

HEALTHCARE INTERMEDIARIES IN ELECTRONIC MARKETS: PERFORMANCE AND CHOICE OF MARKET ENTRY MODE

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ABSTRACT

Operational inefficiencies as well as disparate standards and administrative processes plague the U.S. healthcare industry despite its size and significance. In response, a novel breed of electronic healthcare intermediaries has evolved aiding providers, patients, and other market participants in negotiating more consistent and efficient operations. Intermediation theory posits that intermediaries engage in four distinct functional roles, specifically: (1) information management, (2) logistics management, (3) transaction securitization, and (4) insurance/market making and liquidity management. Employing data from 58 U.S. electronic healthcare intermediaries this research examines how the provision of these functions relates to firm performance and choice of electronic market entry mode. We find the provision of logistics management and, to a greater extent, insurance/market making and liquidity management to be associated with greater firm performance. In addition, we see firms engaged in insurance/market making and liquidity management activities demonstrate a propensity for direct entry and acquisitions in the pursuit of electronic market initiatives. By contrast, healthcare intermediaries offering transaction securitization services employ direct entry and joint ventures. We conclude by reflecting on the significance of these findings for the management of intermediaries within and outside of the healthcare industry.

Keywords: entry-mode, healthcare, intermediaries, performance

1. Introduction

The healthcare industry is one of the most significant sectors of the U.S. economy. The Department of Health and Human Services [2008] reports healthcare comprised some 16% of gross national product for 2006, with a total expenditure of some \$1.9 trillion up by 7.9% over 2005 at over three times the rate of inflation. These growing costs have focused attention on expense reduction and improved efficiency within the overall industry [Porter and Teisberg 2004]. Since the mid 1990s, healthcare has seen ever increasing numbers of caps on reimbursements from plans, decreases in fees for service plans, declines in staff models, reductions in provider reimbursements, and growing emphasis on reducing overall delivery costs [Allen and Sullivan 2006; Fitzpatrick 2006]. More recently, managed care organizations have faced consumer dissatisfaction and demands for greater access to provider networks, driven in part by growing Internet usage and the subsequent availability of medical content through Web-based portals. As a result, providers are being pushed to increase the quality of service afforded to consumers and improve operating efficiencies to achieve cost reductions.

As organizations struggle to meet marketplace demands and ever growing legislative requirements, such as the Healthcare Insurance Portability and Accountability Act (HIPAA) mandates [1996], Internet-based electronic commerce initiatives provide for novel opportunities to address inefficiencies and facilitate the reduction of overhead costs. One key area of potential savings lies within administration [Porter and Teisberg 2004]. The healthcare industry is information intensive, completing an estimated 30 billion transactions each year utilizing paper, phone, and/or facsimile [Shortliffe 2005]. This industry has traditionally embraced administrative technological innovations slowly [Raghupathi and Tan 2002] lagging as many as 10 to 15 years behind others in

information technology (IT) adoption [Goldschmidt 2005]. In response, Internet-based healthcare intermediaries, borrowing business-level strategies from other sectors [Fruhling and Digm 2000], have emerged to leverage advances in information and communications technologies (ICT) to help disparate healthcare organizations of all sizes connect and realize efficiencies in their management of information, finances, and physical logistics.

Consider Global Health Exchange (www.ghx.com) an electronic marketplace uniting over 2,200 hospitals and 150 suppliers with extensive operations in both North America and Europe. Global Health offers both purchasers and suppliers access to consistent data, greater order processing visibility, and increased supply chain transaction processing efficiency. Similarly, McKesson (www.mckesson.com) has leveraged its long history as a pharmaceutical distributor to become an information service provider for traditional functions by expanding into practice management services, patient record digitization and management, transaction clearing, revenue optimization, regulatory compliance, and clinical decision support.

Electronic healthcare intermediaries as we know them today are the result of a variety of evolutionary paths. Many of these companies are pure-plays (e.g., Global Health) that grew out of the dot-com boom. Yet others are traditional incumbent organizations (e.g., McKesson) with histories in claims/payment processing or supply distribution. These organizations are utilizing advances in Internet-based ICT to become full-scale aggregators of multiple vendors and clients. In the wake of numerous failed business models following the dot.com bust, chief information officers (CIOs) and information systems (IS) managers are increasingly involved in shaping strategic organizational decisions with respect to product and service offerings [Johnston 2003]. Further, this digital sector of the economy is relatively new and has witnessed a great deal of growth, attrition, and consolidation over recent years. Accordingly, we investigate its determinants of both performance and the predominant entry mechanisms firms employ in pursuing electronic market initiatives.

Spulber [2003] emphasizes that the value provided by intermediated exchanges must be compensated by some economic rent. Here, dealers and market makers often take advantage of bid-ask spreads in addition to other forms of “taxation” such as commissions or transaction/subscription fees [Gehrig 1993]. Brousseau [2002] further advances intermediation theory identifying four dominant functional activities, or roles, within electronic markets, namely, (1) information management, (2) logistics management, (3) transaction securitization, and (4) insurance, market making, and liquidity management. Each of these functional roles requires specific resources in meeting business objectives with electronic intermediaries possessing the potential to generate additional rents by leveraging specific digitally based resources, specifically *information networks* and/or *market knowledge*. From a management perspective, as firms move past the initial stages of their electronic market initiatives, understanding the potential of resource endowments and subsequent business strategies in fueling competitive advantages emerge as growing concerns [Shin 2001]. Hence, in order to explore the relationship between these intermediary roles and performance, this research asks, *how does the provision of intermediary functional roles relate to performance outcomes for healthcare intermediaries within electronic markets?*

Given the rapid pace of acquisitions, mergers, and related consolidation within the healthcare industry, we are also motivated to understand how these intermediaries pursue diversification initiatives into novel functional areas within electronic markets. CIOs and IS management play a key role in helping devise such strategic organizational initiatives [Johnston 2003]; hence, choice of both electronic market entry mode and intermediary functions emerge as key considerations. While much of the financial economics literature addresses why firms diversify [Jensen and Ruback 1983], the strategic management literature considers firm choice of one entry mechanism over another [Chatterjee and Lubatkin 1990]. Ansoff [1965] defines diversification as the entry of a firm into a new market and/or with a new product. Such an operationalization highlights the act, and not the state, of diversification. Here, unique aspects of each functional intermediary role and specific resources dictate divergent strategic choices with respect to entry into new markets and/or with new products or services. Accordingly, we ask the question, *within the healthcare industry, how does the pursuit of divergent intermediary functional roles yield differences in firm choice of electronic market entry mechanism?*

The next section provides a review of the background theory and presents specific research hypotheses. We follow with a description of the data collection and analysis. Finally, we discuss our results and their implications for the theory and management of healthcare intermediaries specifically, following with general recommendations for intermediaries in other sectors of the economy.

