicians preferred

specific vendors based on past training, current research, or financial relationships. In such cases, the variation in physician preferences inhibited sole- or dual-source contracting. Hospitals and their GPOs were forced to contract with a broad range of suppliers that enabled their clinicians to access products on a 'best of breed' basis.

These contracts encountered additional problems by the time of the new millennium. These problems were both external and internal to the contracts. Externally, small suppliers complained that the bundled, sole-source contracts with large, diversified vendors excluded them (and their innovative products) from the marketplace. Their complaints were publicized in a series of articles in the *New York Times*, a series of investigations by the Government Accounting Office (GAO), and a series of hearings by the US Senate during 2002–2005. Internally, suppliers complained that the majority of GPOs (mostly non-profit consortia of independently owned hospitals and hospital systems) were unable to deliver the higher compliance levels promised in exchange for lower pricing. GPOs discovered that their large, diverse hospital members had varying preferences [p. 114 ↓ ] for suppliers. Moreover, GPOs found that hospital systems developed their own contracts with suppliers independently and achieved lower pricing by leveraging the GPO's contracted price and promising more compliance within the local hospital system.

Burns et al. (2002) examined the trading relationships between multiple, adjacent firms in the healthcare supply chain: different upstream product manufacturers (pharmaceutical firms, medical device firms, medical–surgical suppliers, etc.), wholesalers, GPOs, and downstream hospital systems. Their research found that the word 'partner' does not exist in the supply chain for several reasons, most notably a lack of trust among buyers and sellers. Schneller and Smeltzer (2006) argue that trust is a critical ingredient of these alliances. This lack of trust stems largely from (1) the hospital buyer's perception that product suppliers are primarily interested in selling as much product as they can for as high a price as they can, and (2) the seller's perception that hospital buyers try to hammer them solely on unit price without considering total cost and that they lack the information and internal coordination to be a true supply chain partner.

The healthcare supply chain has also developed other alliances between upstream and downstream trading partners. While US hospitals have traditionally outsourced

many functions to firms in the marketplace (i.e. choosing to buy rather than to make in-house), some institutions have completely outsourced all warehousing and product distribution functions to wholesalers such as Cardinal Health and Owens & Minor. In a similar manner, US hospitals have also outsourced many of their purchasing functions to GPOs (Schneller and Smeltzer, 2006). These contractual arrangements bear many characteristics of strategic alliances (e.g. monitoring, trust, etc.).

## Alliances between Imaging Companies and us Hospital Systems

The medical imaging industry in the US is dominated by three large firms: GE, Siemens, and Philips (Gulati, 2002). In 2005, sales of imaging devices in the US amounted to roughly \$8.1 billion, or roughly 7 per cent of total medical device sales of \$108 billion (Iglehart, 2007). Given such expensive equipment made by high-profile firms, it should not be surprising that this sector of the medical device industry has attracted considerable academic attention (Steinberg et al., 1987; Trajtenberg, 1990; Kevles, 1997; Gelijns and Rosenberg, 1999; Iglehart, 2006).

During the mid-1990s, large imaging manufacturers began to develop strategic alliances with a handful of hospital systems (many of them academic medical centers) and multi-specialty physician clinics. By the new millennium, such alliances became a prominent component of the manufacturers' strategy for sales, marketing, and product development – both in the US and in Europe (Crawford, 2007). Many of the alliances were noted or described in brief stories in trade [p. 115 ↓ ] journals as they were developed (Piotrowski, 2002; Abelson and Freudenheim, 2004; DeJohn, 2005; Deutsch, 2007; Evans, 2007; Ledger, 2007; Gadiesh et al., 2007); they have not been formally analyzed by researchers, however. One such alliance developed at the University of Pennsylvania Health System (a system of three hospitals, including an academic medical center), which permitted the researchers to gain an early view of the burgeoning partnerships. These alliances exhibit some of the same characteristics as the earlier supplier alliances with hospital systems and GPOs described above, and perform many of the same functions.

## Study Methodology

In 2006, we contacted executives at the three largest imaging manufacturers – General Electric Healthcare (GE), Siemens Medical Solutions (Siemens), and Philips Medical Systems (Philips) – to elicit their participation in an academic study of their partnerships with hospitals. Hospitals are by far the largest users of imaging equipment (62 per cent), and thus are the appropriate partner for studying buyer-supplier alliances. The goal of the study was to understand alliance formation, alliance goals, alliance structure and governance, keys to alliance success and stumbling blocks to alliance performance, and alliance benefits for both parties. Two of the three manufacturers (GE, Siemens) agreed to participate. They represent the top two firms in terms of total US market share (36 per cent and 26 per cent, respectively) and dominate the markets for most modalities of imaging equipment (Bos and Willi, 2006).

The two firms nominated their own executives and those at their hospital alliance partners for purposes of conducting interviews. They asked the researchers not to identify their partners by name, however. We succeeded in contacting the majority of their alliance partners and invited them to participate in the study. Of the 14 partners nominated by GE, eight (57.1 per cent) agreed to participate; of the 13 partners nominated by Siemens, nine (69.2 per cent) agreed to participate. All interviews were conducted during April-June 2006.

The interviews followed a structured protocol developed by the researchers. The protocol included questions on the following topic areas:

- Types of alliances
- Clinical areas and modalities covered by alliances
- Date of alliance origin
- Pull vs. push factors in alliance formation
- Strategic intent of alliances
- Structure of alliance: contractual and financial arrangements
- Alliance governance mechanisms
- Metrics for evaluating alliance performance
- Alliance areas working well

- Sources of alliance problems and frictions
- Tangible and intangible benefits of alliances
- Remaining issues to consider

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The specific questions were developed after an in-depth study of one alliance by the researchers based on interviews with the hospital, analysis of primary source documents from the alliance, and an external assessment of the alliance by a consulting firm. The same questions were asked of both the imaging suppliers and the hospital buyers. As noted in the sections below, the two sets of informants often gave different answers and provided different perspectives.

