

# Service and Commodity Based Electronic Intermediaries: A Comparative Analysis

**Jonathan Wareham**

Department of Computer Information Systems  
Georgia State University  
[wareham@acm.org](mailto:wareham@acm.org)

**Rich Klein**

Clemson University  
[rklein@Clemson.edu](mailto:rklein@Clemson.edu)

**Karlene Cousins**

Department of Computer Information Systems  
Georgia State University  
[karlenecousins@hotmail.com](mailto:karlenecousins@hotmail.com)

## **Abstract**

*The theoretical literature concerning supply chain intermediation is surveyed to develop a framework of five intermediary states. Data collected on 134 electronic intermediaries are employed to explore correlations between intermediation states, growth strategies and firm profitability, in a sample representing both service based and commodity based intermediaries. The study finds a positive relationship between more capital intensive states of intermediation and profitability. In addition, we find a higher use of acquisitions as growth mechanisms in service based intermediaries, and a greater use of joint ventures as growth mechanisms within commodity based portals.*

## **1. Introduction**

The topic of electronic intermediation has received a significant amount of attention with the widespread acceptance of the Internet. The ability of these electronic intermediaries, through B2B ecommerce applications, to fundamentally change the structure of supply chains has been widely acclaimed. Electronic intermediaries are involved in uniting the disparate processes of inter-business procurement and sales, ranging from inbound purchasing, outbound sales, distribution, invoicing and financing. By bringing buyers and sellers together in unique ways, the intermediaries can influence the competitive positions of the participating firms as well as fully restructure supply chain processes in vertical industry sectors.

Although the role of intermediaries has been explored, existing theory offers little guidance as to the factors contributing to their profitability. Research approaches have concentrated on the development of economic models, case studies and analyses based on anecdotal evidence. In view of the paucity of rigorous analysis, the purpose of this study is to collect and analyze a large data set to lend support to existing theory as well as to aid in the development of new theory (Bakos 1997).

As such, our paper is structured as follows. The following section surveys the theoretical literature and motivates research questions concerning intermediary profitability and growth

strategies. Section three describes the data collection and analysis. Section four discusses the findings and section five concludes the paper.

## 2. Theory and Research

### 2.1 Theory Review

Most contributions in the area of intermediation come predominantly from finance (Lewis, 1995; Rousseau and Wachtel, 1998). However, there are several works that have focused on the intermediation of goods and services (Bentacourt and Gautschi, 1993; Michael, 1994; Spulber, 1996, 1999; Brousseau, 1999).

The concept of disintermediation was first introduced by Malone et al. (1987) who predicted that as electronic markets lowered the cost of transactions and increased the ease of matching buyers and sellers, traditional roles of intermediaries would be eliminated leading to disintermediation. However, the disintermediation hypothesis has thus been questioned. Bakos (1998) argued that intermediaries would continue to exist but their roles would evolve to that of aggregation, matching of buyers and sellers, information provision, providing inter-organizational information, trust and integrity of the market as well as integrating the components of customer processes.

The literature on electronic intermediation also emphasizes the differences between vertical portals and horizontal portals (Dai and Kauffman 2002). Horizontal portals are characterized by a single industrial input factor (e.g. steel), with buyers and sellers representing a variety of industries. Here the main purpose is demand and supply aggregation. Vertical collaboration effectively describes intermediaries where firms collaborate backwards and forwards across a specific supply chain. However, where the structures and business models of both vertical and horizontal portals are reasonably well understood, the differences between service based intermediaries have received less attention. We define service based portals as intermediaries that aggregate providers and consumers of primarily non-tangible products, including financial services, insurance, healthcare, information and content, travel and entertainment, etc. Given the fundamentally different nature of services compared to manufacturing inputs, we seek to explore the divergent characteristics with a rigorous analysis.

Hence, a review of the classical roles of commercial intermediation may aid understanding of the new class of intermediation currently witnessed in both service and commodity based intermediaries. While unanimous definitions of commercial intermediaries are difficult to extract, Brousseau (1999), following Spulber (1996, 1999), delineates the following typology in which intermediaries ensure adjustments in terms of availability, volume and quality, as well as securing transactions and liquidity in five states:

1. **Information Management**: as an aggregator and filter of information, they support the producer's need to determine demand as well as the consumer's assessment of supply levels and capabilities.
2. **Transaction Securitization**: controlling and guaranteeing the products delivered and assuring payment to producers, third party intermediaries often mitigate adverse selection and moral hazard problems via the endorsement of the transaction with their own reputation or legally binding guarantee. As a subset, some other form of value added service as well as a reconfiguration of the bundle of goods and services is often performed.

3. **Liquidity**: through the extension of credit to both sides of the transaction, intermediaries facilitate the systematic clearing of markets despite possible liquidity constraints in both ends of the channel.
4. **Logistics Management**: performing the basal tasks of sorting, packaging, storing, stocking and transportation of goods from production locations to intermediate warehouses to consumption sites.
5. **Insurance/market-making**: by purchasing production before consumer demands are expressed, they provide producers with some stability and security of demand for their production. While not a guarantee, the intermediary is able to aggregate demand curves and offer some insurance that production can be disposed of. Likewise, some insurance is offered to the consumer that the goods will be available, insulating them from fluctuations in levels of supplies.

These states are the result of what has been observed in the economy. The presence of market intermediaries is viewed as a departure from Walrasian equilibrium, that is, a failure of markets resulting from antecedent conditions of information asymmetry, bounded rationality, moral hazard, and opportunism (Spulber 1996, 1999). Intermediaries compete with decentralized exchanges, in which consumers and suppliers seek out each other and negotiate prices directly (Rubenstein and Wolinsky 1987). Consistent with transaction costs economics (Williamson 1975), each transaction is an individual unit of analysis, yet bundles of transactions can constitute long term relationships, which are also valid entities of analysis (Spulber 1999). Intuitively, some customers have a greater need for local inventories (temporal or spatial sensitivities), have higher aversion towards risk and fear of transacting with unknown entities, or have decreased access to market search mechanisms, giving them a high sensitivity to search and coordination costs.