2. Intermediation Theory in Electronic Markets

Within intermediation theory, Spulber [2003] defines intermediaries as economic agents creating and managing markets between buyers and sellers. Intermediaries emerge in pursuit of two primary objectives, (1) purely informational matching, as well as (2) economic matching [Rubinstein and Wolinsky 1987]. The first objective finds intermediaries gathering, sorting, and arranging information about parties' plans facilitating the matching of supply

and demand. However, markets are subject to supply and demand fluctuations as a result of cycle differences in production plans and consumer demand [Williamson 1975]. As such, economic matching sees intermediaries providing market buffers in the form of inventories and credit, in lieu of perfect information coordination.

Brousseau [2002] notes that intermediaries also possess the ability to aggregate, monitor, and manage production and consumption opportunities. Such initiatives afford consumers and producers stability in supply and demand; a classic market making function. With buyers and suppliers matched through intermediaries, transactions are facilitated through increased product availability, transaction clearing, credit extensions, and risk reduction. In light of these objectives, Brousseau [2002] proposes viewing electronic intermediaries in the context of the following functional roles: (1) information management, (2) logistics management, (3) transaction securitization, and (4) insurance/market making and liquidity management. Table 1 summarizes these intermediary functions.

Table 1. Intermediary Functions

Function	Description
Information Management	Aggregating and filtering information, supporting producers' needs to determine demand and consumers' assessments of supply and capabilities. This provision also includes purely information-based goods such as data and media products.
Logistics Management	Sorting, packaging, storing, stocking and transporting goods from producers to consumers.
Transaction Securitization	Controlling and guaranteeing product delivery while assuring payment to producers. Intermediaries' reputation and/or legally binding guarantee serves to mitigate adverse selection and moral hazard problems.
Insurance/Market Making and Liquidity Management	The extension of credit to both sides of transactions, with intermediaries facilitating systematic clearing of markets. Additionally, such activities call for purchasing production before consumer demands are expressed, with intermediaries providing producers with demand security. Insurance serves to insulate consumers from supply fluctuations.

Brousseau [2002] posits that electronic intermediaries will not become a substitute for traditional commercial intermediaries. This is in contrast to the logic prevalent during the dot-com boom that business-to-business (B2B) intermediaries could disintermediate traditional sectors of the economy [Gellman 1996; Jallat and Capek 2001; Sen and King 2003]. Accordingly, intermediaries assemble a core set of organizational resources in facilitating each of the four different functional roles [Brousseau 2002]. Specifically, (1) information management requires an *information network* and *commercial relationships*; (2) logistics management, *information networks* and *tangible assets*; (3) transaction securitization, *expertise*, *reputation*, and *commercial relationships*; and finally, (4) insurance/market making and liquidity management, *market knowledge*, *commercial relationships*, and *financial resources*.

Table 2. Intermediary Roles and Essential Resources

	Information Management	Logistics Management	Transaction Securitization	Insurance & Liquidity
Electronic Intermediaries	<i>Information Network</i>	<i>Information Network</i>		<i>Market Knowledge</i>
Traditional Intermediaries	Commercial Relationship	Tangible Assets	Commercial Relationship Expertise Reputation	Commercial Relationship Financial Resources

Adapted from Brousseau [2002]

Electronic intermediaries possess the ability to employ advances in Internet-based ICT to deploy *information networks* and to efficiently manage *market knowledge*, an information asset. Electronic intermediaries, however, do not enjoy an advantage over traditional commercial intermediaries with respect to the consolidation of tangible assets, expertise, reputation, and/or financial resources. Hence, Brousseau [2002] contends that electronic intermediaries will not completely replace traditional commercial intermediaries. Table 2 summarizes the essential

organization resources by intermediary role highlighting those resources, i.e., IS and information assets, available to electronic intermediaries.

Given a limited ability on the part of electronic intermediaries to replace all requisite resources of traditional intermediary functions with either IS and/or information assets, these entities can potentially generate additional rents by leveraging *information networks* and/or *market knowledge* [Brousseau 2002]. Hence, we contend that such intermediaries can augment, or complement, traditional intermediary functions in these areas. Intermediation theory emphasizes that the value provided within the exchange sees some form of economic rent realized by the intermediary [Caillaud and Jullien 2003]. Rent generation typically takes the form of a bid-ask spread as well as other forms of “taxation” such as commissions or transaction/subscription fees [Gehrig 1993]. As such, we argue that electronic intermediary performance is a function of their ability to augment traditional intermediary roles in key areas, such as logistics management or insurance/market making and liquidity, which we further detail in our hypotheses formulations.

Our research also seeks to understand how the provision of different intermediary functions relates to healthcare intermediaries’ choice of entry mode when pursuing electronic market initiatives. As argued, purely electronic intermediaries enjoy a limited advantage over traditional intermediaries to impact core services. Hence, given their potential to augment traditional intermediaries with *information networks* or information assets, such as *market knowledge*, we posit that these resource requirements will be closely related to organizational choice of entry mechanism.

3. Research Hypotheses

3.1. Intermediary Functional Roles and Performance

The provision of information management through electronic networks, such as the Internet, is a common practice among firms [Swaminathan and Tayur 2003] affording intermediaries a negligible, sustainable competitive advantage [Barney 1991]. Despite noted opportunities for electronic intermediaries to capitalize on *information networks*, the provision of information management strategies exclusively will likely see limited performance gains due to low barriers to entry [Mahoney and Pandian 1992], as seen in the cases of DrKoop (www.drkoop.com) and WebMD (www.webmd.com). DrKoop emerged as one of the first healthcare portals aggregating and distributing health related content to consumers. The main business focus of the venture was the aggregation, organization, and dissemination of health information to both consumers and professionals on a subscription and fee for use basis. Despite attempts at first mover advantage, the position of the content aggregator in isolation proved very difficult to maintain amidst a constant and insurmountable liquidity crisis that saw numerous attempts at financial support. At one point, DrKoop was worth more than \$1 billion in market capitalization with a stock price of \$45.75. The assets of the company (i.e., brand, trademarks, and e-mail addresses of registered users) were eventually sold for \$186,000 in July of 2002.

Like DrKoop, the initial push of WebMD was in medical content aggregation and distribution for patients and physicians. However, toward the end of the dot-com boom, the company went on a spree of diversification activities moving into operational areas such as insurance claims processing (e.g., Envoy, Kinetra, and MedEAmerica) and medical practice management software development (e.g., Medical Manager and Wellmed). With the merger of Healtheon and WebMD, the resulting company sought to eliminate the inefficiencies that plague the healthcare market. Some 180,000 medical practices utilize its practice management software, and claims processing is the firm’s largest and most profitable business. WebMD was initially in direct competition with DrKoop. However, the former pursued a more sophisticated strategy using information management as a starting point for an aggressive, multifaceted intermediary strategy. Had it chosen to remain in information content aggregation only it might likely have suffered a similar fate as DrKoop.

Business models focusing purely on information management face the challenge of developing sufficient value through content aggregation alone. Absent outright exclusive ownership of copyrighted content, such firms enjoy few natural barriers to entry that might otherwise hinder competition. The logical conclusion of this discussion is that engagement in the three other functional roles (i.e., logistics management, transaction securitization, as well as insurance/market making and liquidity management) provides for a sustainable and potentially profitable strategy [Barney 1991]. For electronic intermediaries, however, the provision of transaction securitization functions does not provide for resource advantages over traditional intermediaries through either *information networks* or *market knowledge*. Accordingly, we formulate hypotheses specific to electronic healthcare intermediaries’ provision of logistics management as well as insurance/market making and liquidity management functions and performance, as shown in Figure 1.