## Types of Alliances

Imaging manufacturers have developed two types of partnerships with their hospital customers. The first type encompasses 'research alliances'. In these alliances, the manufacturer contributes a significant amount of equipment, research personnel, and some research funding to the customer site. The equipment often includes the latest technologies, such as positron emission tomography (PET) scanners; 64- or 128-slice computed tomography (CT) scanners; 3 Tesla (3T), 7 Tesla (7T), and 9.4 Tesla (9.4T) magnets for magnetic resonance (MR) imaging; cyclotrons; and magnetic resonance spectroscopy. The equipment is offered under a variety of terms, including lease recapture arrangements, consignment, steep price discounts, or free donation. In addition to the equipment, the manufacturer may contribute its own scientists (e.g. physicists), programmers and computer experts, and service representatives. The manufacturer may also pay the hospital for its expenditures in salary support for scientists and clinical radiologists, data collection, and space rental. For its part, the hospital's research personnel work with the manufacturer's scientists on mutually agreed research projects, typically focussed on developing the next-generation technology. Intellectual property from such inventions may be shared between the two partners; the most important piece of this intellectual property for the hospital is the academic research papers jointly published by the two parties.

The second type of partnership encompasses 'equipment and service alliances'. Here the manufacturer sells the hospital a broad array of equipment across multiple modalities (e.g. CT, MR, PET-CT, ultrasound), typically with multi-year agreements for service and technology upgrades. These alliances can include other modalities (e.g. information systems, such as computerized physician order-entry) and non-modality items as well (e.g. service on biomedical equipment, such as pumps, scopes, and respirators). The manufacturer often locates service representatives on site at the hospital to deliver repairs and maintenance in an effort to minimize equipment downtime (levels often measured in multi-year service contracts). The manufacturer may also designate a high-level strategic account manager to oversee the alliance. For its part, the hospital often agrees to buy a certain percentage (e.g., 80 per cent) of its technology from that manufacturer as part of a committed purchasing agreement, unless the manufacturer does not manufacture that specific modality. The hospital may also serve as a clinical show site for the manufacturer's latest technology that other hospitals may visit, often committing physician time along with site access.

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A handful of hospitals have both types of alliances with the manufacturer. Such hospitals tend to be large academic medical centers (AMCs) with research programs funded by the National Institutes of Health (NIH). AMCs and their university settings serve as the source for most of the new ideas and advances in imaging technology. This is because the advances rest upon a marriage of multiple disciplines, including engineering, applied physics, applied mathematics, and biology, along with massive amounts of computing power. Due to the complicated nature of the technologies, however, academe has increasingly relied on industry partners to assemble the bits and pieces of technology (Iglehart, 2007).

In the past few years, imaging manufacturers and their hospital customers have imposed some separation and firewalls between these two types of alliances. The move was occasioned by investigations conducted by the US Department of Justice and the Office of the Inspector General (OIG) in the Department of Health and Human Services into ethical business practices in several technological sectors of health care, including pharmaceuticals and (more recently) orthopedic and cardiac devices. Much of these investigations have focussed on conflicts of interest and adherence to the Federal

Government's anti-kickback statutes and false claim laws, and have led to restrictions on the size of industry gifts.

In 2004, electronic manufacturers (including medical imaging firms) sought to proactively get out in front of this movement. The National Electronic Manufacturers Association developed a code of ethics for business dealings with health care providers (NEMA, 2004). The code requires that the imaging firm personnel who make decisions regarding research funding be independent of sales and marketing staff. Moreover, the manufacturer cannot provide research funding in exchange for large equipment deals. Any research requests or research funding should be handled in accordance with the OIG's Compliance Guidance for Pharmaceutical Manufacturers (68 Federal Register 23,731); research should also have well-defined milestones and deliverables contained in a written agreement. State Attorney Generals may also scrutinize these agreements.

## Clinical Areas and Modalities Covered by Alliance

Quite naturally, the equipment alliances with imaging vendors typically focussed on the hospital's department of radiology. 16 of the 17 sites interviewed for this study noted that the alliance covered this clinical area. Imaging modalities encompassed in vendor-hospital contracts usually included x-ray, MR, and CT, with some sites acquiring PET-CT. Other clinical areas, such as cardiology (e.g. imaging machines and monitors in the cath lab suites) and radiation oncology (e.g. linear accelerators), were less likely to be covered by the alliance (7 of 17 sites, 4 of 17 sites, respectively), as were other modalities (e.g. ultrasound). [Table 5.1](#) lists the worldwide market shares for the three major vendors in each of these modalities.

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*Table 5.1 Imaging vendor market shares, by modality (2004 worldwide share)*



Vendor	X-ray	CT	MR	PET	Ultra-Sound	PACS	% sales in US
General Electric	26	40	31	45	35	26	55
Siemens	17	23	28	45	24	10	46
Philips	17	18	28	10	22	18	53

Adapted from: Bos and Willi (2006). CT: computed tomography; MR: magnetic resonance; PET: positron emission tomography; PACS: picture archiving and communication systems.

In addition to radiological equipment, alliances commonly included picture archiving and communication systems (PACS, 11 of 17 sites) and radiology information systems (RIS, 7 of 17 sites). On the service side, the alliances commonly included equipment service and maintenance (11 of 17 sites) and consulting (7 of 17 sites). Revenues from services comprise a large percentage of revenues at each of the three major vendors (GE: 30 per cent; Philips: 27 per cent; Siemens: 20 per cent) and an even higher profit margins compared to equipment sales.

