December 1998

Emergent Structures in the Information Economy

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Abstract

Electronic commerce is growing at a rapid, even bewildering pace. As we have no past experience from which to imagine commercial possibilities, it is hard to discern any constants except for that of continual change. In this research, we suggest that it may be possible to understand the directions of e-commerce by reasoning from the underlying functions that must be provided.

Introduction

- *"Quicken and Excite premiere new business and investing channel"* – Oct, 15, 1997.
- *"Excite acquires MatchLogic, the leader in Internet Advertising Services"* – Jan 15, 1998.
- *"Microsoft Expedia.com teams with Infoseek to deliver "Best of the Web" Online travel"* – March 3, 1998.
- *"Infoseek and Realtor.com take the headache out of home buying"* – March 3, 1998.

…. and so go the headlines heralding yet another merger, alliance or partnership in cyberspace. Today's e-commerce environment is vastly different from the early beginnings of the information economy. Firms, or Web-based intermediaries, as we shall call them, were largely specialized, single-purpose entities to begin with. However, recent times have witnessed a significant overhaul of this initial '*structure*', resulting in a cauldron of emerging relationships among such Web-based entities. Most intermediaries have significantly expanded their repertoire of functionalities in keeping with the growing demands of e-commerce; while some of them have taken over existing specialized intermediaries, others have resorted to cooperative arrangements.

Why are these changes taking place? Is there an underlying pattern driven by a deeper rationale? What are the implications of such changes for the structure of the information economy and the strategy and conduct of its participants? Our research seeks to answer these questions and to investigate the strategic behavior of "firms" in an information economy. In this paper we propose a framework to highlight the various functions that Web-based intermediaries serve in electronic commerce. We also identify several examples of cooperative arrangements among such intermediaries and develop an "affinity matrix" that provides interesting insights into the emerging structure of the information economy.

A Framework for Electronic Commerce

The transformation of the World Wide Web from a distributed information repository (where the focus was on retrieval) into an *electronic marketplace* (where the focus now is on transactions) calls for a whole new set of capabilities along with the creation of new institutions and control mechanisms. In the traditional economy, various forms of intermediaries have arisen to facilitate transactions and provide services to both producers and consumers. Similarly, the information economy will require the services of 'electronic intermediaries' serving similar roles[1] on the Web. Intermediaries, by nature of their role-specialization, help to reduce the risks and uncertainties of transacting business and add value by engaging in activities that help reduce coordination costs and provide economies of scale and scope.
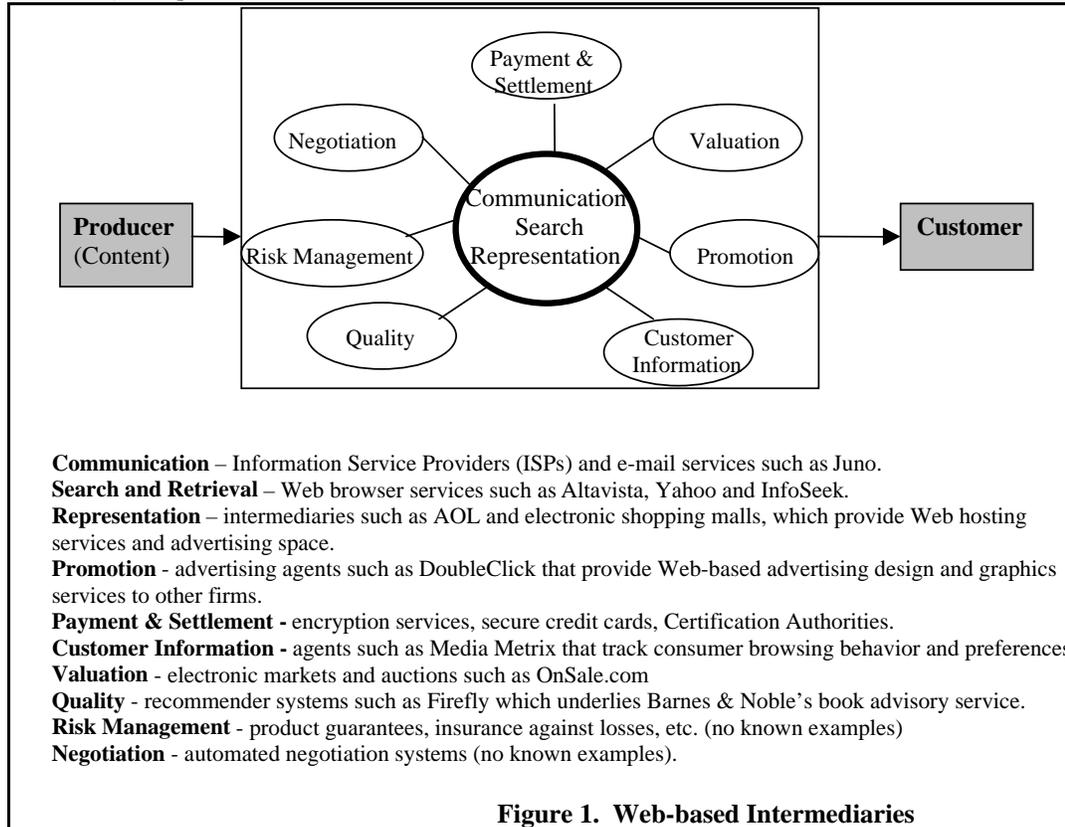
The following framework[2] (see Figure 1) identifies ten functions necessary for the successful growth of e-commerce. While some functions primarily focus on the needs of customers, others serve the needs of suppliers/ manufacturers. *Communication*, s*earch* and *representation* form the core set of capabilities for e-commerce and have been the fastest to evolve. In addition to these core functions, successful e-commerce requires a host of other intermediary functions that serve to reduce the uncertainties that pervade transactions. While the peripheral functions in Figure 1 add value to e-commerce, they are more complex and often require consensus among firms. As a result, they have been slower to evolve. While the functions could all conceivably be provided by one firm, the figure emphasizes the niche roles played by electronic intermediaries.

