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SURVIVING AND THRIVING IN THE NEW WORLD OF WEB AGGREGATORS

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Abstract

This paper examines the development of 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 the incumbent. We also suggest different business models as possible aggregator entry points into an industry and describe their impact.

1. Introduction

Imagine that you are the head of a large and well-established industry giant. Your attitude toward the Internet soon took a dramatic turn from thinking of it as simply a fad to treating it as a revolutionary force in your industry. Tired with being left behind, you decided that you, too, would make your products available online. After all, your customers are clamoring for 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 the largest and hottest marketplace of this decade.

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 informed us that it was less expensive, and without additional delay, to purchase Reilly and Brown's finance text book, *Investment Analysis and Portfolio Management,* from Amazon.com than from A1books.com. If, like A1books.com, your revenue model was based on distributing your products online, the aggregator has just dramatically narrowed your margins. Even if you tried to differentiate your product, the aggregator can un-bundle your offering,

evaluate each piece independently, and repackage it with products from other firms. On the other hand, if, like Amazon.com, your revenue model was based on giving away your products at a loss in hopes of gaining advertising sales, lead generation fees, or better customer data, the aggregator may have just displaced you as a more popular and useful site on the Web.

Aggregators can collect information from *cooperating* or *non-cooperating* sources. New web-based extraction tools [FMS00] 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. Mediation technologies allow for automatic comparison of information (e.g., book prices, bank accounts, shipping rates, intelligence information) and agent technologies allow for strategic use of aggregated information.

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, with 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.

> **Where Will You Buy?**
>
> *Investment Analysis and Portfolio Management,* 5th edition, by Reilly and Brown, 1996. Hardcover. ISBN: 0030186838. List Price: $107.50.
>
> - Available at A1Books.com for $103.90, including shipping and sales tax, in 5-10 days.
>
> - Available through Amazon.com for $96.79, including shipping and sales tax, in 3-7 days.
>
> **Figure 1: Online Book Comparison (Source: www.DealTime.com)**

In the remainder of this paper, we examine a number of aggregators across different industries, including information management services that help users manage vendor 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 aggregators' business, changes in the aggregatees' 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 Categories

Before proceeding further, we will define 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 different web data sources. In the process, the aggregator resolves the semantic and contextual differences in the information.

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

1. *Transparency* - There are two aspects to transparency. First, to the data sources an aggregator appears like a normal user who is accessing the information. Second, the aggregator resolves the contextual differences to allow for effective comparisons and aggregations.

2. *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 our definition, search engines, such as Lycos and Alta Vista, and personalized Web portals, such as My Netscape or My Yahoo, 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 integrate and analyze that information.

2.2 Aggregator Capabilities

Aggregators provide new capabilities for forming *comparisons*, managing *relationships*, and building new *intra and inter organizational* data collections. Aggregators with *comparison* capabilities are focused on collecting information about goods and services for evaluation. Shopbots such as for those for purchasing books, music and electronics are good examples of this capability. *Relationship* aggregators form new information collections that enhance the services provided by the aggregated. These services typically are designed to build a stronger and broader relationship with the aggregator than the aggregated organizations. For example, financial account aggregators (e.g., Yodlee, VerticalOne, ebalance) are being adopted by major financial (e.g., Chase, Citibank) 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]. *Intra-organization* capabilities allow aggregators collect information from multiple parts of a given enterprise (e.g. financial information from all company divisions, manufacturing data from different plant locations), while *inter-organizational* aggregators combine information from multiple enterprises (e.g., financial information from multiple online sites.) A single aggregator may combine several capabilities for a given application. These capabilities are summarized in Table 1.

Aggregator Capability	Examples
▪ Comparison	Comparison of book prices or shipping costs/options.
▪ Relationship	Aggregation of all your frequent flyer programs or financial accounts
▪ Intra-Organizational	Integrate multiple separate departmental calendars
▪ Inter-Organizational	Consolidate information about a company from multiple sources (financials, news, competition)

Table 1. Aggregator Capabilities

2.3 Aggregatee

An aggregatee is any incumbent that could be aggregated. Ultimately, aggregators are also aggregatees, because once they provide their services over the Web, another aggregator can aggregate that service just as easily (we refer so such an aggregator as a mega-aggregator.)

2.4 Aggregated

An aggregated is an entity that serves as an information source to an aggregator whereas an aggregatee is merely a possible target. Airlines, whose frequent flyer miles are accessible through sites such as Max Miles, are examples of the aggregated. In addition, banks, whose financial products can be compared at sites such as Bankrate.com or Banxquote.com, are also members of the aggregated. In both cases, the aggregators provide a single view for comparing the different offerings from the aggregated.