*Table 5.2 Alliance type and date of origin*

Hospital	Vendor	Research alliance	Equipment alliance	Date of origin
1	GE	X		1980s
	Siemens	X		2003
2	GE		X	1990s
	GE	X		2000s
3	GE	X		1994
4	GE		X	1994
5	Siemens		X	1994
6	Siemens	X	X	1994–1995
7	Siemens		X	1999
8	Siemens		X	2000–2001
9	GE	X	X	2002
10	Siemens		X	2002
11	Siemens	X	X	2002
12	Siemens	X	X	2002
13	Siemens	X	X	2002
14	GE		X	2004
15	Siemens	X	X	2004
16	GE	X		2005–2006
17	GE	X	X	2005–2006

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## Date of Alliance Origin

Table 5.2 describes the 17 alliances studied here according to their partnership type and date of origin. The table reveals four interesting findings. First, both types of alliances are popular. A slight majority of alliances are for equipment and service, rather than for research, however. This likely reflects two facts: most hospitals in the United

States are community hospitals and not large AMCs, and lots of community hospitals (and hospital systems) do diagnostic imaging and thus are targets for equipment alliances. Indeed, new technological advances have diffused quickly from the AMCs to the community hospital setting. Second, while most of the early research alliances were struck by GE, Siemens has recently developed its own research alliances. This pattern may reflect GE's longer-running interest in industrial management systems and processes, compared to Siemens' engineering thrust and its focus on products and the capabilities of its products.

Third, the equipment alliances are more recent in origin than the research alliances. This likely mirrors the spread of bundled purchases by US hospitals and their GPOs during the late 1990s. Fourth, the majority of alliances are recent in origin, with 11 of the 17 dating back only to 1999. Thus, the lessons to be gleaned from these alliances to date are likely to be preliminary. Moreover, our ability to discern successful from unsuccessful alliances, and the reasons for the degree of success obtained, is likely to be constrained.

## Pull vs. Push Factors in Alliance Formation

Alliances were not predominantly 'pushed down' by manufacturers onto hospitals. Rather, the majority of alliances developed as hospital customers 'pulled down' the new relationships in order to solve emerging business and operational problems. For example, the investor-owned hospital chain Columbia/HCA decided to outsource the service for its entire diagnostic imaging and biomedical equipment to one imaging vendor in 1996. The hospital chain embarked on this course as part of its drive for national operating efficiencies and sole-source contracting for supplies. Non-profit hospital systems, on the other hand, asked imaging vendors to enter into these alliances as vehicles to tap the latter's engineering expertise to solve workflow problems and/or to address financial distress issues as hospitals unwound their integrated delivery system components. As these types of relationships emerged, manufacturers dedicated account executives and enterprise teams to manage them.

At the same time, certain vendors such as GE were engaged in corporate-wide strategies that fit well with alliance formation. Under the leadership of Jack Welch,

GE's corporate businesses diversified from products into services, which accounted for 70 per cent of GE revenues by 2002. Jeffrey Immelt, Chief Executive at GE Medical Systems (later renamed GE Healthcare), and his successor Joe Hogan elevated the importance of 'services' (e.g. delivery/installation/maintenance, [p. 120 ↓ ] biomedical engineering, consulting) to the same level as the imaging equipment it sold. GE Medical restructured itself into two divisions (equipment sales, service) to reflect the growing importance of services provided to the customer.

To be sure, not all of the partnerships developed strategically. Some alliances were precipitated by specific events, such as the construction of new buildings or imaging centers, which made equipment alliances more sensible. Others developed naturally out of long-standing patterns of using that particular vendor's equipment. Still others developed when an executive or clinician at one hospital that had such an alliance changed positions to another hospital and brought the alliance concept along.

## Strategic Intent of Alliances

Why did the alliances form? The answer depends on who you ask. Our study elicited answers from both the manufacturers and the hospitals. Their responses illustrate important differences in the perspectives and goals of the two sides.

## Manufacturers' Views

Manufacturer respondents pointed out the transition in vendor thinking in the 1990s from 'sell what you make' to 'sell who you are'. Rather than manufacturers trying to sell as much product to hospitals as they could and hospitals trying to leverage their size to get the lowest prices that they could, the business proposition of the relationship changed to one of looking for mutual value. In addition to higher volume or best price, the two sides now looked for a partnership.

For their part, manufacturers wanted to tap the product development capabilities and insights of AMC researchers and collaborate with them in order to invent the next-generation imaging equipment and leap-frog their competitors. They also wanted to

increase their penetration of the hospital's imaging equipment spend and the local market. Such penetration, especially among prestigious AMCs, served to increase the vendor's national reputation and to promote new sales from site visits to that AMC and its installed base of leading-edge equipment.

According to manufacturers, hospitals wanted to tap the technical and consulting expertise of the manufacturers, particularly in areas of workflow redesign and process re-engineering. For example, some hospitals wanted GE to transfer its best practices to the hospital setting and make health care more efficient. Moreover, hospitals wanted the manufacturers to assist them in technology planning over an extended horizon and help them to get the most out of their limited capital equipment budgets. By helping the hospitals in their own local market, manufacturers felt that their local business would grow along with the hospital. This explains why manufacturers chose to partner with AMCs and leading hospital systems (typically the 'players' in the local market).

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## Hospitals' Views

Similar to the manufacturers, hospital respondents mentioned the need to tap the expertise of the vendor's physicists and engineers in order to develop new prototype equipment. Hospitals also mentioned the need to tap the manufacturers' expertise in process re-engineering to make patient workflow more efficient and improve utilization of the technology acquired.

In contrast to the manufacturers, hospital respondents were more likely to emphasize the importance of additional price discounts for large purchases of expensive equipment – discounts over and above what the hospitals' GPOs could negotiate. The alliances also helped the hospitals to secure discounts on consulting and equipment service contracts that have been a growing source of vendor revenues and a strong component of vendor profit margins.

Hospital respondents were also much more likely to mention the importance of new technology to keep their various clinical programs at the forefront of medicine. Hospitals

reported almost uniformly the goal of getting the latest equipment ahead of competitors (both locally and nationally). Getting the latest stuff at the fastest speed meant national prestige, site visits from other facilities, a boost to patient referrals and clinical revenues, improved diagnostic capabilities in patient care, possible designation as a center of excellence, advantage in obtaining outside grants, vendor-funded research projects and academic papers on the latest technology, and, oftentimes, new buildings and research centers in which to house all the new equipment. Some research projects focussed on invention (e.g. development of new radiopharmaceuticals for targeting cancer therapy). Other research projects focussed on evaluation of high-profile surgical interventions (e.g. using the new 64-slice CT device to do a 'triple rule-out CT scan', which rules out the three most dangerous causes of chest pain in patients in the hospital's emergency room).