The ordering of the intermediation states from 1 to 5 is a function of the capitalization required for each function. As we move from information management to insurance, the relative level of financial or physical capital required to execute each function increases (Gehrig 1993).

## 2.2 Research Questions

The limited literature on the subject has emphasized that the value provided in intermediated exchanges must be compensated by some economic rent realized by the intermediary (Spulber 1996, 1999). This rent is typically realized in the form of a bid-ask spread in the case of dealers and market makers, yet can also be obtained in some other type of “taxation”, in the form of commissions, transaction or subscription fees (Gehrig 1993). More capital intensive intermediaries might assume greater aggregate levels of potential and realized functions in the economy, and these states might render corresponding rates of return on the capital employed (Myerson and Satterthwaite 1983, Mookerjee and Reichelstein 1992, Spulber 1999). If the intermediary functions are discrete alternatives, the greater number of functions provided, the greater the level of resulting economic rents, by virtue of a greater the proportion of the value chain that is under the intermediary’s control. Accordingly, we formulate research question 1.

*Research Question 1a: Are the state of intermediation and diversification in electronic intermediaries related to profitability?*

*Research Question 1b: If such a relationship exists, does it differ significantly between service- based versus commodity- based intermediaries?*

Organizational studies have shown ambiguous results concerning the effects of age on business viability and profitability. While some studies have demonstrated support for the “liability of newness argument” by finding declining rates of bankruptcy or dissolution with greater firm age, particularly in manufacturing (Stinchcombe, 1965; Carroll and Swaminathan, 1982), other studies have found the opposite effects, particularly in the service sector (Baum and Mezias, 1992; Amburgey, Dacin and Kelly, 1994).

Intermediary types that have emerged with the Internet comprise a major portion of our sample. As many of these younger firms are struggling to obtain positive profitability, we argue that the older, established businesses are more profitable than the younger start-ups. Likewise, we believe that established industrial enterprises will have greater profitability levels than firms which have recently launched with the express intent of capitalizing on the capabilities offered by the Internet.

We assume that firms that are publicly listed have higher capitalization rates than private, which enables increases in marketing expenditures, strategic and operational investments, financial longevity, as well as incentive structures implicit in a shareholder wealth-maximization paradigm that emphasizes earnings growth and return on equity. As such, research question 2 is motivated.

*Research Question 2a: Are electronic intermediary characteristics such as Internet pure-play strategies, being publicly listed, or age, related to profitability?*

*Research Question 2b: If such a relationship exists, does it differ significantly between service- based versus commodity- based intermediaries?*

Our third research question focuses on how electronic intermediaries evolve through time. A survey of the popular press indicates that many of the businesses with electronic channels have a particularly high frequency of announcements concerning acquisitions, joint ventures and alliances, categories frequently utilized in academic literature (Chatterjee, 1990; Chatterjee and Wernerfelt, 1991).

Several authors have argued that acquisitions serve to minimize the issues of bounded rationality and time compression diseconomies that constrain the content and speed with which people learn (Simon, 1945; Dierickx and Cool, 1989). This makes acquisitions preferred to internal development as a mode of growth. Hence, the goal of acquisitions is to secure the tacit knowledge and organizational memory that reside in an organization’s structure via the routines that the organization maintains (Nelson and Winter, 1982; Karim and Mitchell, 2000).

We suggest that, as the intermediation state becomes more complex and demanding in terms of physical capital, tacit and process-based knowledge and organizational memory, the barriers to removing constraints to individual and organizational learning are most easily overcome via acquisition. Consequently, it is assumed that intermediaries that can perform the functions of logistics management, liquidity management and legal inventory ownership will often choose to develop these capabilities through acquisition. Alternatively, it is assumed that intermediaries that perform functions that require less capital investment, such as information

management, would attempt to extend their breadth through a higher frequency of joint ventures, licensing agreements and alliances.

*Research Question 3a: Is there a relationship between the state of intermediation and the relative frequency of organic growth, acquisitions and joint ventures within electronic intermediaries?*

*Research Question 3b: If such a relationship exists, does it differ significantly between service- based versus commodity- based intermediaries?*

### 3. Data and Analysis

Our initial sample constitutes 145 electronic intermediaries. Our preferred form of data collection was personal interviews with senior and middle management (Creswell, 1997; Mason, 1996; Miles and Huberman, 1994). In the instance that a personal interview was not possible, secondary data was employed, including information collected from web sites, annual reports, newspaper articles, and third party analyses such as stock analysts and venture capital media (Miles and Huberman, 1994). By far, the most difficult unit of data to obtain was profitability. As 27% of the sample was publicly listed, this was obtainable via public sources. However, the remaining 73% were contacted via telephone or personal interview, where data on all variables were solicited and corroborated with third party sources. In 16% of the sample, the respondents did not disclose profitability. However, in the instance that we were able to interpolate a profitability level with some level of confidence, we retained the company in the sample. Otherwise the company was eliminated, which was necessary with 11 companies, resulting in a final sample of 134.

#### 3.1 Sample Profile

Out of the 134 companies that constitute our final sample, 27% are publicly listed, predominantly on the NASDAQ stock exchange. 57% were categorized as Internet pure-plays, while the remaining 43% are companies that existed prior to the growth in Internet-based business models. The average age of the companies is 6.5 years. Full descriptive statistics can be found in table 1.

**Table 1. Descriptive Statistics**

	<u>Data Type</u>	<u>Category</u>	<u>%</u>	<u>N</u>	<u>Mean</u>	<u>S.D.</u>
<b><u>Profit</u></b>	<b><u>Rank</u></b>	<u>(10%)</u>	<u>35.1</u>	<u>134</u>		
		<u>(10%) Profit &lt; (5%)</u>	<u>24.6</u>			
		<u>(5%) Profit &lt; 0%</u>	<u>33.9</u>			
		<u>0% Profit &lt; 5%</u>	<u>11.9</u>			
		<u>5% Profit &lt; 10%</u>	<u>3.7</u>			
		<u>10%</u>	<u>0.7</u>			
<b><u>Intermediation Strategy</u></b>	<b><u>Categorical</u></b>	<b><u>Information</u></b>	<u>22.4</u>	<u>134</u>		
		<b><u>Management</u></b>	<u>33.6</u>			
		<b><u>Transaction</u></b>	<u>29.9</u>			
		<b><u>Securitization</u></b>	<u>11.9</u>			
		<b><u>Liquidity Management</u></b>	<u>2.2</u>			
		<b><u>Logistics Management</u></b>				
		<b><u>Insurance</u></b>				