> **Insight: Everyone will be impacted.** If you are not an aggregator, you definitely will be an aggregatee if you provide any useful information on the Web.

2.5 After Aggregation

After aggregation, or post-aggregation, refers to the services and analysis applied to the collection of aggregated data. Although most aggregators we surveyed have a transaction or a subscription-based revenue model, we believe aggregators will soon begin to extract value from the wealth of information they amassed. Creative post-aggregation activities include re-selling formerly hard-to-obtain summary data back to the aggregated or other interested parties, or helping users optimize their actions.

3. Aggregator Examples

In this section we present detailed examples of aggregators with different capabilities.

3.1 Relationship Aggregation: Managing Reward Programs via Max Miles

Max Miles (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 to Max Miles and authorize it to access and analyze their data. In return, Max Miles periodically sends its customers 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 Max Miles' service immediately benefits from not having to manually keep track of the plethora of passwords and are able to view all account activities through a consolidated statement. Table 2 lists some of the airlines, hotels and car rentals whose reward programs can be accessed through Max Miles.

In addition to the standard account statement, Max Miles provides additional value as it is capable of identifying flight segments, or hotel stays, that were not properly credited. It will deduce that some flight segments may not have been properly posted if, for example, the account data do not show an inbound segment for each outbound flight. In the not-to-distant future, Max Miles expects to offer increasingly more personalized account statements that help users take advantage of special offers for which they are eligible and of interest.

Airlines
American Airlines
Air Canada
Air France
Alaska Airlines
British Airways (US)
Canadian Airlines
Continental Airlines
Delta Air Lines
Hawaiian Airlines
Japan Airlines
KLM
Lufthansa
Midwest Express
Northwest Airlines
Qantas Airlines
Scandinavian Airlines
Swissair
TWA
United Airlines
US Airways
Hotels
Hilton Hotels
Holiday Inn Worldwide
Hyatt Hotels
Marriott Hotels
Starwood Preferred Guest
Rent-a-car
Hertz Rent a Car

Table 2: List of Reward Programs that Max Miles Accesses

Max Miles 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 Max Miles' service for $2.95/month. The following Web portals, travel agents, and reward programs have partnered with Max Miles:

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

Interestingly, because Max Miles 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 Max Miles, outsourcing the task to reduce cost and leveraging the company's technology to better serve its customers. On the other hand, US Airways 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 PIN to a third party with the intention of preventing Max Miles from encroaching on to its business. Max Miles countered this by asking its users, as part of the registration process, to give it a Limited Power-of-Attorney.[2]

There are a number of important issues to consider about this aggregator. First, MaxMiles is attempting to be the relationship between you and your frequent flier programs. This is important to note as it has significant effect on the aggregated organizations. The companies must change their business model to adapt to this new entity. 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 will know how everyone flies, rents cars and stays at hotels. This new set of information is extremely valuable to the aggregated organizations. These organizations may choose to outsource their frequent flier programs. Finally, they may choose to be more combative and limit access to

"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)

the data. Regardless, the aggregator has had significant impact on the aggregated organizations' business models and has changed the relationship between the customer and these organizations.

> **Insight: Aggregation changes relationships.** These changes impact the customer, the aggregator, and the aggregated.

3.2 Comparison Aggregation: Selecting Your Carrier Through Intershipper

DealTime, as briefly described earlier, provides comparisons of products, such as books. As a different example, Intershipper demonstrates both price and non-price information comparisons aggregation services.

Intershipper (www.intershipper.net) began as a side business of BITS, Inc., a small computer shop in Arizona that also doubles as a host for merchants who wish to build an online storefront. When Intershipper was first conceived, it was viewed as an add-on, a free feature, for the owners of the online storefronts to help them minimize their shipping overhead. But BITS quickly realized that they had a one-of-a-kind business on their hand. They had the opportunity to become the intermediary between carriers and package senders.

In addition to the highly popular package tracking service 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 each carrier, a feature useful to most individuals who cannot afford 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 and time of delivery, but also by a wide variety of other factors.

Since the information Intershipper accesses are available on the carriers' Web site, Intershipper does not have to form explicit partnerships to provide its services. As in the case of Max Miles, there was a wide range of reactions from the carriers, one of which went as far as threatening to file a lawsuit if Intershipper does not immediately cease and desist. More interestingly, the same carrier then made a 180-degree turn several months later asking to be listed through Intershipper's Web site.