Finally, hospital respondents mentioned the importance of educational goals such as training more nuclear medical technologists and establishing programs for advanced imaging, as well as an unofficial 'open kimono' policy that afforded hospitals a view to the manufacturer's product pipeline. Hospitals sought training support to increase supply in areas of technician shortage, while pipeline visibility was designed to improve hospital forecasting of what technologies might need to be budgeted for and acquired in the future.

## Alliance Structure: Contractual and Financial Arrangements

The alliances are typically structured as multi-year agreements (3, 5, 7, or 10 years in duration) for equipment, research, and/or service. Agreements for specific modalities and for equipment warranties may be much shorter (1 or 2 years) to avoid technological obsolescence. Some alliance contracts include evergreen clauses that require the vendor to upgrade the equipment to state-of-the-art on a regular basis. Some contracts are renewed and modified several times over their term to achieve the same end.

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The equipment contracts are typically exclusive. The manufacturer can invoke its 'right of first refusal' if it makes equipment that is comparable to what the hospital wants to buy elsewhere. However, the hospital has the right to buy from another vendor if the alliance partner does not make the desired equipment or cannot deliver it in a timely fashion. Alternatively, equipment contracts can involve a high percentage of committed purchasing (e.g. 80 per cent), which make them nearly exclusive. Research alliances do not entail committed purchasing agreements for equipment on the clinical side.

Manufacturers can contribute a host of resources to the alliance: research staff and interns, physicists, and equipment technicians (to maintain the equipment base), the equipment itself, some research funding (in true research alliances), equipment service, perhaps building technologies (e.g. lighting, security, etc.), consulting services, and outsourced services as well (e.g. business office, revenue cycle, billing and collections, etc.). In more developed partnerships, the vendor may underwrite a technology innovation center that analyzes the next generation of products in a given modality (e.g. CT), develops patents for those products, develops guidelines and practice methods for using those products, and develops the applications of that technology to advance the practice of medicine. These resources may all be part of a bundled deal or may be contracted for separately. Some recent partnerships also include information services and information technology (e.g. PACS).

For their part, hospitals contribute to the alliance their own set of researchers and clinicians working with the various modalities. Industry–academia partnerships are viewed as one key vehicle for fostering innovation in many medical and biomedical fields (biotechnology, orthopedic devices). Some of the hospitals and multi-specialty clinics that vendors work with are world-renowned for their capabilities in coordinating patient care and managing patient workflow. Vendors likely work with such providers to try to capture and embed the providers' tacit knowledge into the vendors' computers and expert systems (something the providers may not excel at).

According to some of the hospital respondents, the amount of equipment purchased through these alliances (plus enhancements over time) ranges between \$10 and \$45 million. Savings over and above the hospitals' existing GPO contracts are estimated to be in the low single digits (e.g. either \$1–2 million in annual savings, or 2–3 per cent below GPO pricing).

As part of the alliances, manufacturers co-locate their engineers on the hospitals' sites to work closely with hospital researchers, and assign enterprise account managers or account executives to oversee the partnership. Periodic meetings are held to facilitate information sharing, with periodic research reports at the project level made by hospitals to the vendors. The manufacturer and hospital may also exchange their future technology plans (either formally or informally) to see where areas for future partnership and acquisition may lie. Finally, the vendors and hospitals exchange visits to learn what each other is doing, what each other needs and where their product development activities are headed.

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Respondents typically noted the low degree of bureaucratic apparatus accompanying the alliance. For several research and equipment partnerships, there is often no written agreement. The relationship is based instead on 'history and good faith'. Some respondents noted with pride that there were no lawyers, no steering committees, and no conflict resolution mechanisms ('one reason why the partnership works'). Other partnerships had such features. There may also be no commitment to purchase any specified amount or percentage of equipment from the vendor, making it important for the incumbent vendor to continuously deliver a high level of technology and service at an affordable price.

## Alliance Governance Mechanisms

Given the description of alliance structures above, it is not surprising that alliances were also underdeveloped in terms of their governance. Research alliances tended to center around specific research projects and scientists, with little coordinating superstructure. Project-level scientists either worked directly with one another across firm boundaries, or were loosely overseen by project managers from the vendor's marketing and engineering units. More global-level management was often conducted by two-person dyads: a senior physician or executive at the provider site and a senior executive or account executive at the vendor.

Only two of the 17 sites reported having a 'relationship steering committee' consisting of executives from both sides. This committee, which often included the CEO of the vendor, met quarterly to review the alliance's past performance and set the annual operating plan and priorities. Executives reported this committee was key to their alliance's success. Another site reported they were supposed to have a similar committee but that it did not exist. Two other sites reported that they had an executive sponsor at the vendor's global headquarters that oversaw all aspects of the alliance across the vendor's product divisions.

## Metrics for Evaluating Alliance Performance

It should also not be surprising that most alliances also lacked formal metrics for measuring alliance performance. Metrics of any kind were mentioned by only four of the 17 hospital sites. Where they existed, metrics focussed primarily on equipment service (e.g. rapidity and reliability of service, as measured by equipment uptime). Extensive use of metrics was found in only one site which had outsourced many administrative and service functions to the vendor.

Manufacturers were more likely than hospitals to measure performance of their relationships using customer surveys (both externally and internally conducted) and service statistics. External customer surveys that compared the major imaging vendors were conducted by IMV ServiceTrak and MD Buyline. Specific survey criteria in the IMV survey included customer satisfaction with image quality, hardware and software reliability, system ease of use, ability to upgrade technology, installation and training, service engineer performance, help desk [p. 124 ↓ ] telephone support, and effectiveness of problem resolution. Specific criteria tracked by MD Buyline across modalities included system performance and reliability, installation and implementation, applications training, service response time, and service repair quality. Vendors also compiled their own internal service indicators including 'fill rates' (first-time equipment fix rate, percentage of times vendor can supply a part within 6 hours, percentage of times vendor can supply a part by the next day), number of hours to get service person on site, and a host of customer satisfaction measures.