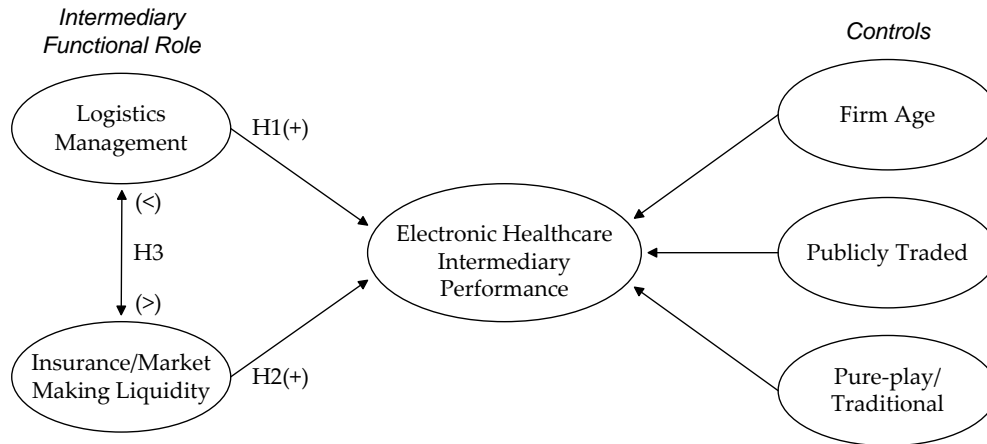


Figure 1. Hypothesized Effects: Intermediary Functional Roles and Performance

Logistics management intermediaries have fulfilled a need for organizations to meet capital intensive [Tamas 2000] and non-core competency [Prahalad and Hamel 1990] functions in the form of transportation and warehousing infrastructure. Here, electronic networks extend the management of physical flows by providing greater visibility of both inter-firm physical and financial flows within supply chains [Sahin and Robinson Jr. 2003]. Hence, the use of IS on the part of electronic intermediaries allows for more innovative management of logistics functions [Rabinovich et al. 2007]. *Information networks* provide for a more efficient means of managing and exploiting both physical and information flows. Moreover, logistics management requires significant investments in tangible assets in addition to organizational procedures and capital resources [Tamas 2000] that should generate some fair economic return. Hence, we posit our first hypothesis.

H1: For electronic healthcare intermediaries, the provision of logistics management will be positively associated with greater performance.

Commercial intermediaries also monitor and manage production and consumption opportunities within markets. Holding inventories, intermediaries afford some level of insurance to consumers that product will be available upon the manifestation of demand. Within this context, information assets can augment traditional commercial intermediaries in aggregating and providing greater transparency of all aspects of these activities. Capitalizing on advances in ICT uniquely positions electronic intermediaries to more effectively and accurately monitor both producers and consumers in a real time environment, thus giving rise to potential advantages with respect to *market knowledge*. By offering credit to both sides of the transaction, a liquidity function, intermediaries can address disparities in production and consumption cycles [Spulber 2003]. Holding inventories, the provision of trade credit, and increased efficiencies generated by greater transparency in information assets (i.e., *market knowledge*) should be compensated by a fair economic return. Accordingly, we present our second hypothesis.

H2: For electronic healthcare intermediaries, the provision of insurance/market making and liquidity will be positively associated with greater performance.

In the context of the greater “macro transaction” that constitutes a complex set of activities delivering products and/or services from producers to consumers [Williamson 1996], insurance and liquidity address coordination difficulties that go well beyond mere information aggregation and matching. As argued, intermediaries addressing these coordination activities hold stronger market positions, which in turn should yield greater rent generation. Moreover, where the provision of logistics management is frequently accessed through service agreements of joint ventures, the provision of insurance/market making and liquidity is not. As such, carrying inventory and offering credit requires a higher level of capital investment that should realize corresponding rates of return on capital employed [Mookherjee and Reichelstein 1992]. Therefore, electronic intermediaries should realize greater performance through insurance/market making and liquidity management roles than logistics management. Hence, we posit the following hypothesis.

H3: For electronic healthcare intermediaries, the provision of insurance/market making and liquidity management provisions will be more positively associated with greater performance levels than logistics management provisions.

3.2. Intermediary Functional Roles and Entry Mode

Economic [Jensen and Ruback 1983] and strategy [Chatterjee 1990] literature generically categorizes market entry initiatives as direct entry, acquisition, or some form of joint venture/strategic alliance. Diversification

highlights the entry of firms into new markets and/or with new products [Ansoff 1958]. These decisions often focus on the “make or buy” dilemma, categorized as internal business development initiatives or acquisitions [Ramanujam and Varadarajan 1989]. Here “entries” may be made in the interest of portfolio diversification or “market” entry [Yip 1982]. Yip [1982] further notes that acquisitions may result in a base within a new market, complementary products and services, and/or overall market diversification for the firm.

Formalized strategic alliances, termed joint ventures, see two or more partners creating separate organizational units [Boyle 1968] enabling management of inter-firm interdependence [Pfeffer and Nowak 1976]. Gulati and Garguilo [1999] suggest that businesses with electronic channels engage in a particularly high frequency of joint ventures, in addition to traditional direct entry initiatives and acquisitions. Our analysis views internal direct entry initiatives, acquisitions, and joint ventures as discreet modes of entry into electronic markets. Table 3 summarizes each of these mechanisms.

Table 3. Entry Mode

Mechanism	Description
Direct Entry	Entry into new markets and/or with new products employing the firm’s internal resources.
Acquisition	Entry into new markets and/or with new products through the outright purchase of stock or other equity interests of a target entity and subsequent assimilation into the firm.
Joint Venture	Entry into new markets and/or with new products with two or more independent firms undertaking some economic activity. Such initiatives employ hybrid governance mechanisms with participants contributing toward equity generation while sharing in revenue and expenses.

We depict our hypotheses related to entry mode in Figure 2. For electronic intermediaries, the provision of logistics management necessitates the management of information with efficient access and management accruing additional efficiencies to the owning entity [Bailey and Friedlaender 1982]. Here, information systems manage the flow and accumulation of information within the firm [Han et al. 2004]. However, such intangible resources, that are a by-product of operations, might not be easily understood or appropriable outside the owning firm [Chatterjee 1990]. Consequently, internal direct entry initiatives prevail as the optimal entry mode for deploying requisite ICT facilitating the management of functional activities [Chatterjee 1990].