3.3 Intra- and Inter-Organizational Aggregation: Integrated Spreadsheet for Financial Research Analyst

With the new aggregation technologies becoming available, all kinds of previously separate sources of intra-organizational and inter-organizational information may be aggregated and integrated. As an example, consider the spreadsheet shown in the upper left portion of Figure 3. This is part of a prototype system developed jointly by MIT and a major financial institution to support their Research Analysts. The Excel spreadsheet that is used by the analyst is automatically and dynamically populated by data retrieved from both internal sources (internal databases and their internal Web intranet containing their proprietary evaluations) and external web sources (in this example, the SEC filings found on FreeEdgar and new items from Yahoo).
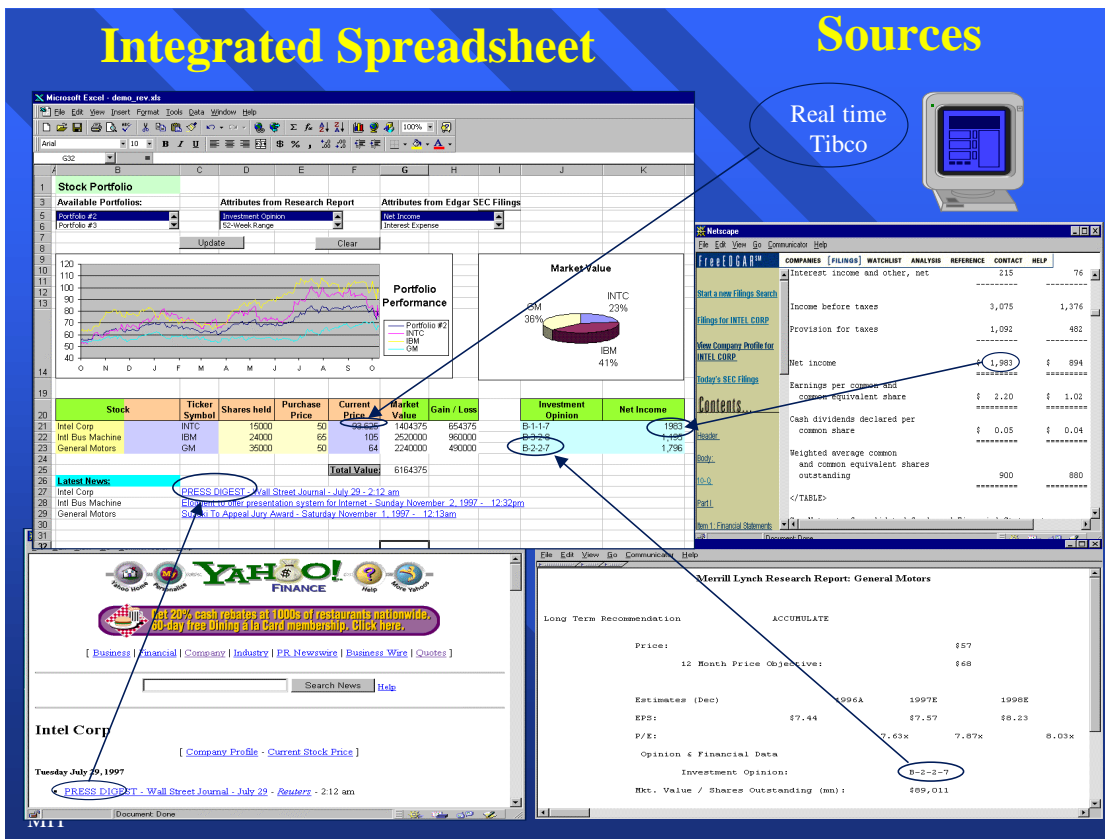
Figure 3. Aggregation of Intra- and Inter-Organizational Web Sources

3.4 Combined Relationship and Comparison Aggregation: Universal Financial Aggregator

Although most current aggregators primarily have only one capability, the next generation is likely to combine several capabilities. We have developed the Universal Financial Aggregator (UFA), a demonstration aggregator that provides integrated access to all of the user's financial accounts that are accessible online. Instead of only seeing individual accounts, the user can instantaneously view his/her total financial status 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 has *relationship aggregation* capabilities, similar to MaxMiles.