## Alliance Areas Working Well

Hospital respondents were typically positive in assessing their vendor alliances. Several common themes emerged here. First, hospitals perceived there was a true partnership. In research-based alliances, hospitals reported that the scientific collaboration at the project level was generating 'good discovery' and 'good papers'. Some sites had sponsored 'science days' where provider and vendor researchers exchanged what they were doing and explored possible synergies. Research alliances usually enabled the hospitals to get early access to the latest technology, which facilitated not only research grants but also first-to-market with new diagnostic and clinical services. In equipment-based alliances, hospitals felt they were working with quality equipment, quality vendors, and quality people that demonstrated their interest in the provider.

Second, hospitals felt that the level of service had improved as a result of the alliance. In a general sense, hospitals reported that their vendor was very responsive, wanted the hospital's input, listened to them and gave them attention, were willing to help, and were very interested in 'keeping us happy'. More specifically, hospitals were satisfied with local equipment service support, minimal equipment downtimes, efforts to resolve local issues, and the streamlined equipment procurement process.

Third, hospitals reported that much of the alliance's successful performance stemmed from the direct lines of communication they enjoyed with vendor executives who listened and made things happen. As one respondent noted, 'it's all about the people'. These vendor executives included dedicated site representatives, dedicated account managers, and senior executives at the vendor's corporate office. Senior executives, in particular, played an important role. They provided visible support for and commitment to the partnership high up in the vendor's organization; they attended many of the alliance meetings at the hospital site; they offered coaching and benchmarking from other sites; they served as 'orchestra leader' in coordinating personnel from the vendor's different product divisions; and provided quick access to information, answers to questions, and resolution of problems without going through bureaucratic chains of command. In many instances, the direct lines of communication were facilitated by mutual visits by executives to each other's site. In a couple of instances, the direct lines

of communication were also facilitated by the close proximity of the senior executive's home or office to the hospital site.

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Fourth, several hospital respondents mentioned that the relationship was improved by frank, honest dialogue between alliance partners. The subject matter of this dialogue included partner strengths and weaknesses (dealing with products and capabilities), forthright disclosure and discussion of the vendor's technology pipeline, efforts to solicit the hospital's viewpoint on the projects the vendor is working on, efforts to resolve contract ambiguities (e.g. non-obsolescence clauses), and partner mistakes. Such dialogue seems to benefit from a well-functioning committee structure, non-disclosure agreements, efforts taken to resolve problems that arise, and the stability in the vendor personnel assigned to the alliance. Some respondents also mentioned the importance of vendors working hard to change from their traditional sales culture to a solutions-driven relationship.

## Sources of Alliance Problems and Frictions

While hospital respondents reported favorable opinions about their vendor alliances, they were also quite candid about the sources of dissatisfaction with the relationships. Perhaps the biggest issue was the *time* involved on the hospital side. Many respondents stated that alliances 'chewed up a lot of faculty time with no compensation'. This issue is particularly acute for research alliances that involve clinicians who must support themselves either through extramurally-funded research grants or through clinical activity (seeing patients). Research alliances typically did not cover a lot of faculty time and thus encountered the problem of lost faculty productivity or income. In a similar vein, respondents noted that they spent a lot of time 'just managing the vendor relationship'. Such issues are exacerbated by the difference in scale between the vendor and the hospital, and the large bureaucracies present on both sides.

In addition to lost faculty time, hospital respondents noted that the alliance partners had different time horizons. In some cases, the complaint was that vendor time horizons

were much shorter than the hospital's, prompting a tug-of-war between the two sides. Hospitals would want more time to conduct due diligence prior to purchasing new equipment or replacing obsolete equipment, while vendors would press the hospital to trust them and go with their product. This circumstance smacks of irony, since alliances are supposed to reduce transactions costs between partners. Clinicians, however, are quite particular in wanting to make sure they are getting the 'latest and greatest' equipment. Of course, the vendor's interest in speed and timeliness could often cause problems for its hospital partner. Respondents reported instances of where the vendor quickly installed equipment ('we know how to install this') without first observing the hospital's workflow and processes that might require customization.

In some cases, the additional time requested by the hospital reflected its inability to devote sufficient time and dedicate a full-time business manager to a new research or innovation center that housed the alliance. Alternatively, a hospital did not have the time to send its clinicians to other hospital sites around the [p. 126 ↓] country to view their equipment installation. In other cases, the hospital reported frustration with the vendor over delays in delivering long-promised information modalities (e.g. PACS, RIS) where the vendor was experiencing technical difficulties. In these instances, the vendor might install some other version or alpha product that was not quite ready for prime time. In still other cases, the difficulties stemmed from the vendor and hospital working in different time zones (particularly Germany vs. the US) or the hospital system having facilities in multiple US time zones for which the vendor needed to customize a solution (e.g. images available simultaneously throughout the country).

Another frequently cited problem was *turnover* in the relationship executives on the vendor side. Respondents noted that vendor executives moved around a lot; hospital personnel would consequently see a lot of new faces which either provoked anxiety and/or weakened the relationship. Some respondents reported a close, personal relationship with Jeff Immelt when he headed up GE Medical Systems (1997–2000); following his promotion to head up all of GE, he was succeeded by Joe Hogan (2000–2004) and then Bill Castell (2004–), who headed up Amersham prior to its acquisition by GE. According to two respondents, Immelt had a personal interest in the alliance, was intrigued by it, made personal visits, and ensured the hospital's needs were taken care of; in contrast, following his departure, 'new people came on board who had no knowledge of the hospital' and had their attention diverted by the Amersham acquisition

(e.g. would GE research be centered in Amersham or GE?). Other respondents noted similar frustrations with the rapid turnover in the people running business units within each vendor.

