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Seizing the Opportunity: Exploiting Web Aggregation

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Abstract

This paper examines the development of web aggregators, entities that collect information from a wide range of sources, with or without prior arrangements, and add value through post-aggregation services. New Web-page extraction tools, context sensitive mediators, and agent technologies have greatly reduced the barriers to constructing aggregators. We predict that aggregators will soon emerge in industries where they were not formerly present. Through studying over a hundred existing and emerging aggregators, we present a model for understanding the aggregator's strategic interaction with existing organizations. We also suggest different ways that businesses can take advantage of the new opportunities presented. Finally, we provide valuable insights to all organizations concerning the issues, impacts, and actions required as aggregators become increasingly present.

1. Introduction

Imagine that you are the head of a large and well-established industry giant. Your attitude toward the Internet took a turn from thinking of it as simply a fad to treating it as an important force in your industry. You decided that you, too, would make your product information and ordering available online. After all, the customers are requesting this move, and you want to better leverage your brand name and existing network of brick-and-mortar assets. Having invested significant resources on building your online presence, you feel that you are finally ready for this marketplace.

But are you really?

On the horizon, unbeknownst to you, a new entity, whose plans are to overturn the familiar business landscape, is fast emerging. A shopbot-like aggregator can selectively extract information from your Web site, couple it with additional data from other sources including those of your competitors, and make the necessary fine-tuning for intelligent comparisons.

DealTime.com (see Figure 1) is one such example. On a recent comparison-shopping trip, DealTime.com indicated that it was less expensive, and with less delay, to purchase Reilly and Brown's finance text book, *Investment Analysis and Portfolio Management*, from Amazon.com than from A1books.com. If A1books.com had a revenue model based on distributing its products online, the aggregator is likely to dramatically reduce A1books.com's volume and narrow its margins. If its business model was based on selling products at a loss with the intention on making profits through advertising sales, lead generation fees, or better customer data, the aggregator may be attracting these customers instead.

Aggregators can collect information from *cooperating* or *non-cooperating* sources. New web-based extraction tools [FMS00, Mal00] have made it possible for aggregators to easily and transparently gather information from multiple sources with or without the permission or knowledge of the underlying data sources. The introduction and acceptance of the eXtended Markup Language (XML) family of standards (e.g., XML, RDF, XML-Schema) significantly increases aggregator abilities for information extraction, comparison and analysis. Mediation technologies (i.e., technology that addresses the differences in the semantics or “meaning” of data) [GBM00] allow for automatic comparison of information (e.g., book prices, bank accounts, shipping rates, intelligence information) and agent technologies (i.e., programs that make use of the aggregated information database to provide services that can act on a user’s behalf) allow for strategic use of aggregated information.

Where Will You Buy?

Investment Analysis and Portfolio Management, 5th edition, by Reilly and Brown, 1996. Hardcover. ISBN: 0030186838. List Price: \$107.50.

- \$103.90, including shipping and sales tax, in 5-10 days.
- \$96.79, including shipping and sales tax, in 3-7 days.

Figure 1: Online Book Comparison
(Source: www.DealTime.com)

Aggregators, by themselves, are not new. What has changed with the advent of the Internet and recent developments in technology is the ability for aggregators to emerge overnight, at minimal cost, and without the need to establish partnerships with the various data sources. As a result, incumbents are often caught off-guard and stumble in their panicked response.

In the remainder of this paper, we examine a number of aggregators across different industries, including information management services that help users manage relationships more effectively, consumer education services for making appropriate comparisons across different products, and shopbots in the book selling and overnight delivery industries. By studying the evolution of the aggregator’s business, changes in the aggregatee’s industries, and the relationships between the two, we provide a framework for understanding the impact on existing business models and changes in strategic relationships. Evans and Wurster [EV99], in their study of a similar phenomenon that they called “navigators,” concluded that this is “the battlefield on which competitive advantage will be won or lost.”

2. Aggregator: Definition, Types, and Sources

We begin this section by defining a few of the terms that will be used in the remainder of this paper.

2.1 Aggregator

A web aggregator is an entity that can *transparently* collect and *analyze* information from multiple web data sources. In the process, the aggregator resolves the semantic or contextual differences in the information (e.g., resolving differences in a collection of prices for a given product, where the prices extracted from disparate sites may be given in difference currencies or may differ due to inclusion or exclusion of shipping charges.)

As the definition suggests, there are three important characteristics specific to a web aggregator.

Access Transparency – To the data sources, an aggregator appears like a normal user who is accessing the information.

Contextual Transparency – The aggregator resolves the contextual differences to allow for effective comparisons.

Analysis - Instead of simply presenting the data as-is, the aggregator synthesizes value-added information based on post-aggregation analysis.