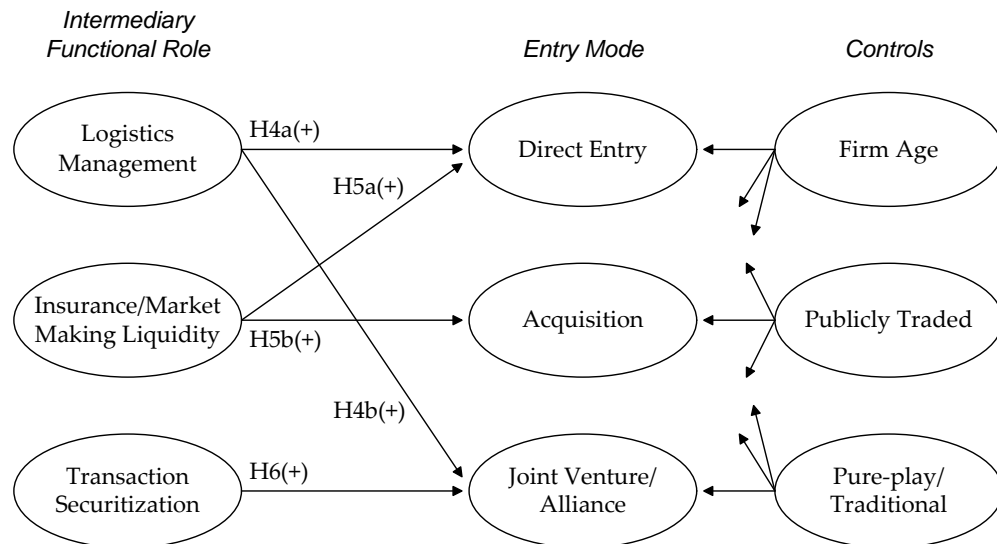


Figure 2. Hypothesized Effects: Intermediary Functional Roles and Entry Mode

Additionally, facilitating the traditional management of physical flows within the logistics function often requires significant capital investment in tangible assets [Tamas 2000] potentially exceeding available financial resources needed for organic initiatives or outright acquisition. Previous research notes that joint ventures persist where one party holds assets specialized to the transaction, while the other faces high production and/or acquisition costs in pursuing sole ownership [Kogut 1988], a situation common with the coordination of logistics across multi-echelon transportation and distribution systems [Das et al. 2000]. Hence, joint ventures provide the most economical access to such necessary specialized tangible assets. Accordingly, we present our fourth set of hypotheses.

H4a/b: For electronic healthcare intermediaries, the provision of logistics management will be positively associated with the occurrence of (a) internal direct entry initiatives and (b) joint ventures.

Holding inventories yields some level of insurance to consumers of product availability while maintaining some consistency of demand for suppliers [Akerlof 1970]. Electronic intermediaries can also effectively monitor, in real time, both producers and consumers, resulting in information assets (i.e., *market knowledge*) enabled by Internet-based ICT. Hence, such intermediaries leverage information asymmetries over the firms they serve [Ramaswami et al. 1997]. Effective management of information assets must also mitigate the risk of poaching and/or misappropriation in sharing with outside parties through joint ventures or other transactional forms [Clemons and Hitt 2004].

Insurance/market making and liquidity management activities further require financial resources on the part of intermediaries to bring liquidity to markets and drive distribution cycles. In contrast to the provision of logistics management, these investments do not constitute non-core initiatives. In considering the choice of entry mode, joint ventures afford less direct and unfettered control over all assets specific to the engagement [Hennart and Reddy 1997]. Hence, organizations should seek to internally develop or acquire assets outright as opposed to engaging in diluted governance through joint ventures. Consequently, we formulate our fifth set of hypotheses.

H5a/b: For electronic healthcare intermediaries, the provision of insurance/market making and liquidity management will be positively associated with the occurrence of (a) internal direct entry initiatives and (b) acquisitions.

Finally, transaction securitization seeks to reduce risk [Akerlof 1970] by mitigating the economic problems of adverse selection and moral hazard [Stiglitz 2000]. Such provisions necessitate the development of expertise and reputation, which require time to mature through knowledge accumulation and experience. Here, repeated transactions earn the respect of commercial partners. Additionally, networks of established commercial relationships facilitate the reduction of external transaction costs and foster market-based governance [Williamson 1991]. Hence, organizations assemble some combination of expertise, reputation, and established commercial relationships in an effort to effectively reduce consumers' perceived risk [Brousseau 2002]. Kogut [1988] finds joint ventures allow for management of uncertainty while permitting access to the assets of other firms. Given internal direct entry initiatives' inherent time constraints coupled with a limited ability to reduce stated risks through either direct entry or acquisitions, joint ventures should facilitate access to such expertise, reputation, and established commercial relationships requisite to transaction securitization activities. Accordingly, our final hypothesis is presented.

H6: For electronic healthcare intermediaries, the provision of transaction securitization will be positively associated with the occurrence of joint ventures.

3.3. Controls

In addition to the constructs detailed, several control variables related to the phenomenon of electronic intermediation are considered. These include: (1) firm age, (2) Internet pure-plays versus traditional brick-and-mortar firms with Internet-based initiatives, and (3) publicly traded versus private entities. Organizational studies show ambiguous results concerning the effects of firm age on business viability and profitability. Some studies find support for the "liability of newness argument" by documenting declining rates of bankruptcy or dissolution with greater firm age, particularly in manufacturing [Carroll and Swaninathan 1982; Evans 1987; Freeman et al. 1983; Stinchcombe 1965]. Other research observes opposite effects especially within service industries [Amburgey et al. 1994; Barnett 1990; Baum and Mezias 1992] such as healthcare.

Intermediary types that have emerged with the rise of the Internet, namely pure-plays, comprise a significant portion of electronic markets. As many of these younger firms struggle to achieve positive performance, the older established businesses are often generating greater economic rents. Likewise, established industrial enterprises potentially achieve greater performance levels than firms recently launched with the express intent of capitalizing on the capabilities offered by the Internet.

Finally, with respect to publicly traded versus private firms, conventional wisdom assumes that publicly listed firms have higher capitalization rates than private entities. Such a situation might enable increases in marketing expenditures, strategic and operational investments, financial longevity, and incentive structures implicit in a shareholder wealth maximization paradigm that emphasizes earnings growth and return on equity.

4. Research Methods

4.1. Data Collection

Chang [2004] notes that electronic markets tend to attract privately held, venture-capital funded organizations. Therefore, our focus on electronic intermediary initiatives necessitates sourcing both public and private firms for our sample. Accordingly, we employ an online business-to-business directory, Online Business-to-business Network,

Inc., to identify firms engaged in electronic intermediary initiatives within the healthcare industry. The directory lists both public and private businesses with activities in B2B electronic markets. While the directory covers over 100 countries, 75 percent of the firms listed are in North America. A closer examination of firms listed under the healthcare sector resulted in the exclusion of firms outside of U.S. markets, non-healthcare organization marketing unrelated products and/or services, organizations whose business models were inconsistent with the definition of an electronic intermediary, and multiple listings for the same firm. Ultimately we were able to identify 58 organizations engaged in electronic intermediary activities within the U.S. healthcare industry for inclusion in our sample. A thorough scanning of the media was made to identify the most significant electronic intermediary members of the sector in an effort to verify a representative theoretical sample.

Table 4 details the mean, standard deviation, and distribution of values for all variables and controls. The average age of companies within our sample is 6 years with just over 26% of the firms in the sample in existence for a greater period. Of the 58 companies within the sample nearly 43% are publicly listed. Internet pure-plays makeup approximately 55% of the sample with the remaining firms existing prior to the growth of Internet-based business models. Table 5 presents a frequency distribution of the predictor variables (i.e., intermediary functional roles) for all dependent and control variables.