In all of these instances, the vendor executives who championed and trouble-shot the alliance left their positions. According to hospital respondents, the vendors then 'took their eyes off the ball', failing to establish some needed alliance infrastructure (e.g. quarterly business reviews and steering committees). One consequence was that the alliance might revert back to the former transaction-based or 'purchase order relationship'. In general, respondents noted that the partnership 'waxed and waned with the particular person occupying the account executive role'. Early occupants who did a great job managing the alliance got promoted and moved up; their successors may not have been as effective or proactive in furthering the relationship, which then suffered.

One hospital respondent noted that turnover of faculty on the AMC side was as much a problem for alliances as turnover of vendor executives. Incoming faculty may have worked with other manufacturers' equipment and/or may dislike the incumbent vendor. It is particularly problematic for alliances when there is turnover in the department chair (e.g. head of radiology) and the incoming chair does not like the alliance or has developed an alliance with a rival vendor at the previous institution.

A third problem reported by respondents was technical problems with the equipment. Hospitals commonly noted delays and functionality issues with both vendors' products, including GE's *Centricity* PACS and Siemens' *Soarian* PACS/IT.

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In particular, the PACS seem to be taxed by the need to learn how to use this rapidly-changing technology in the face of a rapidly-growing volume of data. Hospitals also noted the vendor's tendency to place a low priority on and under-invest in information technology (IT), as well as the vendor's difficulty and lack of interest in customizing IT for the hospital site. In general, hospitals reported that such technologies require a lot of 'tinkering' and 'mutual learning' to make them serve the hospital's needs.

Other technical problems could be more serious. One hospital reported that its MR 'quenched' (similar to a minor explosion in which super-conducting helium gas leaks out through the exhaust). Several weeks after the event, the vendor's engineers still could not determine the cause. In another case, physicians reported difficulty with pedals in the cath lab, resulting in the unknowing administration of several minutes of radiation. After repeated efforts, the vendor's factory personnel said they could not change the pedals. To be sure, such technical problems can occur in the presence or absence of an alliance. Problem occurrences that do not get resolved cast doubt on the value of a strategic alliance; at the same time, however, the presence of communication channels and strategic account executive attention should allow alliances to resolve them more quickly.

A fourth problem area was the effort by both the vendor and the hospital to develop trans-hospital solutions, i.e. install a single line of equipment across multiple departmental silos and technological modalities. The more successful alliances focussed on one clinical area (e.g. radiology); the less successful alliances tried to install the vendor's line of equipment in multiple clinical areas. The problem encountered here is that academic departments and clinical areas in AMCs resemble at once Balkan States and medieval fiefdoms, i.e. a series of independent departments that differ from one another in terms of professional turf, institutional power, staffing levels, budgets, clinical revenues, prestige, attention, etc.

More importantly, the different academic departments each have their own historical relationships with specific vendors. Some may have equipment from one specific vendor; others may purchase equipment from an array of vendors ('best of breed'). Attempts to standardize equipment on one vendor and employ it across several departments and modalities is likely to encounter stiff clinician resistance and counter-detailing by the incumbent vendor. The resistance may be well-founded, especially if the different vendors' systems (e.g. PACS) do not talk to one another, or are a mix of off-the-shelf vs. customized systems, or there are lots of years (and terabytes) of data to transfer. Compounding this problem is the difficulty that the vendor's account executive faces in trying manage the alliance relationship across all of these hospital clinical boundaries where he/she is not an expert. According to some hospital respondents, there is also the related problem that vendors think they can serve as a one-stop-shopping solution for both equipment and information technology. This is a serious

issue particularly (1) for clinicians in academic and research environments who want to work with the 'latest and greatest' and (2) for vendors who continually leap-frog one another technologically.

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## Tangible and Intangible Benefits of Alliances

Imaging alliances appear to provide benefits to both parties, although (as with strategic intent) they recognize different benefits. Manufacturers are quick to point out that the alliances improve the strategic planning processes surrounding technology in their hospital customers by providing a window on the technological pipeline and helping to foster a technology plan. They also provide access to the vendor's engineering and consulting expertise which, along with the equipment, 'transforms the healthcare system'. How so? The alliances reduce the hospital's transactions costs, equipment acquisition costs, operating costs, and service costs. Transactions, in particular, appear to be greatly streamlined. Prior to the alliances, the equipment sales process took 6–12 months, were quite complicated, and involved multiple stakeholders – all due to the high cost of the equipment (Khanna and Raabe, 2006).

Hospitals agree with manufacturers that alliances provide them with a window on the future of imaging technology and serve to reduce their equipment acquisition and service costs. Hospitals also agree that vendors help them to improve patient workflow and other processes. Unlike manufacturers, however, some hospital respondents stated they reduced the transactions costs for sellers by aggregating equipment purchases across multiple hospital departments and sometimes multiple hospitals in a system. They also claimed they helped the vendors to improve *their* understanding of hospital workflow so as to be able to design better next-generation equipment.

In contrast to manufacturers, hospitals also stress the research benefits of their research alliances: financial support for research, new equipment for conducting this research without having to buy it or raise money for it, new grant submissions,

and academic publications stemming from the research. Hospitals also mention the improved ability to upgrade hardware and software, and thus access to the latest and greatest equipment to remain at the leading edge of technology. This conferred prestige benefits to the hospital, both in the local market as an early adopter of innovation and more widely as a showcase site for its equipment installation. The latter, in particular, was seen as a vehicle both to help recruit the best residents in radiology and affiliated fields to the hospital, but also to increase the vendor's equipment sales. This also conferred revenue benefits due to the increased volume of referrals and patients treated with the modalities.