<u>Transaction Securitization</u>	<u>Dichotomous</u>	<u>Yes (1)</u> <u>No (0)</u>	<u>70.9</u> <u>29.1</u>	<u>134</u>	<u>0.71</u>	<u>0.46</u>
<u>Liquidity Management</u>	<u>Dichotomous</u>	<u>Yes (1)</u> <u>No (0)</u>	<u>38.8</u> <u>61.2</u>	<u>134</u>	<u>0.39</u>	<u>0.49</u>
<u>Logistics Management</u>	<u>Dichotomous</u>	<u>Yes (1)</u> <u>No (0)</u>	<u>14.2</u> <u>85.8</u>	<u>134</u>	<u>0.14</u>	<u>0.35</u>
<u>Insurance</u>	<u>Dichotomous</u>	<u>Yes (1)</u> <u>No (0)</u>	<u>2.2</u> <u>97.8</u>	<u>134</u>	<u>0.0224</u>	<u>0.15</u>
<u>Publicly Traded</u>	<u>Dichotomous</u>	<u>Yes (1)</u> <u>No (0)</u>	<u>26.9</u> <u>73.1</u>	<u>134</u>	<u>0.27</u>	<u>0.44</u>
<u>Internet Pure Play</u>	<u>Dichotomous</u>	<u>Yes (1)</u> <u>No (0)</u>	<u>56.7</u> <u>43.3</u>	<u>134</u>	<u>0.57</u>	<u>0.5</u>
<u>Diversification Index</u>	<u>Rank</u>	<u>0 - 2</u> <u>3 - 5</u> <u>6 - 9</u>	<u>70.2</u> <u>26.9</u> <u>2.9</u>	<u>134</u>	<u>2.36</u>	<u>1.37</u>
<u>Organic Growth Rate (%)</u>	<u>Quantitative</u>	<u>.00 - .25</u> <u>.26 - .50</u> <u>.51 - .75</u> <u>.75 - 1.0</u>	<u>51.7</u> <u>13.7</u> <u>10.5</u> <u>24.1</u>	<u>134</u>	<u>0.42</u>	<u>0.38</u>
<u>Acquisition Strategy (%)</u>	<u>Quantitative</u>	<u>.00 - .25</u> <u>.26 - .50</u> <u>.51 - .75</u> <u>.75 - 1.0</u>	<u>55</u> <u>10.3</u> <u>12</u> <u>22.7</u>	<u>134</u>	<u>0.18</u>	<u>0.31</u>
<u>Joint Venture (%)</u>	<u>Quantitative</u>	<u>.00 - .25</u> <u>.26 - .50</u> <u>.51 - .75</u> <u>.75 - 1.0</u>	<u>62</u> <u>8.5</u> <u>7.1</u> <u>22.4</u>	<u>134</u>	<u>0.41</u>	<u>0.38</u>
<u>Age (Years)</u>	<u>Quantitative</u>	<u>0-4</u> <u>5-9</u> <u>10-14</u> <u>15-19</u> <u>20-24</u> <u>25 +</u>	<u>64.9</u> <u>19.4</u> <u>4.5</u> <u>2.2</u> <u>3</u> <u>6.9</u>	<u>134</u>	<u>6.52</u>	<u>9.02</u>

The sample of service based intermediaries came primarily from medical healthcare portals. As healthcare is a highly information intensive sector, this type of portal offered broad opportunities to understand the role of service provision within an electronic intermediary. The functions offered by healthcare portals included content aggregation, patient and records management, facilities and practice management, insurance claims processing. The sample of commodity based intermediaries was drawn from the sectors which facilitate the exchange of raw materials for manufacturing such as metals and plastics. Here, the traditional functions of supply and demand aggregation, payment processing, order clearing, insurance, settlement, financing, warehousing, shipment, were prevalent. In each instance, we transposed the functions provided by the intermediaries to our 5 level state construct, that is, information management, transaction securitization, liquidity management, logistics management and market making.

Table 2 presents a chi-square differences matrix of all dependant and independent variables. Significant differences were detected for all variable combinations, which indicate a lack of co-linearity. The only insignificant difference identified was between logistics management and insurance. However, Campbell and Fiske (1959) note that normal statistical distributions in a large matrix will result in exceptions, as highlighted here, that are not necessarily meaningful.

**Table 2. Proximity Matrix of Chi-Square Between Sets of Frequencies**

	<u>Profit</u>	<u>Tms Sec</u>	<u>Liqu</u>	<u>Log Mgt</u>	<u>Insur</u>	<u>Div Ind</u>	<u>Pure Play</u>	<u>Pub Trd</u>	<u>LN Age</u>	<u>Acq</u>	<u>JV</u>
<u>Profit</u>	---										
<u>Tms Sec</u>	7.098*	---									
<u>Liqu</u>	7.342*	6.311*	---								
<u>Log Mgt</u>	7.737*	8.414**	6.355*	---							
<u>Insur</u>	7.44*	6.889*	5.091*	3.044	---						
<u>Div Ind</u>	7.851*	7.169*	8.954**	8.91**	9.766**	---					
<u>Pure Play</u>	9.131**	7.852*	8.962**	8.551**	7.185*	8.386**	---				
<u>Pub Trd</u>	9.65**	7.632*	7.548*	6.794*	5.653*	9.312**	7.846*	---			
<u>Age</u>	13.432**	11.845**	12.343**	10.457**	15.036**	13.399**	13.39**	11.714**	---		
<u>Acq</u>	7.701*	6.26*	5.746*	5.996*	4.97*	8.21**	7.68*	5.182*	9**	---	
<u>JV</u>	7.213*	7.681*	7.716*	6.496*	6.126*	7.715**	7.109*	8.224**	11.355**	7.994*	---

\* Significant at .05, \*\* Significant at .01

### 3.2 Dependent Variables

The dependent variable for research questions 1 and 2 is the level of average profitability of the intermediary through the 4 years of 1998 to 2001. The variable was registered as an ordinal measure of net profit: 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%. The brackets were used for several reasons. First, given the relative youth of this type of business, a traditional binomial logistic estimation of survival would not adequately capture many of the companies that are currently struggling for their existence. Second, while it was possible to obtain exact profitability information on 27% of our sample, estimates for the remainder of our sample were obtained through interviews (57%) or estimation from publicly available material (16%). In the instance of an interview, the respondents were offered brackets so they were not compelled to disclose exact profitability information.