Moreover, given the user's financial information as well as knowledge of other available financial products, the UFA is capable of helping the user optimize finances. For example, the UFA incorporates a Money Market aggregator that scours the net for the best interest rates offered that are consistent with the user's aggregated financial status. The Money Market aggregator is an aggregator of other money market rate aggregators (i.e., Bankrate.com and Bankquote.com), thus, it is a *mega-aggregator*. With this use of the Money Market aggregator the UFA has *comparison aggregation* capabilities, similar to DealTime. This is done as an *after-aggregation* (after the relationship 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*.

Insight: Aggregator capabilities can be combined and aggregators can be aggregated.

3.5 Additional Aggregators

Aggregation is rapidly spreading to many different industries and assuming many different forms. However, as illustrated in both the Max Miles and Intershipper case studies, incumbents often do not know how to react. In addition to the examples presented above, we have also examined aggregators in the retail, telecommunications, and financial services industry. Readers interested in additional case studies and contributors willing to contribute to the research community's knowledge 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.

Insight: Aggregation is more than just price comparison.

4. Strategic Interactions Between Aggregator and Aggregatee

Based on our observations, aggregators often have an emergent, rather than a planned, strategy. They can appear both as new entrants into the industry or as new divisions within an incumbent's organization. Since the "aggregator" initially has yet to formalize its aggregation strategy, we characterize this primordial state as the non-aggregator/aggregatee stage. Often at this stage, the incumbents are also just beginning to formulate their online strategy and are turning themselves into aggregation targets without realizing the consequences of their action.

The free and easy access to information on the Internet implies that the non-aggregator/aggregatee stage is not likely to remain as a stable equilibrium. Aggregators often emerge and catch aggregatees off-guard. As in Intershipper's case, the aggregation strategy occurred as an after-thought. In this scenario, we describe the aggregator as financially independent and the incumbent as unsuspecting.

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

Incumbents may also view the aggregator's strategy as a threat. Some will try to develop its own aggregator in-house while others will seek to control the aggregator through ownership. When faced with a well-funded, in-house competitor, new-entrant aggregators 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 aggregated or on a consortium of aggregated.

In general, the different states can be characterized along the dimensions of the

(1) Degree of preference given to any one particular aggregated data source
(2) Degree of financial control over the aggregator
(3) Number of participants in the agreement

Table 3 below summarizes the different relationships.

Aggregator	Aggregated
No Aggregation • Non-aggregator	• Aggregatee
Aggregation Without Partnership • Financially Independent Aggregator	• Unsuspecting Aggregated
Aggregation with Partnership • Financially Independent Aggregator with Partial Collaboration	• Collaborating Aggregated
• Financially Independent Aggregator with Limited Alliance	• Collaborating Aggregated member of a Limited Alliance
• Financially Independent Aggregator with Equal Degrees of Collaboration	• Collaborative Aggregated
Aggregation with Ownership • Financially Dependent Aggregator Owned by a Dominant Aggregated	• Dominant Aggregated
• Financially Dependent Aggregator Owned by a Consortium of Aggregated	• Consortium of Aggregated

Table 3: Summary of the Seven Different States Between an Aggregator and an Aggregated

4.1   Non-aggregator / Aggregatee

The Non-aggregator/Aggregatee state is the base case and probably the state to which most firms are accustomed. Each incumbent in the industry that has launched an online presence is an aggregatee. The information and products they placed online are potential 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 useful it will be to have an aggregator that can eliminate the inefficiency.

In Intershipper's case, the express shipping industry is capability, and not price driven. A spread of ten times in shipping rates is not uncommon. Table 4 below shows some of the estimated shipping rates for sending a one-pound package from Cambridge, Massachusetts to Arlington, Virginia vary from $3 to $125. Moreover, obtaining such comparative rate information has been traditionally difficult. Therefore, the information asymmetry provides an aggregator with the opportunity to capture the profit.

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

Aggregatees who comprehend this dynamics can seize the opportunity and build its own aggregator subsidiary. As we shall see in the later part of this paper, UPS funded an online shipping aggregator called iShip to compete against Intershipper.

4.2 Aggregation Without Partnership

4.2.1   Financially Independent Aggregator / Unsuspecting Aggregated

Since the information the aggregator accesses is 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 aggregated data sources usually cannot differentiate between normal users accessing the information and an aggregator accessing the information using the users' PIN.

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

4.3 Aggregation with Partnership

Although some of the aggregated 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 aggregated data sources 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 aggregated, the degree to which the industry is fragmented and antitrust concerns, an aggregated may choose to develop one form of partnership over another.

4.3.1 Financially Independent Aggregator With Varying Degrees of Collaboration With Each Aggregated

An aggregator or an aggregated 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 aggregated in return for a fee. At other times, an aggregated 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.