## Remaining Issues to Consider

Our analysis of the alliances between imaging vendors and hospitals highlights three important issues that serve as fault-lines in these relationships. First, vendors prefer to develop a one-stop-shopping solution for the hospital system, including all of its clinical departments, technological modalities, and hospital sites. A comprehensive contract certainly reduces transactions costs for both [p. 129 ↓] sides, saves more money for the hospital, and increases overall sales for the vendor. However, such an agreement conflicts with the research needs of AMCs and clinician researchers, who want to work with best-of-breed technologies. It also conflicts with the balkanized nature of AMCs (particularly the medical school departments) and their historic relationships with different vendors. Finally, it conflicts with the legacy vendors of individual hospitals that have joined together to form multi-hospital systems. The vendor's effort to sell its entire line of equipment into these settings undermines the partnership by emphasizing its sales opportunity over the hospital's equipment needs. In this manner, the alliance reverts back to a sales transaction.

Second, AMCs and their physicians have a much stronger interest in research than do imaging vendors. Historically, research funding by the NIH has sustained AMCs. For the first time in recent memory, however, NIH funding has fallen. If this trend continues, then such alliances can play a more important role in fostering new innovation. Vendor interest in funding academic research is, at best, modest. One hospital respondent opined that Siemens was more of an engineering firm that viewed research as a means to improve the operations and imaging of its machines, while GE was more of a

marketing firm that viewed research as a means to improve what you can do with their machines. Moreover, many research alliances provide equipment to support research but not for the staff time to conduct it. Several sites also mentioned that marginal research funding often tends to wither away, particularly if the hospital is not purchasing a lot from the vendor through an equipment alliance. This latter finding suggests that the vendor's interest in research pales in comparison to its interest in product sales.

Third, there are two polar-opposite trends driving a wedge between the alliance partners. On the one hand, product life-cycles in the imaging industry are quite modest (3–5 years for linear accelerators, 5–7 years for imaging machines) compared to the pharmaceutical industry (10+ years). New product platforms cycle every 3–5 years, while new products within existing platforms cycle every 1–2 years (Khanna and Raabe, 2006). There is thus an impetus for vendors to develop new, expensive technology quickly and market it aggressively. On the other hand, capital is scarce for hospitals given their low margins, competing technological demands (e.g. electronic medical records), and competing capital and program needs (e.g. new buildings, centers of excellence). One respondent described the situation as a 'war zone' in which vendors are inundating hospitals with new stuff and pricing themselves out of the market, while hospitals feel pressured to remain technologically at the forefront of medicine and be the 'first to market' with the latest and greatest equipment. Vendors may need to prove to their hospital partners the superior features of their equipment across all modalities and then bear some of the risk in the hospital's acquisition of it. More generally, vendors need to document the value-added of their technologies over alternative therapies (e.g. CT technology vs. coronary angiography in prospective randomized clinical trials (Iglehart, 2007)).

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# Contribution to Literature on Buyer–Supplier Alliances and Supply Chain Management

At the beginning of this chapter, we introduced three broad issues: do buyer–seller alliances transform the traditional buyer–seller relationship; do these alliances confer relational advantage on each party; and do such alliances hold out the promise of reducing the rate of increase in healthcare spending? Our analysis of 17 such alliances in the medical imaging industry suggests limited or only mixed success in addressing each issue.

To be sure, the alliances have served to increase both parties' gains from a transactional point of view. Alliances help vendors to sell more equipment and increase sales, while alliances also serve to reduce hospitals' product costs. But do the alliances transform the transactions into value-adding partnerships? The two parties definitely perceive there is a partnership, but it is not clear that the alliances uniformly serve to promote product innovation and development (value for sellers) and to promote solutions to workflow and other operating problems (value for buyers). Why is this so? While slightly more than half of the partnerships involve research alliances, only a handful of these seem to have developed new technologies that providers have licensed out and vendors have incorporated into their products. Moreover, among the hospitals and clinics, the majority stresses the research funding and journal articles that flow from the alliance, not the new technology invented. Similarly, while a near majority of equipment alliances also include consulting services, few can point to documented improvements in workflow or other operating statistics that flow from the vendor services provided.

Similarly, manufacturers and hospitals commonly note the relational advantages they gain from partnering with prestigious alliance partners. Vendors can brag that their equipment populates renowned physician clinics and AMCs, while the latter can boast that they have now deployed state-of-the-art modalities that patients want to utilize and other sites want to visit. These advantages both likely serve to increase the vendor's

sales. It is less clear, however, that they enhance the vendor's innovative capacity and competitive advantage over other imaging firms, or enhance the hospital's competitive advantage in the local market. It is telling that such advantages were never touted in the vendor and hospital respondent interviews. Even when prompted, hospital respondents did not feel that their alliances gave them a real advantage over local competitors.

Finally, there is little evidence that the annual savings enjoyed by hospitals and clinics as a result of their equipment and service alliances (single digits) help to reduce the large sum (\$8.1 billion) spent on imaging equipment in the US, or put a dent in the \$100+ billion spent by insurers and patients out-of-pocket for imaging services (Iglehart, 2006). Moreover, the difficulties imaging companies have had with their PACS technology and with integrating equipment and IT sales suggests that few gains have been made in clinical integration using these alliance vehicles.

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One possible reason for the mixed success of alliances may be their uneven inability to permit partner access to all of their complementary skills and resources. As noted earlier on in the chapter, the alliances studied here are in nascent stages of development. It may be the case that they have not had an opportunity to develop many of the functions needed to confer value on both parties. One capability which alliances seem to have developed is marketing and reputational advantage. Both sides have gathered quite a bit of media attention for these alliances, and seem to have used the publicity to tout their state-of-the-art installations. To some extent, imaging firms have also co-located both technical and administrative personnel on hospital sites, and sometimes even benefit from vendor executives who live nearby. To a much lesser degree, they have also co-located capital assets and made specific capital investments in hospitals, such as providing advanced equipment at little or no cost to support research. On the other hand, the study uncovered few other mechanisms to reduce spatial and temporal barriers (which, in turn, generate frictions) and improve communication.

As another illustration, the two firms have engaged in some sharing of information (e.g. research agendas, research results and papers, technology pipelines and acquisition plans) as part of their research alliances. However, with the exception of

a few instances of shared intellectual property, the alliances do not appear to involve much shared investment, risk, or reward.