The dependent variable for research question 3 is intermediation state. This construct serves as an independent variable in questions 1 through 2, and the dependent variable in question 3. We capture this by using four binary variables to represent the company's participation in the five intermediary states. Our base case was information management, as all firms provided this function. For the resulting states, provision of the function by the intermediary was coded as a 1, otherwise 0.

### 3.3 Independent Variables

Our focal independent variable for research questions 1 and 2 is intermediation state, based upon the Spulber (1996) framework previously discussed. As mentioned above, this was captured as a binary variable coded as 1 in the instance the function is provided by the intermediary. Other independent variables include publicly traded, a binary variable equal to 1 if the company is listed on any major stock exchange, 0 if not. Likewise, Internet pure-play is also a binary variable that assumed a value of 1 if the company was launched with the express intent of capitalizing on the capabilities of the Internet, and 0 if the company had an existing industry function independent of the Internet. Age is a continuous variable that measures the period between establishment of the company through the point of data collection.

Diversification index is an index we developed based upon our functional typology. We utilized the Berry-Herfindal index defined as one minus  $\sum_{i=1, \dots, I} P_i^2$ , where  $P_i$  is the proportion

of sales in the  $i$ th business (Neter et al., 1996). However, as SIC codes, which are normally used, did not offer sufficient granularity for this analysis, we substituted our own functional typology of intermediary function identified in each sector, measured and time  $t$  at either the point of exit or at the date of measurement. The event of diversification was registered when the firm entered a different functional area.

Growth strategies were registered in the data collection process. Each time a company expanded its functional capabilities, we registered the instance as either organic growth, growth by acquisition, or growth by joint venture/alliance. Typically, growth was defined as the entrance of the company into a new functional area as defined in our typology. However, in many instances, companies made acquisitions of companies in areas already included in the company's current portfolio of functions in an effort to expand market share. Hence, all cases where significant growth was achieved via acquisition, joint venture, or internally were registered. Many of the larger, mature entities had over 30 instances of some kind of growth, where the younger, smaller companies had less than five registered instances. In order to normalize the data, we transformed the nominal counts to relative frequencies. Hence, a company could have 30% of growth via internal/organic means, 40% via acquisitions, and 30% via joint venture or alliance (Seddighi, Lawler and Katos, 2000).

### 3.4 Estimation and Findings

Research question 1 addressed the relationship between intermediary profitability and intermediary state and diversification level. We regressed profitability against the different levels of intermediation identified in each organization. In order to assess the partial effects of each function of intermediation provided, we fitted four different models with binary variables (Models I-IV), corresponding to the five states of intermediation as well as the diversification index in model V. Information management is our base case as all the companies in our sample provided it. Models VI and VII are alternative specifications based upon the use of the Akaike information criterion (AIC) and Bayesian information criterion (BIC) model selection procedures.

As indicated in table 3a, the overall fit of the models increases for each specification through model V where we find the highest level of fit with Cox & Snell, Nagelkerke and McFadden pseudo  $R^2$  statistics of .335, .353 and .138. All models are significant. As expected, the coefficients on all parameters are positive across all models, although significance does vary across specifications. In general, this supports the idea that profitability is positively related to the provision of higher intermediary states. Note that liquidity management and logistics management are highly significant across all specifications. The provision of insurance is does show significance at the 10% level in model five, and 15% in the other specifications, lending moderate support to the central thesis more capital intensive intermediary states are positively correlated with profitability. Models VI and VII represent the specifications based on the lowest AIC and BIC criteria. The parameters for liquidity management and logistics management are substantial (1.6-2.1) and significant in these models. This would indicate that higher profitability is associated with intermediaries providing liquidity management and logistics management. The provision of insurance also shows a positive parameter that is significant at the 13% level. However, we note that the frequency of companies that provide insurance only constitute 2.2% of the sample. Diversification is shows a very small coefficient that is insignificant.

**Table 3(a). Ordinal Logistic Regression of Profitability, Intermediary States and Diversification Index; Pooled Sample**