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[1] Since we are primarily concerned with 'electronic intermediaries' in an *information economy,* we restrict our discussion to intermediary functions that lend themselves to automation.

[2] This framework extends [Kambil '97].

Emergent Relationships among Web-based Intermediaries for E-commerce

While most electronic intermediaries began as specialized agents, we are beginning to witness a consolidation on various levels. Note that traditional industries have exhibited similar patterns of integration at various stages of their life- cycle and such relationships have been attributed to transaction costs (e.g., asset-specificity), economies of scope, asset complementarity, etc. [Langlois & Robertson, 1989].

Communication – Information Service Providers (ISPs) and e-mail services such as Juno.
Search and Retrieval – Web browser services such as Altavista, Yahoo and InfoSeek.
Representation – intermediaries such as AOL and electronic shopping malls, which provide Web hosting services and advertising space.
Promotion - advertising agents such as DoubleClick that provide Web-based advertising design and graphics services to other firms.
Payment & Settlement - encryption services, secure credit cards, Certification Authorities.
Customer Information - agents such as Media Metrix that track consumer browsing behavior and preferences.
Valuation - electronic markets and auctions such as OnSale.com
Quality - recommender systems such as Firefly which underlies Barnes & Noble's book advisory service.
Risk Management - product guarantees, insurance against losses, etc. (no known examples)
Negotiation - automated negotiation systems (no known examples).

Figure 1. Web-based Intermediaries

The "affinity matrix" (see Figure 2) captures some of these emergent relationships among Web-based intermediaries. The diagonal cells in Figure 2 list intermediaries that have tended to spe-cialize in a particular function. The off-diagonal cells poten-tially contain alliances between the interme-diaries on the diagonal of the corresponding row and column. In Figure 2, these cells contain a number of examples of interme-diaries that have strategic relationships with other interme-diaries (indicated by the "+" sign.)