It is important to note that, under this definition, search engines, such as Google and Lycos, and personalized Web portals, such as MyNetscape or MyYahoo, are not aggregators. Similarly, Web-based malls, category e-store, or community-based Web sites also do not fit under this category. Although these Web sites amass different information, little is done to provide contextual transparency and/or analysis.

2.2 Aggregator Types and Data Sources

Aggregators are used to build *integrated information collections* for many purposes, such as forming *comparisons* and managing *relationships*. These new integrated information collections can be built from information sources inside an organization (i.e., *intra-organizational*), between organizations (i.e., *inter-organizational*) or both. *Comparison* type aggregators are focused on collecting information about specific goods and services for evaluation. Shopbots such as for those for purchasing books, music and electronics are good examples of this capability. *Relationship* type aggregators form new information collections based on relationships with the aggregatees.. For example, financial account aggregators (e.g., Yodlee, VerticalOne, CashEdge) are being adopted by major financial (e.g., Chase, Citibank, Merrill Lynch) and non-financial institutions (e.g., CNBC, AOL)¹. These organizations provide their customers with the ability to manage all financial relationships through a single aggregator [Pan99]. Examples of these *aggregator types* and *sources* are shown in Table 1.

	Comparison	Relationship
Inter-Organizational	Comparison of book prices or shipping costs from alternative suppliers	Consolidation of all one's frequent flyer or financial accounts
Intra-Organizational	Comparison of manufacturing costs from multiple plants	Consolidation of all information about each customer from the company's separately maintained web sites across functions (e.g., accounting, service) and geography (e.g., domestic and international).

Table 1. Examples of Aggregator Types and Sources

As will be discussed later, it is possible for an advanced hybrid aggregator to combine several types and sources for a given application.

2.3 Aggregatee

An aggregatee is any organization whose information could be collected by an aggregator. Ultimately, aggregators are also aggregatees, because once they provide their services over the Web, another aggregator can aggregate their information just as easily (we refer to such an aggregator as a *mega-aggregator*.) Likewise, as we will see later, many aggregatees may also become aggregators.

2.4 After-Aggregation Analysis

After-aggregation, or post-aggregation, refers to the services and analysis applied to the collection of aggregated data. Currently most aggregators provide a majority of their value merely through the creation and access to the aggregated information collections (i.e., consolidated financial accounts, frequent flier accounts, competitor prices.) Aggregators can extract even greater value from this wealth of information through after-aggregation analysis. For example, although it is very interesting to be able to view all one's financial accounts in a single online report, the real value of such a collection of information will come with the ability to provide advice (e.g., asset allocation) or to act on the information as an agent for the

account owner (e.g., automatically moving money from one account to another to maximize return.) Finally, privacy issues aside, the owner of the aggregator (i.e., the entity that offers the aggregation service) has access to valuable information through which it can selectively offer products, tailor marketing, and better understand its business.

3. Aggregation Examples

One of the best ways to understand aggregation is through examples. In this section we present some aggregation examples with different capabilities. These examples will be very useful later in presenting aggregation opportunities (Section 4) and strategic options (Section 5).

3.1 Relationship Aggregation: Managing Reward Programs via MaxMiles

MaxMiles (www.maxmiles.com) runs a Web-based reward management program to help frequent travelers better manage the rewards earned from different airlines, hotels, and car rental companies. Users provide their account and personal identification numbers for all their reward programs to MaxMiles and authorize it to access and analyze their data. In return, MaxMiles provides its customers with a consolidated statement that shows, among other things, the number of points earned for each account and the number of points that will expire at each date. Users of the MaxMiles service immediately benefit from not having to manually keep track of a plethora of passwords and are able to view all account activities through a single consolidated statement.

In addition to the standard account statement, MaxMiles provides additional after-aggregation services. For example, it is capable of identifying flight segments that possibly were not properly credited. It will deduce that some flight segments may not have been properly posted if, for example, the account data does not show an inbound segment for each outbound flight. In the not-to-distant future, MaxMiles expects to offer more personalized account statements that help users take advantage of special offers for which they are interested and eligible.

MaxMiles currently provides its service both to businesses and individual consumers. While the specific revenue from each business partner is not disclosed, individual consumers can sign up for the MaxMiles service for \$2.95/month. The following Web portals, travel agents, and reward programs have partnered with MaxMiles:

- AOL and Excite offer the MaxMiles service through their Web portals.
- Advanced Travel Management, Journey Corp, Internet Travel Network, and Microsoft's Expedia, offer MaxMiles online mileage management reports through their travel agent site.
- Hyatt Hotel provides the MaxMiles service for its Diamond and Platinum members.
- XTRA On-Line and Sabre integrate the MaxMiles technology into their travel reservation products.