<u>DV = Profit</u>	<u>I</u>	<u>II</u>	<u>III</u>	<u>IV</u>	<u>V</u>	<u>VI</u>	<u>VII</u>
<u>Model Fit/ Null Hyp. Test</u>							
<u>Wald Chi-Square</u>	<u>4.837</u>	<u>31.45</u>	<u>50.76</u>	<u>52.458</u>	<u>54.662</u>	<u>50.145</u>	<u>51.99</u>
<u>Degrees of Freedom</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>2</u>	<u>3</u>
<u>Significance</u>	<u>0.028</u>	<u>0.000</u>	<u>0.000</u>	<u>0.000</u>	<u>0.000</u>	<u>0.000</u>	<u>0.000</u>
<u>Pseudo R-Squared</u>							
<u>Cox &amp; Snell</u>	<u>0.035</u>	<u>0.209</u>	<u>0.315</u>	<u>0.324</u>	<u>0.335</u>	<u>0.312</u>	<u>0.322</u>
<u>Nagelkerke</u>	<u>0.037</u>	<u>0.221</u>	<u>0.333</u>	<u>0.342</u>	<u>0.353</u>	<u>0.329</u>	<u>0.339</u>
<u>McFadden</u>	<u>0.012</u>	<u>0.079</u>	<u>0.128</u>	<u>0.132</u>	<u>0.138</u>	<u>0.126</u>	<u>0.131</u>
<u>Intercept &amp; Covariates:</u>							
<u>-2 Log L</u>	<u>392.032</u>	<u>365.419</u>	<u>346.11</u>	<u>344.411</u>	<u>342.207</u>	<u>346.724</u>	<u>344.879</u>
<u>AIC</u>	<u>404.032</u>	<u>379.419</u>	<u>362.11</u>	<u>362.411</u>	<u>362.207</u>	<u>360.724</u>	<u>360.879</u>
<u>SC (BIC)</u>	<u>421.419</u>	<u>399.704</u>	<u>385.292</u>	<u>388.491</u>	<u>391.185</u>	<u>381.009</u>	<u>384.062</u>
<u>Trans. Securitization:</u>							
<u>Estimate</u>	<u>0.767</u>	<u>0.018</u>	<u>0.318</u>	<u>0.278</u>	<u>0.127</u>		
<u>Standard Error</u>	<u>0.353</u>	<u>0.389</u>	<u>0.401</u>	<u>0.402</u>	<u>0.413</u>		
<u>Wald Chi-Square</u>	<u>4.725</u>	<u>0.002</u>	<u>0.631</u>	<u>0.48</u>	<u>0.095</u>		
<u>Significance</u>	<u>0.03</u>	<u>0.964</u>	<u>0.427</u>	<u>0.488</u>	<u>0.758</u>		
<u>Liquidity Management:</u>							
<u>Estimate</u>		<u>1.88</u>	<u>1.55</u>	<u>1.527</u>	<u>1.494</u>	<u>1.683</u>	<u>1.642</u>
<u>Standard Error</u>		<u>0.383</u>	<u>0.386</u>	<u>0.387</u>	<u>0.388</u>	<u>0.354</u>	<u>0.356</u>
<u>Wald Chi-Square</u>		<u>24.019</u>	<u>16.97</u>	<u>15.581</u>	<u>14.818</u>	<u>22.567</u>	<u>21.290</u>
<u>Significance</u>		<u>0.000</u>	<u>0.000</u>	<u>0.000</u>	<u>0.000</u>	<u>0.000</u>	<u>0.000</u>
<u>Log Mgt:</u>							
<u>Estimate</u>			<u>2.185</u>	<u>2.011</u>	<u>1.868</u>	<u>2.103</u>	<u>1.933</u>
<u>Standard Error</u>			<u>0.506</u>	<u>0.529</u>	<u>0.523</u>	<u>0.496</u>	<u>0.517</u>
<u>Wald Chi-Square</u>			<u>18.684</u>	<u>14.47</u>	<u>12.311</u>	<u>18.016</u>	<u>13.985</u>
<u>Significance</u>			<u>0.000</u>	<u>0.000</u>	<u>0.000</u>	<u>0.000</u>	<u>0.000</u>
<u>Insurance:</u>							
<u>Estimate</u>				<u>1.886</u>	<u>2.171</u>		<u>1.955</u>
<u>Standard Error</u>				<u>1.281</u>	<u>1.296</u>		<u>1.278</u>
<u>Wald Chi-Square</u>				<u>2.167</u>	<u>2.808</u>		<u>2.34</u>
<u>Significance</u>				<u>0.141</u>	<u>0.094</u>		<u>0.126</u>
<u>Diversification Level:</u>							
<u>Estimate</u>					<u>0.188</u>		
<u>Standard Error</u>					<u>0.124</u>		
<u>Wald Chi-Square</u>					<u>2.292</u>		
<u>Significance</u>					<u>0.13</u>		

In table 3b we fitted three separate models for commodity based and service based portals, to explore the differences between the two. Model selection was guided by the use of AIC and BIC, as described above. All models are significant and the pseudo R<sup>2</sup> statistics lie in a similar range of the previous specifications. Examining the parameters, we find that transaction securitization is insignificant across all specifications (although we do see 9.4% in CMD11). Liquidity management is highly significant with parameters converging towards 3.0 for service based commodities, and only 1.0 for commodity based intermediaries. In contrast, logistics management is significant for commodity based intermediaries, with parameters converging towards 3.0. This finding is also supported by intuition; one would expect the provision of logistics management to be of primary importance to the successful operations of a commodity based portal. The provision of liquidity is also significant, but the estimates are much lower at 1.0, suggesting that it is of secondary importance. Alternatively, as service base portals primarily provide intangibles, the provision of liquidity management may, in fact be a critical differentiator.

**Table 3(b). Ordinal Logistic Regression of Profitability, Intermediary States and Diversification Index Comparing Service & Commodity Based Intermediaries**

<b>DV = Profit</b>	<b>Serv I</b>	<b>Serv II</b>	<b>Serv III</b>	<b>Comd I</b>	<b>Comd II</b>	<b>Comd III</b>
<b>Model Fit / Null Hyp. Test</b>						
Wald Chi-Square	19.796	20.52	20.822	29.07	31.694	33.176
Degrees of Freedom	1	2	2	2	3	4
Significance	0.000	0.000	0.000	0.000	0.000	0.000
<b>Pseudo R-Squared</b>						
Cox & Snell	0.332	0.342	0.346	0.29	0.311	0.323
Nagelkerke	0.355	0.366	0.37	0.304	0.327	0.34
McFadden	0.147	0.152	0.155	0.113	0.123	0.129
<b>Intercept &amp; Covariates:</b>						
-2 Log L	114.906	114.182	114.568	228.481	225.856	224.374
AIC	124.906	126.182	126.568	242.481	241.856	242.374
SC (BIC)	134.365	137.532	137.919	259.481	261.397	264.358
<b>Trans. Securitization:</b>						
Estimate		-0.546			0.881	0.79
Standard Error		0.653			0.526	0.527
Wald Chi-Square		0.703			2.807	2.243
Significance		0.402			0.094	0.134
<b>Liquidity Management:</b>						
Estimate	3.022	3.304	2.81	1.334	1.033	0.995
Standard Error	0.738	0.813	0.751	0.419	0.453	0.455
Wald Chi-Square	16.753	16.515	13.987	10.146	5.193	4.787
Significance	0.000	0.000	0.000	0.001	0.023	0.029
<b>Log Mgt:</b>						
Estimate			1.308	2.181	2.478	2.263
Standard Error			1.443	0.55	0.578	.606
Wald Chi-Square			0.821	15.727	18.404	13.966
Significance			0.365	0.000	0.000	0.000
<b>Insurance:</b>						
Estimate						1.764
Standard Error						1.299
Wald Chi-Square						1.844
Significance						0.175

Research question 2 explores the relationship between intermediary profitability, Internet pure-play strategies, public listing, and firm age. The dependant variable is profitability and the independent variables are Internet pure-play, publicly listed, and the natural logarithm of firm age. Each variable was added individually as depicted in models I through III in table 4a, where models IV and V represents alternative specifications based upon the lowest AIC and BIC scores.