4.3.2 Financially Independent Aggregator of a Limited Alliance

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

As we shall see later in the Intershipper's case, Intershipper can facilitate its efforts at building partnerships by taking advantage of the fact that some of the carriers are unwilling to let the UPS-dominated aggregator, iShip, become the only aggregator in town.

4.3.3 Financially Independent Aggregator With Equal Degrees of Collaboration

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 aggregated.

4.4 Aggregation with Ownership

Similarly, the aggregated 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 aggregated can choose to form a consortium to invest in the aggregator or to invest on its own.

4.4.1 Financially Dependent Aggregator Owned By A Single Aggregated

An aggregatee or an aggregated can also decide to invest in an existing 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.

4.4.2 Financially Dependent Aggregator Owned By A Consortium of Aggregated

To counteract the possibility of a single aggregated dominating the aggregator, a group of aggregated 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 aggregated with control over the aggregator. Consequently, the consortium does not allow Metal Site to fully integrate the data of its data sources in order to prevent complete transparency in the market place. [SGF99]

4.5 Evolution of Relationships

Thus far, we have described the progression of aggregator/aggregatee relationship in a linear fashion, proceeding from a non-aggregator to that of independent aggregator to that of a collaborative aggregator. However, as Figure 4 illustrates, 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 investment from industry incumbents. Similarly, aggregators that emerge as subsidiaries of an incumbent can also be divested to become a financially independent aggregator. In studying Figure 4, it is important to note that the aggregator could start at any state, stay in any state, or transition between states – whatever makes sense to it.

Figure 4. Seven Different Relationship States
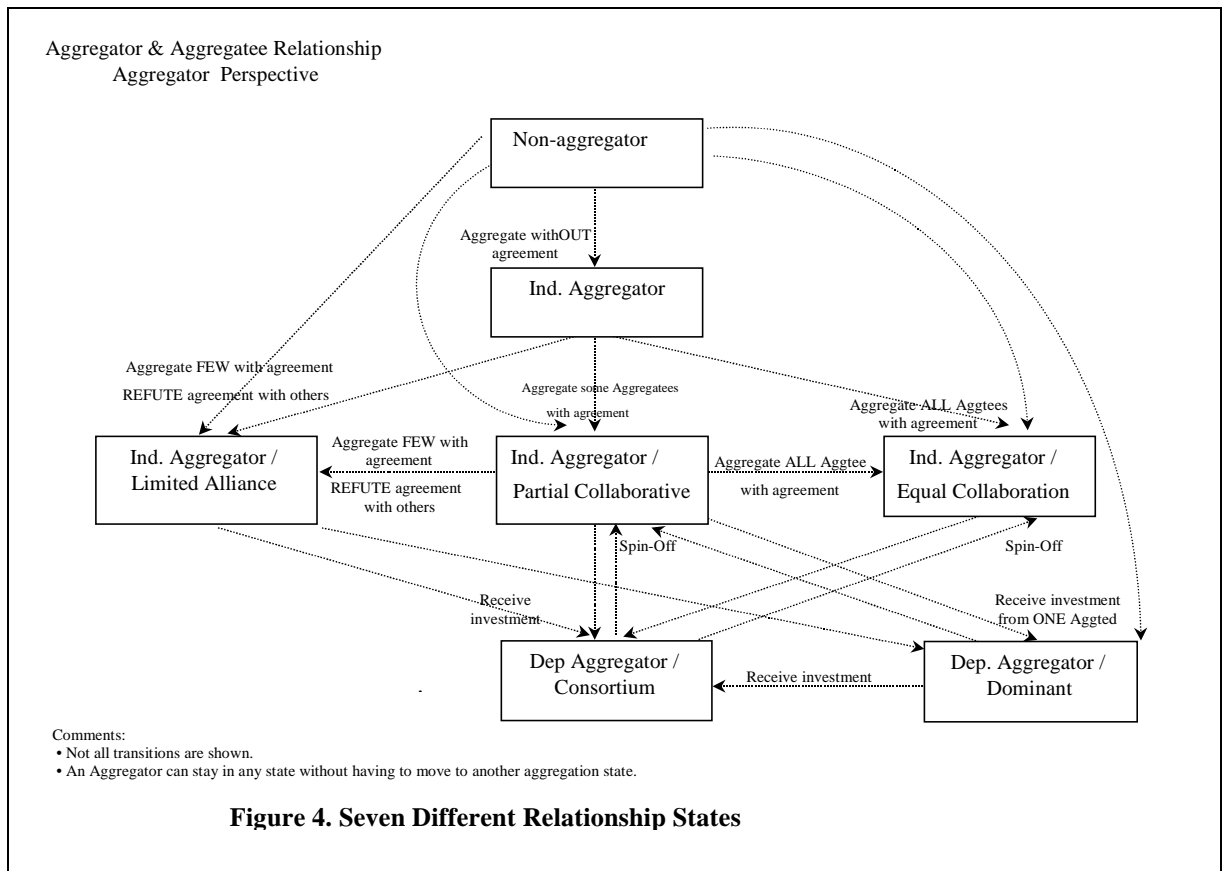
5. Example of Strategic Interactions: Intershipper vs. iShip