Interestingly, because MaxMiles does not have to partner with the reward programs in order to serve its clientele, a wide range of different relationships have developed. Some reward programs, such as the Hyatt Gold Passport Program, chose to pursue an active partnership with MaxMiles, outsourcing the task to reduce cost and leveraging the company's technology to better serve its customers. On the other hand, US Airways initially took a more defensive and hostile attitude. US Airways explicitly prohibits (see Figure 2), in its click-wrap contract, the revelation of a user's password to a third party, with the intention of preventing MaxMiles from encroaching on to its business. MaxMiles countered this by requiring its users, as part of its registration process, to give it a Limited Power-of-Attorney.ⁱⁱ

There are a number of important issues to consider about this aggregator. First, MaxMiles interposes itself between the customer and the frequent flier programs, the aggregatees. This is important to note as it can have significant effect on the aggregatees. As the aggregator replaces the direct relationship with the aggregatee, companies must change their business model. They may choose to cooperate and provide data and /or financing for preferential treatment (e.g., listing of special offers on MaxMiles.) They may cooperate for access to strategic data. It is important to note that MaxMiles is gathering knowledge of how everyone flies, rents cars and stays at hotels. This new set of information is extremely valuable to the aggregatees. These organizations may choose to outsource their frequent flier programs. Alternatively, they may choose to be more combative and try to limit access to the data. Regardless, the aggregator can have significant impact on the aggregatees' business and can change the relationship between the customer and these organizations.

"US Airways provides Dividend Miles account information for the benefit of its Dividend Miles members. Access to this information is subject to the rules in the Dividend Miles Membership Guide and the liability limitations provided for this website. In addition, by using this site to access your Dividend Miles account, you agree that you will use this site in a manner consistent with the Dividend Miles Membership Guide and **you further agree not to allow access to this site to any third party by revealing your access code to any third party for any reason.** Failure to comply with the foregoing restrictions on the use of this site shall be grounds, in US Airways' sole discretion, for the termination of your access to this site and/or your membership in the Dividend Miles program."

Figure 2: From the US Airways Web Site (emphasis added)

3.2 Comparison Aggregation: Selecting a Carrier Through Intershipper

DealTime, as briefly described earlier, provides comparisons of products, such as books. As a different example, Intershipper (www.intershipper.net) demonstrates both price and non-price information comparison aggregation services. It provides a comparison of shipping options from multiple carriers (e.g., Fedex, UPS, DHL) given a package source, destination, and weight.

In addition to providing convenient access to the highly popular package tracking services (available via the individual carrier's Web sites), Intershipper consolidates two additional services. First of all, Intershipper provides the user with a list of the closest drop-off centers for all the carriers, a feature useful to individuals who do not want to wait around for a scheduled pickup. But more importantly, given the sender's and the recipient's zip code along with the package's weight, Intershipper will show its user a list of the different carriers, their prices, and the times at which the package is estimated/guaranteed to arrive. Intershipper is an intelligent assistant that can help users select the best carrier, not just by the estimated cost, but also by other factors (such as, expected time of delivery and whether delivery time is guaranteed.) Since the information Intershipper collects is available on the carriers' Web site, Intershipper does not have to form explicit partnerships to provide its services. This case will be discussed in more depth later.

3.3 Combined Relationship and Comparison Aggregation: Universal Financial Aggregator

As a research experiment, in 1998 we developed the Universal Financial Aggregator (UFA), a demonstration aggregator that provided integrated access to all of one's financial accounts that are accessible online. Instead of only seeing individual accounts or only the accounts from a single institution, the user can instantaneously view all his/her financial accounts across multiple institutions through an integrated personalized balance sheet. In addition, the UFA also helps the user manage the plethora of logins and passwords. In this regard, the UFA is a *relationship* aggregator, similar to MaxMiles.

To illustrate how rapidly aggregation services can emerge, commercial versions of such services, now referred to as Financial Account Aggregators [Mar00, OBR00], started in late 1999 from companies, such as Yodlee (www.Yodlee.com), VerticalOne (now merged with Yodlee), and CashEdge (www.cashedge.com.) In June 2000, Chase, who had been an aggregatee announced that it was now also an aggregator, by entering into a relationship with Yodlee, and would be providing financial account aggregation services to its customers. Today such financial account aggregation services are being offered by most major financial services institutions (e.g., Citibank, Chase, Wells Fargo, Merrill Lynch, Fleet Bank, Fidelity), as well as by numerous non-financial institutions (e.g., Yahoo, AOL.)