Table 4. Descriptive Statistics

Construct	Mean	Std. Dev.	Category	Percentage
Performance	3.67	.28	Profit < -10%	46.6
			-10% ≤ Profit < -5%	24.1
			-5% ≤ Profit < 0%	15.5
			0% ≤ Profit < 5%	10.3
			5% ≤ Profit < 10%	3.4
			Profit ≥ 10%	0.0
Direct Entry	.356	.413	.00% - .25%	51.7
			.26% - .50%	13.7
			.51% - .75%	10.5
			.75% - 1.0%	24.1
Acquisition	.329	.39	.00% - .25%	55.0
			.26% - .50%	10.3
			.51% - .75%	12.0
			.75% - 1.0%	22.7
Joint Venture	.316	.41	.00% - .25%	62.0
			.26% - .50%	8.5
			.51% - .75%	7.1
			.75% - 1.0%	22.4
Information Management			Yes	98.3
			No	1.7
Logistics Management			Yes	5.2
			No	94.8
Transaction Securitization			Yes	58.6
			No	42.3
Insurance & Liquidity			Yes	29.3
			No	70.7
Age	6.12	6.17	0-4	52.1
			5-9	21.8
			10-14	10.4
			15-19	9.9
			20-24	1.7
			25 plus	4.1
Pure-plays/Traditional Firms			Yes	55.2
			No	44.8
Publicly Traded			Yes	42.8
			No	57.2

Table 5. Frequency Distribution of Predictor Variable

	Information Mgt.	Logistics Mgt.	Trans. Secur.	Insur./Liquidity
Profit < -10%	0	0	34.4	0
-10% ≤ Profit < -5%	42.1	0	21.9	0
-5% ≤ Profit < 0%	22.9	0	18.6	25
0% ≤ Profit < 5%	10.8	66.7	25	18.8
5% ≤ Profit < 10%	14	33.3	6.2	5
Profit ≥ 10%	3.5	0	0	12.5
Direct Entry	33.3	0	46.6	12.5
Acquisition	70.2	100	56.3	87.5
Joint Venture	28.1	0	6.3	0
Age, 0-4	3.5	0	18.8	31.3
Age, 5-9	21.1	0	25	18.8
Age, 10-14	15.7	33.4	15.6	12.5
Age, 15-19	14	0	25	12.5
Age, 20-24	26.3	0	12.5	6.3
Age, 25 plus	3.5	66.6	3.1	18.8
Pure-plays/Traditional	52.6	66.7	46.9	25
Pub. Trade/Private	43.9	66.7	56.3	56.3

Data collection employed secondary archival sources and a semi-structured interview technique targeting senior and middle management. Secondary data includes information collected from websites, annual reports, newspaper and periodical articles, third party analyses/stock reports, Lexis-Nexis, and COMPUSTAT. Interviews focused on identifying firms' intermediary product and/or service offerings in addition to diversification initiatives not widely reported in public announcements. Further, these interviews assessed performance measures for private firms, who often lack publicly available accounting data. Work examining technology alliances within the biotechnology industry [Lerner and Merges 1998] and B2B business models [Dai and Kauffman 2002] similarly adopts this approach to data collection.

4.2. Dependent Variables

The dependent variables for our research questions are performance and choice of entry mode respectively, while the independent variables include the four intermediary functional roles. A variety of measures of firm performance have been utilized in the strategic management literature, including market share, return on assets (ROA), return on equity (ROE), return on investment (ROI), and return on sales (ROS). ROA, or net income divided by book value of total assets, is a common indicator of firm performance. This measure controls for differences in net investment measuring firm success in deploying assets to generate profits [Pandya and Rao 1998]. Markides [1995] found use of ROA, ROI, or ROS as performance measures yields no differences in results. ROA was selected as ROS is often significantly correlated with market share [Peng and Luo 2000], and ROE or ROI bore a greater potential of divulging confidential firm information for privately held entities.

Raw data for the ROA measure was collected through a variety of techniques. First, in the instance that the company was publicly listed we sourced data from public records including annual reports and COMPUSTAT. In instances where public accounting data were not available, we sought to ask company respondents for both the book value of net assets and an indication of performance. Given reluctance on the part of respondents from privately held firms to disclose exact figures, we offered the opportunity to express ROA in specific categories, additionally assuring respondents that participating firms would not be identified in reporting the study. Accordingly, we employed an ordinal scale measure of ROA as follows: less than negative 10%; greater or equal to negative 10%, but less than negative 5%; greater or equal to negative 5%, but less than 0%; greater or equal to 0%, but less than 5%; greater or equal to 5%, but less than 10%; greater or equal to 10%. While exact accounting information existed for some 43% of the sample, estimates for the remainder were obtained through interviews, approximately 38%, or estimation from other publicly available material, just over 13%. Categorical brackets posed offered sufficient granularity for the study while permitting respondents the requisite freedom when estimating figures.

For the 38% of firms from whom we collected respondent estimates, we controlled for validity by seeking two responses from each organization in addition to employing random controls from municipal accounting registrars for some 27% of these firms. Inter-rater reliability scores confirmed reliability of responses provided by different respondents within the same organization [James et al. 1984] with an intra-class correlation coefficient of .83 significant at the .001 level. [Shrout and Fleiss 1979].

4.3. Independent Variables

In capturing entry mode we collected panel data over a ten-year period starting in 1997 up through 2006. An entry registered each time a company expanded its functional capabilities or market through direct entry initiatives, acquisitions, and/or joint ventures/alliances. In many instances, companies pursued initiatives in areas already included in their current portfolio of functions, diversifying functional capabilities and/or target markets. Hence, the study registered cases where significant market entry initiatives were achieved internally and/or via acquisition or joint venture. Many of the larger, mature organizations had over thirty instances of some form of electronic market entry, where as younger, smaller companies had less than five. We transformed nominal counts into relative frequencies in an effort to normalize the data [Seddighi et al. 2000]. As an example, a company could have 10% internal direct entry initiatives, 70% acquisitions, and 30% joint ventures.

Binary variables capture intermediary functional roles for the focal independent variables. For example, procurement portals perform some type of market aggregation and economic matching. In instances that the firm does nothing other than match buyers and sellers, it would be categorized positive for information management and negative for the other three functional roles. If the intermediary provided warehousing and logistics, logistics management would register positive. However, should the firm take a more active role in facilitating transactions, such as accepting payment and coordinating the delivery of goods, it would register positive for transaction securitization. Likewise, should the company extend credit to either side of the transaction or assume legal title to inventory, a positive score would register for insurance/market making and liquidity management.

4.4. Controls

Control variables for the study include firm age, pure-plays versus traditional brick-and-mortar organizations, and publicly traded/listed versus private firms. Age is registered as a continuous variable measuring the period from firm establishment through the point of data collection. We employed a categorical binary variable for companies launched with the express intent of capitalizing on the capabilities of the Internet as opposed to traditional brick-and-mortar firms. Likewise, publicly traded versus privately held entities utilized a binary categorical variable for companies listed on major exchanges.