**Table 4(a): Ordinal Logistic Regression of Profitability, Internet Pure Play, Publicly Traded and LN of Age ; Pooled Sample**

<b>DV = Profit</b>	<b>I</b>	<b>II</b>	<b>III</b>	<b>IV</b>	<b>V</b>
<b>Model Fit / Null Hyp. Test</b>					
Wald Chi-Square	0.002	11.437	23.11	11.422	23.089
DF	1	2	3	1	2
Significance	0.966	0.003	0.000	0.001	0.000
<b>Pseudo R-Squared</b>					
Cox & Snell	0.000	0.082	0.158	0.082	0.158
Nagelkerke	0.000	0.086	0.167	0.086	0.167
McFadden	0.000	0.029	0.058	0.029	0.058

<b><u>Intercept &amp; Covariates:</u></b>					
<b><u>-2 Log L</u></b>	<u>396.867</u>	<u>385.432</u>	<u>373.759</u>	<u>385.447</u>	<u>373.78</u>
<b><u>AIC</u></b>	<u>408.867</u>	<u>399.432</u>	<u>389.759</u>	<u>397.447</u>	<u>387.78</u>
<b><u>SC (BIC)</u></b>	<u>426.254</u>	<u>419.717</u>	<u>412.942</u>	<u>414.834</u>	<u>408.065</u>
<b><u>Publicly Traded:</u></b>					
<b><u>Estimate</u></b>	<u>-0.0148</u>	<u>-0.044</u>	<u>-0.0506</u>		
<b><u>Standard Error</u></b>	<u>0.351</u>	<u>0.355</u>	<u>0.358</u>		
<b><u>Wald Chi-Square</u></b>	<u>0.002</u>	<u>0.015</u>	<u>0.02</u>		
<b><u>Significance</u></b>	<u>0.966</u>	<u>0.901</u>	<u>0.888</u>		
<b><u>Internet Pure Play:</u></b>					
<b><u>Estimate</u></b>		<u>-1.078</u>	<u>-0.674</u>	<u>-1.076</u>	<u>-0.677</u>
<b><u>Standard Error</u></b>		<u>0.325</u>	<u>0.349</u>	<u>0.324</u>	<u>0.348</u>
<b><u>Wald Chi-Square</u></b>		<u>11.009</u>	<u>3.717</u>	<u>11.003</u>	<u>3.792</u>
<b><u>Significance</u></b>		<u>0.001</u>	<u>0.054</u>	<u>0.001</u>	<u>0.052</u>
<b><u>LnAge:</u></b>					
<b><u>Estimate</u></b>			<u>0.06424</u>		<u>0.06394</u>
<b><u>Standard Error</u></b>			<u>0.02</u>		<u>0.02</u>
<b><u>Wald Chi-Square</u></b>			<u>10.255</u>		<u>10.316</u>
<b><u>Significance</u></b>			<u>0.001</u>		<u>0.001</u>

Interestingly, being publicly traded does not show any correlation with profitability. Being an Internet pure-play demonstrates a clear and significant negative correlation with profitability in all models. Finally age is significantly correlated with profitability, although the coefficient is moderate, despite the logarithmic transformation.

Table 4b shows a similar breakdown of both service and commodity based portals based on AIC/BIC statistics. Where the parameter estimates are similar for Internet pure play, the differences on age are substantial. This suggests that age is a far more important predictor of profitability for service based intermediaries than for commodity based.

**Table 4(b). Ordinal Logistic Regression of Profitability, Internet Pure Play, Publicly Traded and LnAge for Comparing Service & Commodity Based Intermediaries**

<b><u>DV = Profit</u></b>	<b><u>Serv I</u></b>	<b><u>Serv II</u></b>	<b><u>Comd I</u></b>	<b><u>Comd II</u></b>
<b><u>Model Fit / Null Hyp. Test</u></b>				
<b><u>Wald Chi-Square</u></b>	<u>15.983</u>	<u>17.915</u>	<u>9.589</u>	<u>11.058</u>
<b><u>DF</u></b>	<u>1</u>	<u>2</u>	<u>1</u>	<u>2</u>
<b><u>Significance</u></b>	<u>0.000</u>	<u>0.000</u>	<u>0.002</u>	<u>0.004</u>
<b><u>Pseudo R-Squared</u></b>				
<b><u>Cox &amp; Snell</u></b>	<u>0.319</u>	<u>0.349</u>	<u>0.107</u>	<u>0.122</u>
<b><u>Nagelkerke</u></b>	<u>0.341</u>	<u>0.373</u>	<u>0.112</u>	<u>0.128</u>
<b><u>McFadden</u></b>	<u>0.140</u>	<u>0.156</u>	<u>0.037</u>	<u>0.043</u>
<b><u>Intercept &amp; Covariates:</u></b>				
<b><u>-2 Log L</u></b>	<u>116.521</u>	<u>114.172</u>	<u>247.961</u>	<u>246.493</u>
<b><u>AIC</u></b>	<u>126.521</u>	<u>126.172</u>	<u>259.961</u>	<u>260.493</u>
<b><u>SC (BIC)</u></b>	<u>136.081</u>	<u>137.645</u>	<u>274.617</u>	<u>277.591</u>
<b><u>Publicly Traded:</u></b>				
<b><u>Estimate</u></b>				
<b><u>Standard Error</u></b>				
<b><u>Wald Chi-Square</u></b>				
<b><u>Significance</u></b>				
<b><u>Internet Pure Play:</u></b>				
<b><u>Estimate</u></b>		<u>-0.881</u>		<u>-0.521</u>
<b><u>Standard Error</u></b>		<u>0.599</u>		<u>0.437</u>
<b><u>Wald Chi-Square</u></b>		<u>2.165</u>		<u>1.422</u>
<b><u>Significance</u></b>		<u>0.141</u>		<u>0.233</u>
<b><u>LnAge:</u></b>				
<b><u>Estimate</u></b>	<u>0.233</u>	<u>0.202</u>	<u>0.05723</u>	<u>0.04789</u>