Given the total picture of a user's financial situation, a financial account aggregator can make use of knowledge of other available financial products to help the user optimize his or her finances. For example, our experimental UFA incorporates a Money Market comparison aggregator that scours the net for the best interest rates offered that are consistent with the user's aggregated financial status. In fact, since our Money Market aggregator is also an aggregator of other money market rate aggregators (i.e., Bankrate.com and Bankquote.com), it is what we refer to as a *mega-aggregator*. Thus, by using this Money Market aggregator, the UFA is also a *comparison* aggregator, similar to DealTime. This is done as part of the *after-aggregation* service that incorporates *analysis* by evaluating the amount of additional interest that could be earned by moving funds – and facilitating the movement as your *agent*. This is an example of combining *relationship* and *comparison* type aggregation. Some of the high-end commercial financial account aggregators have announced their intention to offer such after-aggregation analysis capabilities in the near future.

Aggregators of all types will affect companies in a wide range of industries. We have examined a range of such examples in the retail, telecommunications, and financial services industryⁱⁱⁱ. We have seen early aggregators focused on price comparison while emerging aggregators are more focused on relationships, and the creation and analysis of information collections. In addition, from our UFA experiments, we see that there is much more functionality and value that can be provided by combining aggregation types. In many instances this will be a relationship aggregator providing added after-aggregation value through the use of comparison aggregators.

4. Seizing Aggregation Opportunities

There are many ways that a business can exploit aggregation opportunities to its benefit. Some examples of these opportunities are described later in this section.

4.1 Acquiring Aggregation Capabilities

New Web-page extraction tools [FMS00], context sensitive mediators [GBM00], and agent technologies have greatly reduced the time, cost, and effort needed to construct aggregators – thereby reducing the barriers to the rapid emergence of new aggregators. Though organizations might use these tools to create aggregators, it is not necessary for an organization to have in-house aggregation capability. There are aggregation service providers who will license or rent the aggregation technology to another firm. This allows for non-technology companies to easily incorporate such services. With the advent of the Internet, many firms are outsourcing their technology needs to service providers to benefit from the economies of scale. For example, Hyatt Hotels and various travel agents have licensed the MaxMiles technology instead of building and maintaining their own aggregation services.

Once one company in an industry provides a useful aggregation service, the others are often compelled to offer comparable services to their customers. For example, when Chase provided free financial account aggregation, most of the other major financial institutions felt the need to also offer comparable services –

mostly by licensing or renting the service from a financial account aggregation technology and service provider, such as Yodlee or VerticalOne.

4.2 Opportunities to use Aggregation to Improve Business

4.2.1 Keeping Existing Customers Relationships and Acquiring New Ones

Essential to the survival of most organizations is keeping existing customers and acquiring new customers. One of the most crucial impacts of aggregators to date is that they have can add value to the customers' online experience. For example, relationship aggregators are about building and maintaining relationships with customers. As a result, a financial services organization would strongly prefer that a customer access his or her accounts through their web site rather than through an aggregator provided by a competitor or third party. This is why financial account aggregation is becoming the "ATM machine of the 21st century" – if you do not offer it, your customers will go elsewhere to get the service. Thus, everyone must offer that service. Those organizations that can add even more value through after-aggregation services will differentiate themselves and be in the best position to keep their existing customers and acquire new customers. In the examples of MaxMiles, Intershipper, and Financial Account Aggregation this relationship with the customer has proven to be one of the greatest opportunities and concern for aggregatees.

4.2.2 More Efficient Information Processing

For manufacturers of information goods, such as Bank Rate Monitor (www.bankrate.com), there is an interesting twist. Aggregators may represent a significantly more efficient model of production. Instead of building the information goods through the establishment of costly agreements with each data source, aggregators can add and integrate new data sources rapidly and without agreement. More importantly, aggregators may be able to collect information in more ingenious ways such as offering a service and observing consumer purchasing pattern. New aggregators may end up displacing original manufacturers of information goods that do not take advantage of this opportunity.

Even for businesses that are not manufacturers of information goods, aggregation can be used to assist in the management of their information. This is especially important for relationship aggregators, which could be used in support of Customer Relationship Management (CRM) applications. As another example, a financial account aggregator can help a business manage its multiplicity of bank accounts, checking accounts, credit cards, certificate of deposits, and money market accounts.

4.2.3 Lead / Sales Generator

Partnering with a comparison or relationship aggregator can help a business to increase sales. *Lead generators* "aggregate ... [users] ... according to their profiles, preferences, and other criteria, translate this data into specific product and service needs, and then direct [users] to vendors whose offerings meet those needs" [HR 97]. For example, DealTime.com, after identifying the various possible vendors for the desired book, then can direct a buyer to that vendor's web site to make the purchase. The financial account aggregator could direct an individual to new and more appropriate investment opportunities.

Not only do lead generators provide businesses with additional customers who are ready to buy, more importantly, lead generators can also help vendors design increasingly more personalized products. As Bakos points, "Increased selling effectiveness comes from being able to design appropriate products to address the needs of individual consumers, and from being able to identify the moment when a customer's purchasing decision is most likely to occur ..." [Bak98].