5. Research Methods

Protocols employed within the study controlled for coding bias through a cross-validation mechanism to evaluate the accuracy of each independent researcher's assessments [Mason 1996; Miles and Huberman 1994]. Researchers completed the coding of data (i.e., performance where publicly available, choice of entry mode, and intermediary functional roles) for all firms included in the sample. The analysis independently tested inter-rater reliability for each variable using Cohen's kappa [Cohen 1960], a statistic that adjusts raw agreement figures to account for the possibility of agreement occurring by chance. The first iteration saw kappas above .6 for over 87% of the ratings, with most above .7. Prior work considers kappa values above .6 substantial and above .8, almost perfect [Landis and Koch 1977]. For the remaining 13%, the researchers discussed the data in-plenum and consensus emerged around the remaining coding. Our second iteration achieved kappas greater than .6 in more than 98% of the sample with the remaining resolved again through in-plenum discussions.

Table 6. Inter-correlations and Proximity Matrix of Chi-square Between Sets of Frequencies

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
1. Performance	-----	.20	-.08	-.02	.34*	.12	.41*	-.02	-.07	.07
2. Direct Entry	4.469*	-----	.15	-.07	.19	.29*	.33*	.06	.10	.06
3. Acquisition	4.225*	3.105*	-----	.07	.19	.09	.45**	.06	.17	.09
4. Joint Venture	6.080*	4.423*	5.421*	-----	.01	-.19	.21	-.20	.21	.11
5. Logistics Mgt	4.470*	0.913	3.075*	4.556*	-----	.02	-.02	-.07	-.01	.09
6. Trans Secur.	4.781*	4.410*	3.523*	6.434*	4.403*	-----	.03	.31	-.10	.02
7. Liquidity Mgt.	4.682*	2.895*	2.612*	5.542*	2.870*	3.974*	-----	.27	-.02	-.07
8. Firm Age	5.937*	3.452*	5.593*	8.160**	4.222*	6.104*	6.462*	-----	.08	.11
9. PurePlay/Trad	6.380*	5.831*	5.625*	4.835*	5.916*	5.712*	6.338*	8.140**	-----	.17
10. Pub Trade	5.539*	3.595*	4.022*	5.298*	4.268*	5.041*	4.917*	6.151*	5.261*	-----

* $t < 0.05$; ** $t < 0.01$

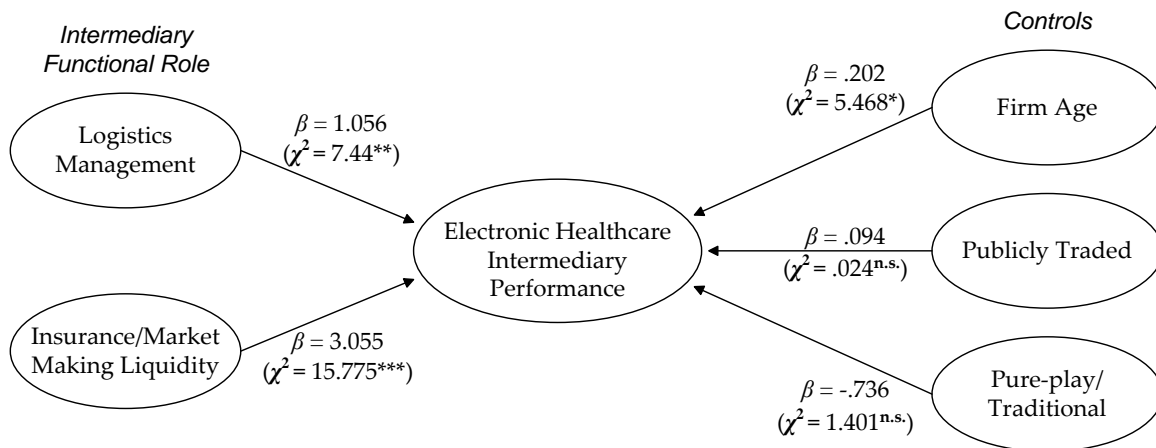
Table 6 details inter-correlations for study variables and controls within the upper half of the matrix. The lower half presents the chi-square differences for all dependent, independent, and control variables. The chi-squared analysis finds for significant differences for all combinations of variables and controls, supporting a lack of collinearity. Given multiple dependent variables for entry mode, we conducted a Levene test of the homogeneity of

variance for each dependent variable across all level combinations of the between-subjects factors. These results find error variance does not increase or decrease with one predictor variable, inferring equal error variance of the dependent variable across groups. Further, a Box's M test of the homogeneity of the covariance matrices of the dependent variables across all level combinations of the between-subjects factors finds equality across all groups for the observed covariance matrices of the dependent variables.

5.1. Intermediary Functional Roles and Performance

The first research question addresses the relationship between performance and intermediary roles. We utilize ordinal logistic regression to examine this relationship as the dependent variable, performance, employs an ordered categorical variable. Categorical variables with a natural ordering of the possible values (e.g., low, medium, and high) are considered ordinal [McCullagh 1980]. Employing ordinal logistic regression (OLR) as an analysis tool permits estimation of a readily interpretable model. With this technique, the proportional odds model re-expresses the categorical variable in terms of a number of binary variables based on internal cut-points in the scale. Given a variable, y , measured on a 6-point scale, binary variables y_c with $c = 1, \dots, 6$ are defined as $y_c = 1$ if $y > c$ and $y_c = 0$ if $y \leq c$. Similarly, explanatory variables x_j where $j = 1, \dots, k$, are considered five binary logistic models corresponding to a regression of each of the y_c 's individually against the x 's. Here, the true β values are assumed the same for all models with the intercept terms α_c ; where $c = 1, 2, 3, 4, 5$; registering the real differences in models. Pooled estimates of the five binary models equate to a single set of β estimates. Each pooled value for a given predictor estimates the common odds ratio that describes the relative odds for $y > c$ for values of x_j differing.

Our analysis regressed performance against intermediary functional roles. Figure 3 details the analysis results. Only logistics management and insurance/market making and liquidity management have positive beta coefficients and chi squareds statistically significant at the .01 and .001 levels respectively, supporting H1 and H2. The parameter estimates for insurance/market making and liquidity management are significant and positive in specification, indicating that intermediaries providing these functional roles show a greater likelihood of falling into a category of greater performance. Subsequently, the analysis also supports H3, with the effects for logistics management substantially less than insurance/market making and liquidity management. With respect to controls, the analysis finds only for a significant, but moderate, positive association between firm age and performance. This finding is consistent with intuition suggesting that older firms demonstrate somewhat superior performance than their younger counterparts.