<u>Standard Error</u>	<u>0.058</u>	<u>0.06</u>	<u>0.020</u>	<u>0.022</u>
<u>Wald Chi-Square</u>	<u>15.983</u>	<u>11.386</u>	<u>8.173</u>	<u>4.95</u>
<u>Significance</u>	<u>0.000</u>	<u>0.001</u>	<u>0.004</u>	<u>0.026</u>

Research question 3 explores the relationship between intermediary state and growth type. In our first test we employ a probit estimation of growth strategies as our independent variable, where intermediary type is our dependant variable. The base case of the dependant variable is service, coded as 0, where commodity intermediaries are coded as 1. The base case of the independent variables is organic growth.

**Table 5. Maximum Likelihood Probit Estimates; Pooled Sample**

DV=Sector Type, Base Case=Service

IV=Growth Type, Base Case=Organic

	<u>b</u>	<u>Std. Error</u>	<u>Wald</u>	<u>Sig.</u>	<u>Exp(b)</u>
<u>Constant</u>	<u>.468</u>	<u>.377</u>	<u>1.541</u>	<u>.214</u>	<u>1.596</u>
<u>Acquisition</u>	<u>(2.835)</u>	<u>.879</u>	<u>10.392</u>	<u>.001</u>	<u>.059</u>
<u>Joint Venture</u>	<u>-1.213</u>	<u>.599</u>	<u>4.098</u>	<u>.043</u>	<u>3.365</u>

-2 Log Likelihood = 145.324

Cox & Snell R Squared = .204

Nagelkerke R Squared = .280

McFadden R Squared = .091

The results of the probit estimates presented in table 5 are highly significant and unambiguous. The use of acquisitions is negatively associated with commodity type intermediaries ( $\beta=(2.835)$ ), and positively with service based intermediaries. The use of joint ventures as a growth form is positively associated with commodity based intermediaries ( $\beta=1.213$ ), and negatively with service based intermediaries. Alternative specifications were run, where both acquisitions and joint ventures were employed as base cases. However, the results indicated that organic growth was evenly distributed across all data points.

Our final tests seek to determine the relationship of the growth mechanisms and the intermediary state. While we have not assumed that intermediary states are inclusive, that is the higher states include the provision of the lower states, upon a review of the data, we did not find any instances in our sample in which this was not true. In other words, in our sample, the intermediaries that provided logistics management also provided liquidity management, transaction clearing and information management. This is important in that it permits us to employ ordinal logistic regression with intermediary state as the dependant variable. The independent variables included growth method, defined as organic, acquisition and joint ventures. The results are shown in table 6a, where organic growth represents the base case.

**Table 6(a): Ordinal Logistic Regression of Intermediation State and Growth Strategy; Pooled Sample**

<u>Model Fit</u>			
<u>-2 Log L</u>	<u>Chi-Square</u>	<u>DF</u>	<u>Significance</u>
<u>201.325</u>	<u>7.789</u>	<u>2</u>	<u>0.02</u>

**Pseudo R-Squared**

<b>Cox &amp; Snell</b>	<u>0.056</u>
<b>Nagelkerke</b>	<u>0.060</u>
<b>McFadden</b>	<u>0.021</u>

**Parameter Estimates**

<b>Parameter</b>	<b>Estimate</b>	<b>Std. Error</b>	<b>Wald Chi-Square</b>	<b>Significance</b>
<b>Constant</b>				
<b>Int. Strat. = 1</b>	<u>-0.699</u>	<u>0.341</u>	<u>4.195</u>	<u>0.041</u>
<b>Int. Strat. = 2</b>	<u>0.859</u>	<u>0.343</u>	<u>6.266</u>	<u>0.012</u>
<b>Int. Strat. = 3</b>	<u>2.5</u>	<u>0.405</u>	<u>38.122</u>	<u>0.000</u>
<b>Int. Strat. = 4</b>	<u>4.48</u>	<u>0.672</u>	<u>44.424</u>	<u>0.000</u>
<b>Acquisition</b>	<u>1.595</u>	<u>0.611</u>	<u>6.812</u>	<u>0.009</u>
<b>Joint Venture</b>	<u>0.723</u>	<u>0.479</u>	<u>2.277</u>	<u>0.131</u>

This parameter estimates indicate that acquisitions are positively correlated with more capital intensive intermediary states, with a beta of 1.595 which is highly significant. This agrees with our intuition, that more capital intensive states of intermediation require greater user of acquisitions to obtain the organizational knowledge and routines to maximize in order to maximize the use of capital

Table 6b runs a similar ordinal regression on the split sample to explore any differences between commodity and service based intermediaries.

**Table 6(b): Ordinal Logistic Regression of Intermediation State and Growth Strategy Comparison of Service & Commodity Based Intermediaries**

**Model Fit**

	<b>-2 Log L</b>	<b>Chi-Square</b>	<b>DF</b>	<b>Significance</b>
<b>Service</b>	<u>42.388</u>	<u>43.952</u>	<u>2</u>	<u>0.000</u>
<b>Commodity</b>	<u>129.334</u>	<u>4.356</u>	<u>2</u>	<u>0.113</u>

**Pseudo R-Squared**

	<b>Service</b>	<b>Commodity</b>
<b>Cox &amp; Snell</b>	<u>0.592</u>	<u>0.05</u>
<b>Nagelkerke</b>	<u>0.652</u>	<u>0.053</u>
<b>McFadden</b>	<u>0.375</u>	<u>0.018</u>