Let us now revisit the Intershipper example discussed earlier and show how the aggregator's and aggregatee's relationship states and business model have evolved over time.

BITS, Inc., the parent of Intershipper, began as a non-aggregator. 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 aggregated.

When some of the unsuspecting carriers realized what has happened, they were furious. One had their corporate counsel write a letter demanding Intershipper to cease and desist from its operations. But their business development managers did not want their company to be left out of Intershipper's listing, especially if they were more competitive. After all, by exposing them to a larger customer base, small shipping carriers benefited from Intershipper's service. As a result, that very same firm who had just demanded to be removed from Intershipper's listing asked to be readmitted.

BITS realized that this add-on service may also be useful to others and wanted to move toward a transaction fee model. In order to attract a sufficiently large number of users, Intershipper was willing to initially let users access its service for free and to support its operations via the sale of advertising space.

Despite the number of advertising supported Web sites, few earn a profit. Moreover, seeing how the UPS-owned competitor, iShip, is better funded and can possibly compete at a loss for much longer period of time, Intershipper desperately needs a change in strategy.

This was where we had left Intershipper in our most recent interview. There may be many different strategies Intershipper can take. The following is one such example:

> Although Intershipper can leverage its position as an intermediary and dole out preferential treatments in return for a fee, we argue this is 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 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.

6. Business Models Beyond Advertising

Many online businesses employed an advertising-based revenue model. With low startup costs and a near-zero marginal cost of distribution, many providers of content and information services have entered the Internet space. Web sites that gave away a popular service built an enormous user base that became highly valuable to the advertisers. More importantly, Web sites that were able to help advertisers target a specific audience or demographic group and provide context-based advertising became increasingly sought after. Yahoo, who has always provided a free directory service and is able to present advertisements based on the user's search criteria, receives tens of millions of visits per day. At the rate of a nickel a page, Yahoo has ramped up its earnings stream.

Unfortunately, the advertising model is not for everyone. Unless a Web site can attract significant traffic, advertisers simply will not pay to advertise on that site. In addition, the effectiveness of banner advertisements has been questioned recently. Moreover, with the advent of aggregators who are capable of extracting only the relevant and interesting portion of the Web page, there is clearly a need for new business models that go beyond advertising.

In this section, we present three business-oriented and three consumer-oriented models for aggregators. These models are summarized in Tables 5 and 6 below.

6.1 Business-Oriented Business Models

Business Model	Description	Examples	Sources of Revenue
Aggregation Service Provider	• Provide aggregation technology to firms looking to outsource this service.	**Max Miles** provides its technology to Hyatt Hotels for use in its reward program.	1. License 2. Subscription
Sales / Lead Generator	• Matches consumers to the most appropriate product offering. • Creates tailored products by coordinating multiple transactions and bundling existing offerings. • Facilitates online transactions through the provision of trust and the fulfillment of transactions.	**CNET** provides comparison tools to help consumers better assess their purchase and lists vendors with the item in stock. **CNET** also certifies merchants to reduce consumer's risk of purchasing from unfamiliar merchants.	1. Transaction 2. Certification
After Aggregation Knowledge Provider	• Generates market data for sale to the aggregatees or industry.	**Intershipper** can provide market data to the individual carriers.	Sale of data

Table 5 Summary of Business-Oriented Business Models

6.1.1   Aggregation Service Provider

Aggregation service providers license or rent the aggregation technology to another firm. This allows for non-technology companies to easily incorporate complementary services or outsource business areas that are not key to their core competency. With the advent of the Internet, more and more firms are outsourcing their technology needs to service providers to benefit from the economies of scale. Hyatt Hotels and the various travel agents who have licensed Max Miles'

technology are examples of firms who have decided to purchase instead of build and maintain 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 Citigroup 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.