These *sales generators* can also provide consumers with structured products tailored to their individual needs. They have the ability to transparently create and manage custom bundles of offerings for a particular user. In much the same way that investment banks design specific products that suit the need of a particular company, we will begin to see aggregation businesses that provide bundled products tailored to individual needs, such as assembling integrated vacation packages, combining travel, hotel, special events, equipment rentals, etc. As another example, college students typically take different classes from one another. The textbooks they need for the semester constitute a specific bundle of goods. Instead of having the student search laboriously for the cheapest bookstore to buy each individual book while keeping in mind the additional shipping cost and the overhead for managing multiple transactions, a transaction coordinator can offer the student a specific bundle of textbooks, sourcing a few books from one place while another set from a different bookstore, transparently. These coordinators also take on the responsibility and the risk of making the coordinated transaction of delivering the bundled good transparently to the consumer.

4.2.4 Leveraging Trust

While trust has always been an important element in doing business, it will become even more critical in electronic commerce. The lack of face-to-face contact between the buyer and the seller and the ease with which a small (or illegitimate) outfit can appear large (and legitimate) puts small, unrecognized new entrants at a great disadvantage. Historically, retailers have provided that level of face-to-face trust for small producers. It makes sense, therefore, for well-known retailers to build or invest in an aggregator and leverage its brand image to *facilitate the transaction* through escrow services, quality guarantees, and extension of credit. CNET with its certification program automatically extends CNET's name and legitimacy to small and relatively unknown retailers, thus making sales by them more viable.

4.2.5 Agents

Buyer-oriented aggregators can serve as *purchasing agents* that search for the lowest cost provider of a particular input. Such buyer agents "help [consumers] get maximum value from their information profiles by using choices they have made in the past to deduce which product or service would best match their current needs, and then finding the vendor that can deliver the preferred product or service at the cheapest price" [HR97]. This might also involve creating aggregated products. As the MaxMiles case study illustrates, not only are aggregators well suited to help users manage multiple relationships, but, more importantly, once aggregators have access to the vast amount of personal information, aggregators can generate more personalized recommendations than any of the individual organizations. In these scenarios, buyers can build and maintain their own aggregators, *subscribe to the service* of an aggregator, or even pay aggregators a *commission on the savings*. TPN Register (www.tpnregister.com), a joint venture between GE and Thomas Publishing Company, allows buyers to provide design and engineering specifications that can be bid upon by suppliers. "The system allows its users, especially from smaller companies, to find low bidders among suppliers that might not consider them via traditional channels" [SGF99].

4.2.6 After-Aggregation Knowledge Provider

An aggregator is well positioned to collect detailed and highly valuable market information that is not available to the individual aggregatees. Through its ability to simultaneously access and integrate information from multiple sources, aggregators have a better understanding of the overall market than any single participant. A company's web site helps it to know more about its customers – but it tells little about its *non-customers*, that is, possible customers that chose to take their business elsewhere. For example, Intershipper not only knows which carrier the consumer ultimately selected, but it also knows the user who usually ships with Fedex that decided to go with UPS for all packages over one-pound between Boston and New York. Consequently, aggregators can sell summarized and aggregated

information back to the individual firms. Knowledge providers of this type exist in the brick-and-mortar world. IMS America collects, aggregates, and repackages data from various hospitals for sale back to the original hospitals. In this manner, each hospital is able to see how its operations compare with those of its peer group. However, as the cost of collecting and integrating information falls, aggregators will increasingly provide after-aggregation market knowledge in different industries.

5. Strategic Interactions Between Aggregator and Aggregatee

Based on our observations, aggregators often have an emergent, rather than a planned, strategy. They can appear as new entrants into the industry or as new divisions within an existing organization. In the initial phase aggregatees may be just beginning to formulate their online strategy and are turning themselves into aggregation targets without realizing the consequences of their action.

Aggregators often emerge and catch aggregatees off-guard. In this case, we describe the aggregator as financially independent and the aggregatee as unsuspecting. An existing organization (e.g., office supply product provider) may build an aggregator to provide market intelligence on competitors product pricing. In this case, aggregatees may never be aware of the actions of the aggregator.

Once the aggregator realizes the possibilities and develops a more mature strategy, it may try to profit from the opportunity by strengthening its relationship with the aggregatees. Formal partnerships can often reduce the integration cost for the aggregator while aggregatees may gladly pay for preferential treatments. In this scenario, the aggregator is called a financially independent aggregator with collaboration while the aggregatee is called a collaborating aggregatee.

Aggregatees may also view the aggregator's strategy as a threat. Some will try to develop their own aggregator while others will seek to control the existing aggregator through ownership. When faced with a well-funded, in-house competitor, an aggregator may respond with a closer leaning toward the rest of the incumbents who seek to strike a better balance-of-power. In this scenario, the aggregators are financially dependent, on either a single aggregatee or on a consortium of aggregatees.