**Parameter Estimates**

<b>Parameter</b>	<b>Service Based Intermediaries</b>				<b>Commodity Based Intermediaries</b>			
	<b>Estimate</b>	<b>Std. Error</b>	<b>Wald Chi-Square</b>	<b>Sig.</b>	<b>Estimate</b>	<b>Std. Error</b>	<b>Wald Chi-Square</b>	<b>Sig.</b>
<b>Constant</b>								
<b>Int. Strat. = 1</b>	<u>-0.661</u>	<u>0.558</u>	<u>1.403</u>	<u>0.236</u>	<u>-0.83</u>	<u>0.475</u>	<u>3.054</u>	<u>0.081</u>
<b>Int. Strat. = 2</b>	<u>3.137</u>	<u>0.939</u>	<u>11.155</u>	<u>0.001</u>	<u>0.675</u>	<u>0.467</u>	<u>2.089</u>	<u>0.148</u>
<b>Int. Strat. = 3</b>	<u>4.866</u>	<u>1.008</u>	<u>18.595</u>	<u>0.000</u>	<u>2.275</u>	<u>0.521</u>	<u>19.046</u>	<u>0.000</u>
<b>Int. Strat. = 4</b>	<u>6.591</u>	<u>1.386</u>	<u>22.605</u>	<u>0.000</u>	<u>4.229</u>	<u>0.744</u>	<u>32.28</u>	<u>0.000</u>
<b>Acquisition</b>	<u>5.095</u>	<u>1.305</u>	<u>15.247</u>	<u>0.000</u>	<u>1.069</u>	<u>1.432</u>	<u>0.557</u>	<u>0.455</u>
<b>Joint Venture</b>	<u>-2.164</u>	<u>0.944</u>	<u>5.25</u>	<u>0.022</u>	<u>1.372</u>	<u>0.661</u>	<u>4.314</u>	<u>0.038</u>

These results highlight some interesting differences between the groups. Where acquisitions are positively correlated with more capital intermediary states for service based intermediaries, there is no clear correlation in commodity based intermediaries. Moreover, service based intermediaries also demonstrate a clear negative correlation between more capital intensive intermediary states and the use of joint ventures as a growth method. In commodity based intermediaries, we find a significant, positive correlation between the use of joint ventures and

more capital intermediary states. Notice that the fit statistics for commodity based intermediaries are substantially less than for service based, making the results for this group less robust.

## 4. Discussion

In research question 1 and 2, we explore the relationship between intermediary profitability and the provision of intermediary states, as well as other variables. We also explore the difference between service based and commodity based intermediaries. In all regressions, we find positive correlations between profitability and intermediary state. However, for service based intermediaries, we find significant positive support for the provision of liquidity management, where both liquidity management and logistics management are significant in commodity based portals. Interestingly, only one specification within the commodity sample indicated a significant relationship between an insurance / market making provision and profitability. For service-based intermediaries, this may be due to the fact that most of these businesses are limited to the extent that they carry physical inventories. For commodity-based portals, the result is more perplexing. One would expect that many of these types of intermediaries would carry legal title to inventories and realize the corresponding economic rents. However, this proposition did not find unambiguous support in our sample.

Empirically, these results are consistent with the general lack of success witnessed within content aggregators and B2B exchanges that emerged from the electronic commerce boom of 1998-2001. Likewise, we have seen similar difficulties in the many emergent B2B portals that offer little contribution to supply chains other than matching buyer and seller. Generating sufficient interest in these markets can be prohibitively difficult in the case that the markets do not choose to perform some functions of transaction guaranteeing and clearing, liquidity management, and market making/insurance by physically or legally managing inventories. While we did find some support for a positive relationship between firm age and profitability, we found no relationship between diversification levels or public listing. Unsurprisingly, we found some indication of a negative correlation between Internet pure play strategies and profitability, suggesting that industrial incumbents with well established logistics processes were better able to compete in this period.

Our analysis of intermediation states and growth strategy found a positive relationship between the frequency of acquisitions in service based intermediaries. Likewise we found that joint ventures were more frequently employed by commodity-based intermediaries. This evidence suggests that service-based intermediaries are characterized by a greater need to acquire existing capital assets, tested organizational routines and business processes. Moreover, such resources might best be acquired under a single governing body, rather than running the risks implicit in a bilateral governance agreement such as a joint venture. Commodity-based intermediaries, in contrast, employed joint ventures to a greater degree. Intuitively, this result is ambiguous. One interpretation may be that the existing industrial structure and practices in commodity-based portals facilitates the use of contractual relationships in logistics processes, making the overall transaction costs of market base mechanisms more efficient than in service based industries.

Table 7 summarizes the significant findings of the analysis.

**Table 7. Significant Results**

<b>Significant Results</b>	<b>Service-Based Intermediaries</b>	<b>Commodity-Based Intermediaries</b>
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<b>Positive Profitability Correlation</b>	Liquidity Management Age	Liquidity Management Logistic Management Age (very moderate)
<b>Negative Profitability Correlation</b>	Internet Pure-Play	Internet Pure-Play
<b>Dominant Growth Mechanism</b>	Acquisitions	Joint Ventures
<b>Relationship to intermediary state an Growth Mechanism</b>	Acquisitions used in capital intensive intermediary states (estimate=5.1) Joint Ventures employed in less capital intensive states (estimate - 2.7)	Joint Ventures used in capital intensive intermediary states (estimate=1.3)

## 5. Conclusion

This study has developed a framework of five intermediary states and applied it to explore the relationships between intermediary states, profitability, growth strategy and the differences between commodity and service based intermediaries. Using data collected from 134 electronic intermediaries, this study identified a positive relationship between more capital intensive stages of intermediation and profitability. Increased profitability at certain states of intermediation suggests that firms performing the more capital intensive supply chain functions, such as transaction management and inventory management, command greater economic rents as a function of greater proportions of the supply chain under their domain, as well as increased yields due to greater capitalization levels. We found a positive correlation between profitability and the provision of liquidity management in service based portals, and the provision of liquidity and logistics management and insurance in commodity based portals. This analysis supports the argument that the lack of success found for pure content aggregators and B2B exchanges gives credence to the notion that it is difficult to maintain profitability solely through information management, as has been anecdotally argued in the literature.

The increased use of acquisitions as growth strategies in more service-based intermediaries may demonstrate a greater need to acquire processes realized through tested organizational routines and business processes. In contrast, the use of joint ventures as growth mechanism by commodity-based intermediaries suggests that contractual, bilateral governance is more efficient and common in such industries.

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