For manufacturers of information goods, such as Bank Rate Monitor, there is an additional twist. Aggregators may represent a significantly more efficient model of production. Instead of building the information good 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. Aggregators may end up displacing original manufacturers of information goods.

> **Insight: The business models and market conditions for aggregators and aggregatees will continue to change**

6.1.2   Lead / Sales Generator

Lead generators are defined as entities that "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 you to that vendor's web site to make the purchase.

Not only do lead generators provide vendors 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 and to be prepared for that moment, one step ahead of the competition" [Bak98]. Lead generators, like sellers' agent, receive a percentage of the sales as commission for their service.

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 businesses that provide bundled products tailored to our 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.

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 extend CNET's name and legitimacy to small and relatively unknown retailers, thus making sales by them more viable.

6.1.3 After Aggregation Knowledge Provider

An aggregator is well positioned to collect detailed and highly valuable market information that is not available to the aggregated. 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.

> **Insight: Aggregators create new and valuable information spaces**

6.2 Consumer-Oriented Business Models

Business Model	Description	Examples	Sources of Revenue
Information Management Service Provider	• Manages an individual's information through an aggregation of multiple accounts. • Provides multiple perspectives on a piece of information beyond that of individual relationships.	**Max Miles** provides a single account statement that summarizes the frequent flyer mileage points from all of the reward programs of which the individual is a member.	1. Subscription 2. Software license
Agent	• Enables users to more quickly and accurately perform actions, such as searching, shopping, or summarizing information, than would otherwise be possible.	**DealTime.com** enables its users to instantaneously search through hundreds of bookstores for the best possible price, taking into account the sales tax and the shipping cost.	1. Subscription 2. Per-use fee 3. Commission based on savings.

After Aggregation Advisor	• Provide decision support services to the individual.	**Max Miles** automatically identifies possible legs of a trip or possible hotel stays that were not properly credited.	Subscription

Table 6 Summary of Consumer-Oriented Business Models

6.2.1 Aggregated Information Management Service Provider

Service providers can assist users with the management of their information. This is especially important for relationship, intra-organizational, and inter-organizational aggregators. Individuals and companies can outsource the maintenance of their complex information aggregation needs. For example, a financial account aggregator can help manage a multiplicity of bank accounts, checking accounts, credit cards, certificate of deposits, and money market accounts. Sophisticated aggregators of this type, especially for high net worth customers or businesses, may have a subscription-based revenue model.

6.2.2 Agent

Although lead generators facilitate the transaction process by introducing consumers to vendors, lead generators do not necessarily work in the consumer's favor. In other words, the lead generator may not introduce the consumer to best possible vendor, but perhaps the vendor who is willing to pay the lead generator the most.

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 Max Miles case study illustrates, not only are aggregators are 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 significantly better and more personalized recommendations than any of the aggregated. Consumer agents may adopt a subscription model or "evolve toward a commission structure. [As] customers will save time and money by using agents…they will pay agents a proportion of the savings" [HR97]. 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].

6.2.3 After-Aggregation Advisor

While the after-aggregation market knowledge provider supplies information to the businesses, aggregators can also provide advice to individuals. An information management service provider can provide its users with specific advice tailored to the user's profile. For example, as we have seen, in addition to presenting the user with an integrated financial statement, an advanced Financial Account Aggregator can help individuals maximize their use of cash by automatically transferring balances from a low interest account to that of a high interest account.

> **Insight: Although aggregation is important, the "after aggregation" may be even more important.**

7. Enabling Technologies

We mentioned in the beginning of this paper that aggregation is not a new business phenomenon. However, with the advent of the Internet and the development of new technologies, the barrier-to-entry for aggregation has been lowered in many industries. Web-based extraction tools have made it possible for aggregators to transparently gather information from multiple sources with or without the permission or knowledge of the Aggregatees. Mediation technologies allow for automatic comparison of information (e.g., book prices, bank accounts, shipping rates, intelligence information) and agent technologies allow for strategic use of aggregated information[GBM00]. The introduction and acceptance of the XML family of standards (e.g., XML, RDF, XML-schema) significantly increases aggregator abilities for information extraction, comparison and analysis.

The package of technologies developed at MIT will converge to an Aggregator tool that can enable the rapid deployment of an Aggregator sit. For example the Web-wrapper system [FMS00] along with I-Wrap system [Mal00] can enable an aggregator organization to wrap any site through a visual interface, eliminating the need to understand any of the underlying technologies. The Mediation engines developed can eliminate semantic differences in data and thus the aggregator can easily aggregate different sites. For a more detailed description and demo of these systems you can visit context2.mit.edu/coin.