In general, the different states of aggregation can be characterized by the (1) preference given to one particular aggregatee, (2) the degree of financial control over the aggregator, and (3) the number of participants in any agreement among aggregatees and aggregator. Table 2 below summarizes different relationships states.

Aggregator	Aggregatee
No Aggregation	
<ul style="list-style-type: none"> • Non-aggregator 	<ul style="list-style-type: none"> • Aggregatee – but no aggregation yet
Aggregation Without Partnership	
<ul style="list-style-type: none"> • Financially Independent Aggregator 	<ul style="list-style-type: none"> • Unsuspecting Aggregatee
Aggregation with Partnership	
<ul style="list-style-type: none"> • Financially Independent Aggregator with Partial Collaboration 	<ul style="list-style-type: none"> • Collaborating Aggregatee
<ul style="list-style-type: none"> • Financially Independent Aggregator with Limited Alliance 	<ul style="list-style-type: none"> • Collaborating Aggregatee Member of a Limited Alliance
<ul style="list-style-type: none"> • Financially Independent Aggregator with Equal Degrees of Collaboration 	<ul style="list-style-type: none"> • Collaborative Aggregatee
Aggregation with Ownership	

<ul style="list-style-type: none"> • Financially Dependent Aggregator Owned by a Dominant Aggregatee • Financially Dependent Aggregator Owned by a Consortium of Aggregatee 	<ul style="list-style-type: none"> • Dominant Aggregatee • Consortium of Aggregatees
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Table 2: Summary of Different Relationship States Between an Aggregator and an Aggregatee

5.1 No Aggregation

The No Aggregation state is the base case and probably the state to which most firms are accustomed. Although each incumbent in the industry that has launched an online presence is an aggregatee, there are no active aggregators yet. The information and products that the aggregatees have placed online are targets for consolidation. The higher the degree of inefficiency in information dissemination and the higher the difficulty in making appropriate comparisons of like products, the more likely it is that an aggregator will emerge that can eliminate the inefficiency.

5.2 Aggregation Without Partnership

5.2.1 Financially Independent Aggregator / Unsuspecting Aggregatee

Since the information the aggregator accesses is likely to be widely available and can be extracted without the aggregatee's knowledge, there is no *a priori* need to establish any partnership or arrangement. In fact, the aggregatees usually cannot differentiate between normal users accessing the information and an aggregator accessing the information (using a users' password, if necessary.)

The initial phase of Intershipper was to enter into an industry that was largely capability, not price, driven. A spread of ten times in shipping rates was not uncommon. Table 3 below shows that some of the estimated shipping rates for sending a one-pound package from Cambridge, Massachusetts to Arlington, Virginia vary from \$3 to \$125. Obtaining such comparative rate information has been traditionally difficult.

Carrier Service	Date Delivered	Rate
RPS Ground	8/17 (Guaranteed)	\$3.25
UPS Ground (Commercial)	8/17 (Guaranteed)	\$3.25
U.S.P.S. Priority Mail with Confirmation	8/16	\$3.55
...		
FedEx Priority Overnight w/ Sat. Delivery	8/14 (Guaranteed)	\$30.50
UPS Next Day Air Early AM	8/16 by 8:30 AM (Guaranteed)	\$43.50
FedEx First Overnight	8/16 by 8:00 AM (Guaranteed)	\$45.50
UPS Next Day Air Early AM w/ Sat. Delivery	8/14 by 9:30 AM (Guaranteed)	\$53.50
BAX Guaranteed Overnight	8/16 by 5:00 PM (Guaranteed)	\$125.00

Table 3: Some Rates for Sending a One-Pound Package from Cambridge, MA to Arlington, VA (Source: www.intershipper.net)

In Intershipper's case, as discussed later, the fact that one of the carriers sent a letter threatening to take legal action against the aggregator and then changing its course demonstrates that many aggregatees are completely unprepared for aggregation in their industry.

5.3 Aggregation with Partnership

Although some of the aggregatees may engage in a hostile relationship with the aggregator, others will choose to build mutually beneficial partnerships. Such partnerships may facilitate the aggregator's data extraction while also providing it with the ability to tap into special information not yet available on the

Web. For example, although Intershipper is able to access the publicized shipping rate, it may not have access to the customer-specific negotiated rates. Partnering with the aggregatees is one way for Intershipper to gain access to this data.

In this state, the entities can select to have bilateral relationships, negotiated on a one-to-one basis, or an industry-wide relationship with equal treatment to all. In addition, a selective group of entities can decide to build a limited alliance, one in which only specific aggregatees are allowed to join as members. Depending on the relative size of the aggregatees, the degree to which the industry is fragmented and antitrust concerns, an aggregatee may choose to develop one form of partnership over another.