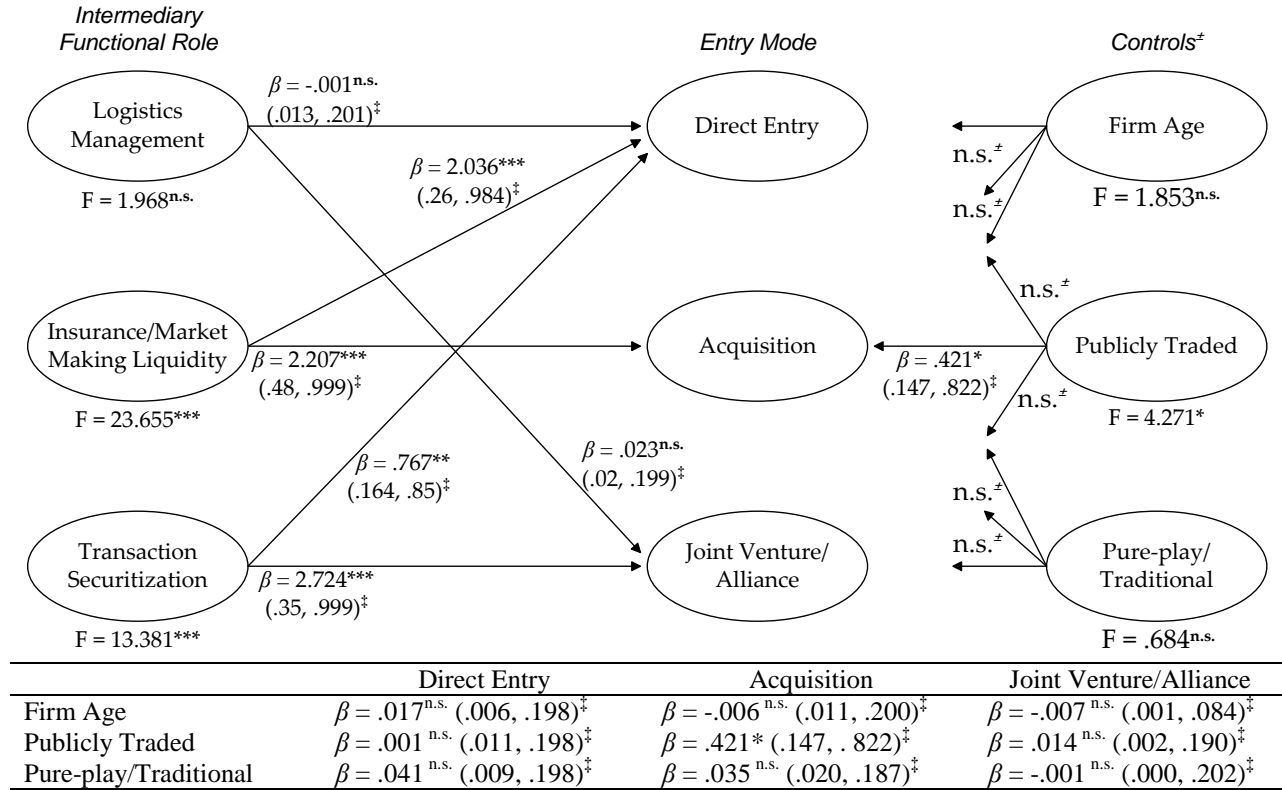


* $t < 0.05$; ** $t < 0.01$; *** $t < 0.001$

Figure 3. Results H1 through H3

5.2. Intermediary Functional Roles and Entry Mode

The second research question explored intermediary choice of electronic market entry mode. The presence of multiple related and continuous dependent variables dictated the use of general linear model (GLM) multivariate analysis of covariance (MANCOVA) with growth strategies as the multiple dependent variables and intermediary roles as the multiple independent variables [Sharma 1996]. The multivariate analysis allows for simultaneously testing each factor's effect on the group of dependent variables [Hair et al. 1998]. The univariate analysis of variance (ANOVA) examines the effects of individual independent variables upon specific dependent variables [Nelder and Wedderburn 1972]. The results of this analysis are shown in Figure 4.



* $t < 0.05$; ** $t < 0.01$; *** $t < 0.001$; n.s. = not significant

[‡] (eta squared, observed power); [±] non-significant statistical testing values for controls reported under the figure

Figure 4. Results H4 through H6

The analysis found statistically significant F -statistics for two individual independent variables, namely (1) insurance/market making and liquidity management and (2) transaction securitization. The multivariate analysis finds no support for either H4a or H4b with respect to logistics management provisions. However, firms engaged in insurance/market making and liquidity management activities primarily employ acquisitions and direct entry to a lesser degree with both eta squared and observed power at lower levels. These findings support both H5a and H5b. By contrast, results indicate that intermediaries engaged in transaction securitization activities achieve electronic market entry primarily through joint ventures with the highest eta squared and observed power. This result supports H6. Additionally, we find a less predominant but significant positive effect for transaction securitization and direct entry initiatives. Finally, with respect to controls, only publicly traded firms show a slight but significant propensity for acquisitions at the .05 level.

6. Discussion

6.1. Intermediary Performance

This research finds for significant positive relationships between the provision of (1) logistics management and performance in addition to (2) insurance/market making and liquidity management and performance. Both functional roles afford electronic healthcare intermediaries the opportunity to augment traditional functions through IS or information assets, namely *information networks* and *market knowledge* respectively. As predicted, such opportunities give rise to greater performance for the respective intermediary. Additionally, by definition logistics management requires significant investments in tangible assets, while insurance and liquidity functions call for investments in inventories through financial resources and significant working capital. By contrast, information management and transaction securitization initiatives are less capital intensive relying on information systems (i.e., *information networks*) in addition to *commercial relationships*, *expertise*, and *reputation*. Investments in capital-intensive assets, through logistics management as well as insurance/market making and liquidity management, constitute a key distinction in profit realization for electronic healthcare intermediaries.

With the inclusion of information management in the analysis no significant effects were detected for the provision. Our findings are consistent with the general lack of success on the part of pure content aggregators and

B2B exchanges that emerged during the initial electronic commerce boom of the late 1990s. In considering the paths of DrKoop and WebMD, while the former held an information management strategy, the latter expanded into a variety of higher-level intermediary roles via insurance claims processing and supply chain management. Though content aggregation may constitute an asset provision in its own right, the challenge faced by pure content providers is that assets are often not requisite to the operations of the business. Thus, an optimal platform for marketing supplementary content may in fact be applications facilitating the revenue stream, such as insurance claims processing and extending liquidity through the purchasing of accounts receivables. Noteworthy, while our work focused on the information management function within B2B markets, Palvia and D'Aubeterre [2007] posit that for firms pursuing business-to-consumer (B2C) information management strategies, specific mechanisms facilitating infomediary activities differ by industry and may be a source of advantages within certain economic sectors.

Clearly, difficulties exist with many emergent B2B portals that offer few contributions beyond matching buyer and seller. Generating sufficient interest in markets can be prohibitively difficult in the absence of some value proposition. It is well established that opportunism, bounded rationality, and moral hazard constitute a permanent part of all transactions. Secure roles for intermediaries lie in offering functions and services that help mitigate these problems. This potentially includes more capital intensive functional roles such as insurance/market making and liquidity management. Consider that healthcare transaction clearinghouses have long offered value to providers and insurers by cleansing and standardizing transactional data across highly disparate sets of communication protocols. There are, however, some indications that such businesses are waning. The U.S. government imposition of HIPAA standards requires all participants in the industry to communicate through a predefined set of standards [1996]. Large providers with financial ballast already circumvent transaction clearing intermediaries communicating directly with insurers. Transaction clearing intermediaries will, however, continue to add value to this highly complex industry sector. Many things can go wrong in electronic transactions. Moreover, there will always be a need for middlemen who are willing to accept the inglorious task of data maintenance and keeping infrastructure running smoothly. However, with increased adoption of HIPAA standards, the healthcare sector may see greater consolidation and commoditization thereby squeezing out an important market niche for these intermediaries.