Finally, few of the alliances have developed internal coordinative and governance mechanisms to improve alliance functioning. While vendors typically have dedicated alliance personnel and alliance strategies, hospitals do not. As a result, hospitals tend to lack knowledge management, internal coordination, conflict resolution, external visibility, and accountability mechanisms. Our findings emphasize the importance of *both* alliance parties developing the capabilities to work together; one-sided capabilities may not be sufficient.

It is too early to tell whether these alliances will be ultimately successful or not. Both supply and demand considerations suggest they will at least continue to diffuse across the US hospital industry. On the supply side, vendors' technological innovations and marketing push of services and IT should foster more alliances. The imaging market is also quite concentrated and competitive, leading vendors to pursue similar strategies such as alliances. On the demand side, the market seems under-penetrated: the number of alliances developed thus far is small, there are over 100 AMCs with which to partner, and over 300 metropolitan statistical area (MSA) markets in the US with sizeable populations and hospitals doing imaging procedures. Hospitals may be keen to enter these alliances not only to reduce their equipment expenditures (which compete for scarce budgetary dollars with other capital and infrastructure needs) but also to seek efficiencies that will counterbalance future, eventual cutbacks in federal reimbursement for imaging services. The rising volume and cost of imaging services have exceeded the rates for other Medicare services and elicited much federal attention (Iglehart, 2006).

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Returning to the perspectives on alliances cited earlier in this chapter, we note that our sample of alliances seems to fit the idea of access to complementary resources, at least in the broad strategy adopted by the partners. However, in terms of implementation of access to such resources, most of the alliances studied fell short of expectations. The primary reasons for this shortfall related to the uneven ability of the firms to provide access to resources promised to their partners. The issues of turnover at the point of contact between organizations and the lack of commitment of managerial resources on

either side to manage the relationship eventually limited the gains that had been present in theory.

With regard to the perspective on relational or alliance capability, the alliance partners in our sample had limited capability at the time of inception of the alliances, and did not engage in the activities necessary to develop such capabilities. The steps in building such capabilities are described by Dyer et al. (2001). In particular, the presence of an alliance function, a dedicated set of manager(s) to focus on such transactions, and the development and utilization of standard processes for managing all phases of alliances (from inception to management and termination) were not in evidence in this study. One conclusion we can draw is that there is substantial potential for application of these ideas in supplier–buyer alliances in the medical imaging industry. In addition, firms that invest in such functions and routines may stand to gain competitive advantage over their rivals who have not done so.

These alliances should consider the lessons from the GPO industry and other purchasing consortia. As noted earlier, the GPOs developed an entirely different approach in the 1990s for working with PPIs: instead of competitive bidding, they assigned multi-year contracts to one vendor; instead of line-item contracting they developed multi-product bundles with incentives to engage in one-stop-shopping; and instead of contracting with lots of suppliers, they contracted with a small number of large, diversified firms that dominated oligopolistic markets. The GPOs were not entirely successful following this approach, both internally and externally. Internally, they had trouble getting their hospital members (and their medical staffs) to buy large quantities of products from one source and ignore their historical preferences (incumbent suppliers) and vendors with the best-of-breed. Externally, they were pilloried for excluding smaller companies with innovative technologies that patients and physicians reportedly could not access, as well as for their inability to reduce healthcare costs. GPOs in the US have spent the last 5 years defending themselves against such claims.

The alliances studied here do not involve GPOs. Indeed, the alliances include contract terms and prices that are more favorable than those struck by GPOs. However, the alliances have pursued the 1990s GPO approach. They should be wary of the same internal and external issues faced by the GPOs. Physician preferences for particular

vendors, equipment features (e.g. pedals), and state-of-the-art technology may impose limits to the number of departments and modalities [p. 133 ↓ ] in a hospital that these alliances can span. Similarly, differences in incumbent vendors across hospitals that form multi-hospital systems may impose limits to the degree that systems can standardize vendor purchases across sites. Finally, imaging vendors need to be wary of smaller-share imaging firms that are developing innovative equipment, features, and IT. As seen in the past few years in the hospital bed, endo-mechanical instrument, and pulse oximetry markets, smaller firms have successfully taken their larger, diversified competitors to court over restraint of trade due to the latter's alleged exclusive contracts with hospitals.

It may not be possible to generalize our findings to all buyer–supplier alliances in the healthcare industry. First, the alliances here involve large manufacturers of medical imaging equipment. Capital equipment, in contrast to other medical products, is purchased less frequently (every few years) at much higher cost. Hence, these types of alliances may be more salient to both parties than other alliances. Second, the alliances here focus on sophisticated technology. From the manufacturer's perspective, such alliances serve to increase the focus on product features and product development, and less on product price. Hence these alliances are more applicable to PPIs and less applicable to commodity products. Third, the alliances here involve research investigations and two-way flows of knowledge. That is, the alliances permit the buyers to transmit emergent knowledge back to the suppliers, and allow both sides to improve their product development activities. Hence, these alliances serve a unique purpose of mutual knowledge exchange to foster new product development. Fourth, as a result, these alliances naturally focus on an atypical set of providers: prestigious AMCs and multi-specialty clinics which engage in product research. Hence, these alliances are more applicable to larger hospital systems and research institutions than to community hospitals.

Nevertheless, the alliances studied here are important for the simple reason that they involve two important stakeholders in the healthcare system: large imaging manufacturers and large hospital systems. They are also important because they constitute a growing set of efforts to enable firms in the healthcare supply chain to access complementary resources, to promote innovation while also improving quality and efficiency, and ultimately to develop true value chains. Such alliances are neither

widespread in the healthcare industry nor usually successful. The findings reported here point to some successes and, more importantly, some important lessons for improvement in future alliance functioning. Given the fragmented organization of the hospital industry in the US (and in some other countries) – especially when contrasted with the concentrated organization of the medical imaging industry – the alliances studied here can serve to transfer proprietary technology and knowledge from more sophisticated to less sophisticated enterprises and, hopefully, improve the systemic and efficient operation of hospitals.

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