5.3.1 Financially Independent Aggregator With Partial Collaboration / Collaborating Aggregatee

An aggregator or an aggregatee may be interested in differentiating their relationship. For example, an aggregator may wish to leverage its position as the intermediary and provide preferential treatment to an aggregatee in return for a fee. At other times, an aggregatee may wish to differentiate itself from its competitors through a special relationship.

For example, on its Computers.com Web site, CNET has chosen to differentiate individual retailers through a certification process. Retailers that are CNET-certified receive preferential listings and may appear more credible in the eyes of the consumer.

5.3.2 Financially Independent Aggregator of a Limited Alliance / Collaborating Aggregatee Member of a Limited Alliance

When an industry is characterized by a high degree of rivalry, the participants may tend to avoid partnerships with its competitors. Instead, an aggregatee may seek to sharply limit the aggregator's list of potential partners.

5.3.3 Financially Independent Aggregator With Equal Degrees of Collaboration / Collaborative Aggregatee

On the other hand, the aggregator may value its long run neutrality over any short-term gains from doling out preferential treatments. Aggregators that want to serve as electronic marketplaces or in an advisory role must maintain their impartiality at all times. These aggregators are likely to provide equal degrees of collaboration to all of the aggregatees.

5.4 Aggregation with Ownership

Similarly, the aggregatees may also decide to strengthen and lock-in their partnership with the aggregator through a direct investment. Again the options here parallel those before: the aggregatee can choose to form a consortium to invest in the aggregator or to invest on its own.

5.4.1 Financially Dependent Aggregator Owned By A Dominant Aggregatee / Dominant Aggregatee

An aggregatee can decide to invest in an existing aggregator or even preemptively launch its own aggregator. For example, UPS decided to launch its own aggregator called iShip. This allows UPS to maintain more control over who is included as its competitor, how UPS will be compared against them, and how the comparison will be made. By owning the aggregator, UPS has the potential to access information about how users of the aggregator ship. This can provide UPS with a tremendous strategic advantage.

5.4.2 Financially Dependent Aggregator Owned By A Consortium of Aggregatees / Consortium Aggregatee

To counteract the possibility of a single aggregatee dominating the aggregator, a group of aggregatees can form a consortium and make equal investments into an independent aggregator. For example, three large steel manufacturers, LTV Steel, Steel Dynamics, and Weirton Steel, built Metal Site (metalsite.net) as a neutral marketplace for their industry. This eliminates competitive bidding for the aggregator's preferential treatment and provides the consortium of aggregatees with control over the aggregator. [SGF99]

5.5 Evolution of Relationships

Thus far, we have described the progression of aggregator/aggregatee relationship in a linear fashion, proceeding from the “no aggregator” state to that of independent aggregator to that of a collaborative aggregator. However, the strategic interactions between the aggregator and the aggregatee are dynamic and multi-dimensional. An aggregator can just as easily emerge with established partnerships with or without investment from industry incumbents. Similarly, aggregators that initially emerge as subsidiaries of an incumbent can be divested to become a financially independent aggregator.

6. Example of Strategic Interactions: Intershipper vs. iShip

In this section we revisit the Intershipper example discussed earlier and show how the aggregator's and aggregatee's relationship states and business models can evolve over time.

BITS, Inc., the parent of Intershipper, began as an independent company. Its main source of revenues came from selling network equipment online and hosting online storefronts for various merchants. When BITS built Intershipper, it only intended to provide a free service to its online storefront customers to help them compare prices across multiple shippers rapidly. Intershipper became an aggregator and the carriers were aggregatees.

When one of the unsuspecting carriers realized what had happened, it was furious. It had its corporate counsel write a letter demanding Intershipper cease and desist from aggregating its information. Since Intershipper had several other carriers that it could still aggregate (and it did not want to incur legal expenses), it agreed to remove that carrier from its list. About 6 months later, the carrier's business development managers decided that they did not want their company to be left out of Intershipper's listing. As a result, that very same firm who had demanded to be removed from Intershipper's listing then asked to be readmitted.

BITS realized that this add-on service might also be useful to others. In order to attract a sufficiently large number of users, Intershipper was willing to let users access its service for free and to support its operations via the sale of advertising space and licensing its service for a fee to other web sites that need to ship goods.

Despite the number of advertising supported Web sites, few earn a profit. Moreover, seeing how the UPS-owned competitor, iShip, was better funded and could possibly compete, even at a loss, for a much longer period of time, Intershipper needed a change in strategy. This was where we had left Intershipper after our most recent interview.