The shaded por-tion in each cell con-tains a pair of +ve or –ve signs indicating the presence or absence of "supplementarity", by which we mean a supporting functional rationale for the alliance. The first sign in the pair indicates whether or not the column function is supported by the row function, while the second sign indicates whether or not the row function is supported by the column function. A **+/+** pair indicates a two-way (strong) supplementarity, a **+/-** or **-/+** pair indicates one-way (weak) supplementarity, while a **-/-** pair indicates no direct supplementarity. For example, *search* and *quality* go hand in hand. However, Web-based search mechanisms (for example Yahoo, Excite) have evolved from information retrieval models and therefore perform search only at the syntactic level (keywords/phrase). The diversity of sources on the Web and their effervescent nature makes quality signaling a very important function that adds value to simple search mechanisms. The first "+" sign in the search/quality cell indicates this affinity. On the other hand, since search mechanisms form the default interface to the customer, quality signaling is most effective when coupled with a search mechanism. Hence the second "+" sign. As indicated by the contents of the search/quality cell, a number of alliances have already been formed around this strong supplementarity relationship.

A "?" sign in a cell is indicative of a *potential* alliance, while a "-" sign signifies that we do not expect to encounter a direct alliance between the intermediaries corresponding to that cell. The absence of examples in the cells (marked "?") may simply be a reflection of the early stage of development of these functions relative to others. Cells with a low affinity index (-/-) might eventually be populated due to the compounding effect (or the supplementary nature) of such functions. For instance, *search* and *payment & settlement* might not exhibit direct affinity (see matrix); however, *search* has a strong supplementarity with *representation*, which in turn has a supplementarity relationship with *payment & settlement*. Hence *search* may be indirectly affiliated to *payment & settlement* (e.g., the alliance between Yahoo and Visa.)

The matrix helps highlight supplementary functions for e-commerce and can be used to guide the direction of cooperative arrangements among existing Web-based intermediaries. By highlighting supplementary functionalities, the affinity matrix sensitizes specialized Web-based intermediaries and investors to the potential value of cooperative arrangements.

Figure 2. The Affinity Matrix for Web-based Intermediaries

	Commm.	Search	Represen	Promotion	Payment & Settlement	Quality	Customer Info.	Valuation
Valuation								Auction Net, Auction Web, OnSale, First Auction
Customer Information							Media Metrix, Net Ratings, Relevant-Knowledge	? (-/+)
Quality						ABC Interact., Net Shepherd, SafeSurf, PICS, VCR	? (+/+)	? (-/+)
Payment & Settlement					Visa, MC, Cybercash, DigiCash	— (-/-)	? (+/-)	? (-/+)
Promotion				Net Gravity, Action-Ads, Pointcast, Double Click.	VISA + Pointcast, Cybercash + Net Gravity (-/+)	Net Shepherd + Double Click (+/+)	? (+/-)	Onsale + Pointcast, Onsale + Wired Digital (-/+)
Representation			Amazon.com, CarPoint, Autoweb Netscape AOL	? (+/+)	Netscape + Cybercash; Cybercash +AOL (+/-)	Internet Explorer + Net Shepherd (+/+)	? (+/-)	Onsale + Net Buyer, Onsale + AOL (+/+)
Search		Altavista, InfoSeek, Lycos, Yahoo, Excite Inc.	Yahoo + Autoweb, Yahoo + CarPoint (+/+)	Altavista + DoubleClick, Yahoo + ABVS Interact. (-/+)	Yahoo + VISA (-/-)	Yahoo + ABC Interact., Altavista + Net Shepherd (+/+)	AOL Net Find + Altavista (+/-)	Onsale + HotBot (-/+)
Communication.	DejaNews, Inc. Audio Net, U.S.Email, Juno.	Yahoo + Audio Net (-/-)	— (-/-)	Pointcast + Juno (-/+)	— (-/-)	— (-/-)	Juno + Market Facts (-/+)	Onsale + DejaNews, Inc. (-/+)

Summary and Conclusions

The needs of electronic commerce extend far beyond those of just information dissemination and retrieval. To cope with the ever increasing complexities of the information economy, Web-based intermediaries will fulfill a wide range of functionalities. In this paper, we provide a classification of these func-tionalities and identify emerging relationships among intermediaries belonging to different classes. The "affinity matrix" serves as a useful tool for examining the relationships that exist among the intermediary functionalities and provides a platform for studying these emergent structures in the information economy.

Here, we can offer only the beginnings of our research on the emergent structure of the information economy. In addition to the functional synergies that we have examined in this paper, many other factors determine the likelihood of alliances between Web inter-mediaries. These factors include issues of market size, technology platform, and the ambitions of the firms' leaders. We hope to unravel other interesting phenomena in future work.

References

References are available upon request.