6.2. Choice of Entry Mode

Our analysis finds no significant relationship for logistics management and choice of entry mode. However, insurance/market making and liquidity management are associated with direct entry and acquisitions, while transaction securitization functions are related to direct entry and joint ventures. Findings specific to insurance/market making and liquidity management intermediaries are consistent with intuition that suggests that the intermediary should own inventories and credit facilities before it can be extended to clients. Hence, by definition these assets must be wholly owned or internally cultivated. Moreover, this finding is also in line with the suggestion that more complex and capital intensive roles are more easily acquired through acquisition than developed organically [Brousseau 2002]. An example of this phenomenon can be seen in Global Health and Medibuy. Global Health, which provides products and services to aid in reducing costs to buyers and suppliers of healthcare products, acquired Medibuy, an Internet-based trading exchange and wholesaler for medical suppliers. Through this acquisition, Global Health used its financial resources to acquire Medibuy's existing market knowledge, established commercial relationships of in excess of 1,400 hospital networks, product inventories, and subsequent access to future production.

Our analysis further indicates that healthcare intermediaries offering transaction securitization services expand into electronic markets predominantly through joint ventures and, to a far lesser degree, direct entry. This supports the argument that transaction securitization activities cannot be easily emulated from technology infrastructure alone, as can the other three functional roles. Transaction securitization functions do not rely upon digitally based resources (i.e., *information networks* or *market information*) as other roles do. Hence, electronic intermediaries would seek to facilitate such functions through joint ventures or alliances rather than expending capital acquiring such functional capabilities. Consider, as an example, the numerous alliances formed between CheckFree (www.checkfree.com/) and healthcare intermediaries. CheckFree's proven track record and established commercial relationships facilitate the implementation of systems to provide reconciliation, exception management, and financial flows for these firms. Finally, we speculate that the unexpected relationship between transaction securitization activities and direct entry initiatives reflects efforts on the part of intermediaries to integrate functional capabilities with intermediary product/service offerings.

6.3. Contributions for Theory and Practice

Findings reinforce theoretical arguments that electronic intermediaries provide functions in the economy that are not completely replaced, or disintermediated, through traditional commercial intermediaries. Rather, electronic intermediaries augment or complement traditional intermediation functions through IS and information assets, namely *information networks* and increased *market knowledge*. Intermediaries engaged in the provision of more

capital-intensive intermediary functions, including logistics management and insurance/market making and liquidity management, can realize higher returns on investments and thereby superior performance. Movements into the more capital intensive intermediary function of insurance/market making and liquidity management are most likely completed through direct entry and acquisition given the need to quickly appropriate *market knowledge* and operational infrastructures as well as to maintain full control of requisite assets.

Upon reflection, our findings for healthcare intermediaries are not inconsistent with what we see in other, more traditional intermediaries. From a practical perspective, intermediaries that aggregate and coordinate information provide a valuable service. However, potential barriers to entry for information coordination might be low. Accordingly, defending a profitable position on this strategy alone may prove difficult. Electronic intermediaries must do more than just manage and coordinate information in order to maintain profitability. They should expand operations into the more capital intensive intermediary states; such as transaction clearing, trade financing, and inventory management; which are requisite functions to all transactions. Further, pursuit of intermediary provisions on the part of electronic intermediaries may necessitate divergent approaches to expanding into given functions. Where transaction securitization can often be obtained via joint ventures, holding inventories and trade credit facilities should be wholly owned, conducive to acquisition or organic growth through direct entry. Our research should aid CIOs and IS managers charged with informing their firms' choice of intermediary functional roles in developing profitable business models as well as the subsequent selection of electronic market entry mechanisms.

6.4. Limitations and Future Research

Our study is not without limitations that warrant attention. The current research relies upon a commercial directory for identification of potential firms for inclusion in the study. The directory employed afforded the opportunity to develop a sample of both public and private firms. However, common with most studies of this nature, it is impossible to guarantee the randomness of the sample compared with the full population of potential firms, warranting some critical reflection on the generalizability of our findings. Moreover, our sample of 58 firms constitutes a further limitation of our work meriting careful consideration. As the electronic portion of the healthcare sector matures attracting more firms, future work should validate findings with a larger sample.

While our research offers new insights into electronic healthcare intermediaries' performance, clearly a number of variables have not been included that may otherwise be determinative. Consider that our findings potentially contradict the logic of the outsourcing literature suggesting administrative functions be conducted outside the firm [Cross 1995; Gallivan and Oh 1999; Hirschheim and Lacity 1998; Loh and Venkatraman 1992]. Outsource vendor scale and specialization potentially enables greater efficiency; however, we do not control for the proxies of firm size or scale economies. These factors should be considered in future research. Further studies might employ tools developed within industrial economics to understand the role of specialization and niche strategies in shaping intermediary profitability patterns.

Whereas the majority of companies in this sample displayed a high propensity to announce diversification initiatives through press releases, the Internet, and annual reports, study procedures potentially overlook instances of internal growth not announced within the public domain. Organizations focus public announcements on groundbreaking developments that hold marketing value, while routine and less dramatic activities may not warrant marketing and/or public relations attention. Here, entry into new product offerings and/or markets, particularly Internet-based, would constitute more dramatic events warranting external attention.

Areas for future research related to this study should also include the inter-relationship between various intermediary roles as either inclusive or discrete alternatives. Do the provisions of more capital-intensive intermediary functions imply the ability to provide the less capital-intensive tasks; that is, are the roles inclusive? Furthermore, an examination of alternative operating measures of performance beyond financial metrics would be valuable. Consideration should be given to assessing the specific contribution of intermediaries towards supply chain efficiency. Finally, as this analysis focuses on a specific industry sector that is highly service-based, future research should contrast differences in business sectors [Barney 1991], namely service-based intermediaries and commodity/manufacturing focused firms. Given an absence of significant results supporting Hypotheses 4(a) and 4(b), we speculate that for this intermediary role, the business sector in which the firm operates, irrespective of industry, may be a mediating factor.

7. Conclusions

This research examined data from 58 U.S. electronic healthcare intermediaries finding that performance is positively associated with the provision of logistics management as well as insurance/market making and liquidity management. Results further support the notion that pure information management and aggregation cannot sustain the performance of most intermediaries. We subsequently inform firm choice of strategic business model pursuits specific to electronic intermediary functional roles. An examination of intermediary choice of electronic market

entry mode finds that insurance/market making and liquidity management activities expand predominantly through acquisitions. Firms engaged in the functions of transaction securitization services show the greatest tendency to pursue entry through joint ventures. In both instances, significant internal initiatives exist at less substantial levels.

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