What are Intershipper's options? Although Intershipper can leverage its position as an intermediary and dole out preferential treatments in return for a fee, we argue that this would be a shortsighted strategy. Maintaining a biased relationship will encourage other shipping carriers to introduce their own

aggregators and increase competition. Instead, at this moment, Intershipper contrasts nicely against iShip. Intershipper is an independent aggregator whereas iShip is not. Shipping carriers other than UPS should have a vested interest in supporting Intershipper. For example, through its control of iShip, UPS obtains several advantages over its competitors. In addition to being able to determine the factors, the location, and the time of comparison, UPS also knows more about the industry than any of its competitors. Through iShip, it knows the exact conditions – the route, the price, the package, and the type of user – under which a particular competitor was selected. We argue this is highly useful market data not available elsewhere. Intershipper, being an independent aggregator, can provide the same level of information to the other carriers. Instead of having each carrier in the shipping industry build its own aggregator, they can jointly make an investment into Intershipper. This provides the carriers all of the benefits UPS enjoys but with significantly less risk.

7. Legal and Policy Issues

Organizations rushing to put their information on the Internet are just beginning to realize the impact of aggregators using that information. Many are not prepared for the open comparison with competitors, the disinter-mediation that can occur, or the lost opportunity from not harvesting competitive information. Aggregation strategy has only recently come into consideration by senior executives. Aggregation will play a significant role in most enterprises, both private sector and government.

As a result, legal and political issues are emerging. For example, various types of legislation are under consideration (e.g., Coble Bill, Bliley Bill, Gramm-Leach-Bliley Act) that address who and how web information can be re-used. International laws also will effect the location, operations and future of aggregators, as those not allowed in one country may simply operate in another. There has been research to explore the impact of regional and global legal, economic, and cultural issues on the development of local and global aggregators [ZMS01]. The outcome of these domestic and international actions may influence the development of aggregators. But, in spite of some high profile challenges to some aggregators (e.g., Ebay vs. AuctionWatch and Bidder's Edge), most challenges seem doomed to fail simply because the customer will demand access to information through aggregators.

8. Conclusions

Let us go back to “the head of a large and well-established industry giant” introduced at the beginning of this paper. What might his or her organization learn from this paper? This research provides a clear picture that **everyone can be impacted** by aggregation. Even if one does not intend to be an aggregator, if there is any useful information on its web sites, it will likely **become an aggregatee**. In response, or to preemptively cease the opportunity, one might decide to **become an aggregator** also. Thus, aggregation strategy must be part of its eBusiness and core business strategy planning.

This is **not a disappearing dotcom phenomenon**, aggregators create new and valuable information spaces, these are important to all organizations and in many areas of business. In fact, in some industries, such as financial services, the key providers of financial aggregation services are the largest most-established companies (e.g., Chase, Citibank, Merrill Lynch).

Although **comparison aggregation** (e.g., DealTime, MySimon) might be the most common type of aggregation service today, other types, especially **relationship aggregation**, are likely to be even more important. Furthermore, as seen with the Universal Financial Aggregator (UFA) example, it is possible to **combine multiple types of aggregators** to provide totally new services.

Because the impact is so widespread and significant, the aggregation phenomena **will change, and will continue to change, business relationships and create new partnerships**. The need to share information and gain value from these new information spaces will result in organizations both established and newly created to work together in new ways. The wealth of knowledge that can be gained from the new information spaces that are created, the after-aggregation analyses, and the new relationships that evolve through aggregation **will change the way organizations do business**. Any organization that ignores the potential impact of these phenomena will be negatively impacted by the gains of others through the use of aggregated information.

Thus companies should look upon aggregation as **both a threat and an opportunity**. The airline industry should think what happens if MaxMiles succeeds as the primary frequent flyer aggregator and thus owns all the information about who flies where and when. At the same time a computer retailer with no brand recognition should think about becoming a certified merchant of CNet owned computers.com to have a level playing field with retailers who are spending millions of dollars in advertising.

Like it or not, aggregators will use your information to create new information collections that will affect your current business model, branding, and relationships. Aggregators will change the way organizations operate and the way global e-commerce develops^{iv}. It is a wise organization that considers its e-strategy, prepares for aggregators, adds aggregation capabilities to their internal and external operations, and fully understands whether they should **aggregate or be aggregated**.

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ⁱ As a measure of the projected impact of aggregation, two studies predict a high penetration of account aggregation services ([Mar00] and [OBR00]).

ⁱⁱ As of this writing, although there have been several controversies, there are no definitive legal decisions with regard to aggregation. Some of the current legal issues are discussed in [ZMS01]. A detailed analysis of the legal issues is being produced in a subsequent report.

ⁱⁱⁱ Readers interested in additional case studies should visit the Home of Aggregator Research Web site at context2.mit.edu/aggregation. Included at that site is a list of over a hundred aggregators found in Europe, North American, and Asia.

^{iv} Although many of the cases studied here look mostly at the Business-to-Consumer sector, aggregation activities will play an even more important role in the Business-to-Business side of eBusiness.