8. Conclusions

This paper has defined and analyzed an emerging business, aggregators, in the Internet space. It has also shown that this has repercussions for all players in every industry. Some of the key insights and business implications are summarized in Table 7 below.

Insight	Implication
Everyone is impacted, if you are not an aggregator, you will be an aggregatee.	Aggregation strategy must be part of your eBusiness and core business model strategy planning.
Aggregation is not limited to price comparisons.	You should identify new aggregation applications and business opportunities.
Aggregator capabilities can be combined and aggregators can be aggregated.	Entirely new types of aggregator applications can be defined.
Aggregators create new and valuable information spaces	Determine who will own this valuable information space
Although aggregation is important, the "after aggregation" may be even more important.	The tremendous value in "after aggregation" analysis and value-added services must be exploited.
Aggregation changes relationships	Decide what relationship you wish to have with

(Aggregator-aggregatee, aggregator-user, aggregatee-user).	your customers and aggregators.
The business models and market conditions for aggregators and aggregatees will continue to change.	Aggregators and aggregatees must be prepared to react to these changes (possibly switching or combining roles)

Table 7. Summary of Key Insights and Implications

Companies should look upon Aggregation as both a threat and an opportunity. Amazon should think what will happen to their new "Purchase circle " section if an Aggregator places itself in between Amazon and the customer and thus the Aggregator is able to provide a much richer community information by aggregating the information across all book retailers. The airline industry should think what happens if Maxmiles becomes the frequent flyer mile center 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 like Buy.com who are spending millions of dollars in advertising. Although many of the cases studied here look mostly at the Business-to-Consumer sector, we think that the Aggregator will play an even more important role in the Business-to-Business side of E-commerce.

As described above, it is critical for Aggregators to be able to connect with the systems of the Aggregatees. The World Wide Web makes such linkage possible. We have developed a business case for Aggregators, shown the emergence of this model through some real cases even as new technologies will enable even easier aggregation. We are now looking at topics such as the impact of Aggregators in Business-to-Business E-Commerce and the value of after-aggregation, and the impact of regional issues on the development of local and global aggregators.

Legal and political issues (e.g., U.S. Congress - Coble Bill, Bliley Bill) 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 aggregations. International laws also will effect the location, operations and future of aggregators, as those not allowed in one country may simply operate in another.

Organizations rushing to put their information on the Internet are just beginning to realize the impact of aggregations using that information. Many are not prepared for the open comparison with competitors, the disintermediation that is occurring, or the lost opportunity from not harvesting competitive information. Aggregation strategy has only recently come into consideration by senior executives, though we have begun to see aggregation as a key part of e-strategy reviews. Aggregation will form a fundamental component of many organization's web presence and play a significant role in most enterprises (e.g., commerce, government).

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. 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.*

9. Acknowledgements

10. References

[Bak98] Y. Bakos, "The Emerging Role of Electronic Marketplaces on the Internet", *Communications of the ACM*, 1998.

[EW99] P. Evans and T.S., Wurster, "Getting Real About Virtual Commerce," Harvard Business Review, November 1999, pp. 85-94.

[FMS00]   A. Firat, S. Madnick, and M. Siegel, "The Caméléon Approach to the Interoperability of Web Sources and Traditional Relational Databases", *Proceedings of the Workshop on Information Technology and Systems,* Brisbane, Australia, December 2000.

[GBM00] C. Goh, S. Bresson, S. Madnick, and M. Siegel, "Context Interchange: New Features and Formalisms for the Intelligent Integration of Information," *ACM Transactions on Office Information Systems*, July 1999.

[HR97] J. Hagel III and J. F. Rayport, "The new infomediaries", *The McKinsey Quarterly Number 4*, pp. 54-70, 1997.

[Mal00] A. Malchik, "An Aggregator Tool for Extraction and Collection of Data from Web Pages,"(MIT Master's Thesis, 2000).

[Mar00] O. Marenzi, "Account Aggregators, Screen Scrappers and Online Financial Services," Report by Celent Communications, March 2000.

[OBR00] "Account Aggregation 2.0," Online Banking Report (August 2000) Issue 63.

[Pan99] H. Pan, "Integrating Financial Data over the Internet"*,* (MIT Masters Thesis, 1999).

[SGF99] A. Segev, J. Gebauer and F. Farber, "Internet-based Electronic Markets", *EM - International Journal of Electronic Markets.*

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

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