A Conceptual Investigation of the E-commerce Industry

Classifying structures for providing products and services in the electronic marketplace.

Electronic commerce, or activities that directly support commerce by means of electronic (networked) connections, is redefining the very foundations of competitiveness in terms of information content and information delivery mechanisms. Flows of information over international networks have created an electronic marketspace [8] of firms that are learning to exploit business opportunities. Those that embrace e-commerce are predicted to succeed and those that do not are expected to fail [6, 10].

Little, however, is understood about the structure of the e-commerce industry. To compete effectively, firms need a useful classification scheme for the e-commerce market, its products and services.

The e-commerce industry is comprised of a variety of products and services, including: hardware components (routers, firewalls, digital switches, servers, and workstations); software products (HTML editors, Java development environments, EDI applications, network user interfaces, browsers, groupware, middleware, and so forth); network elements (wireless, cable, and satellite networks, and Web-based telephony); and other transmission network services (the Internet and virtual private VANs). Other critical components

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include intellectual services, systems integration, and consulting. Moreover, the industry requires mechanisms for managing the Internet and dealing with overriding public policy concerns such as universal access, privacy, encryption, and information pricing. Finally, there are also issues of technical standards and compatibility across networks.

One way of conceptualizing the e-commerce industry is to think of it as a traditional supply-demand process. The “players” are broadly classified as e-commerce suppliers—providers of technological infrastructure and of intermediary services—and users who consume the technologies and services to reach other users [11]. Suppliers are responsible for providing: the technology (networks, routers, Internet access, Web servers, and security firewalls); the design, installation, and maintenance of e-commerce content (for example, Web site management, digital currency back-up, and validation of transactions); and intermediary services (processing electronic bill payments, value-added Web searches, electronic invoicing, and so forth).

Understanding the E-commerce Industry

In order to assess the current composition of the e-commerce industry, a validation study of e-commerce industry providers and products was conducted. Such a classification is useful for both e-commerce providers and users. It allows managers to focus on smaller, more integral units for purposes of technology forecasting, trend analysis, planning and strategizing. Moreover, it allows providers to better understand the competitive and cooperative dynamics of their industry as well as the marketplace. Furthermore, an empirically derived classification of the industry allows researchers to study phenomena that are more similar in strategy and customer perception.

To explore the intricacies of how a market functions, industries are often divided into segments. Standard industrial classification (SIC) codes are one of the best-known industry classification schemes [5]. The industry classification proposed for e-commerce is being carried out in the same spirit: the e-commerce industry will be characterized by substructures or units that share certain characteristics.

Several models of e-commerce have focused on the technology necessary for e-commerce [1, 3, 4, 12]. Unfortunately, none of the models makes an explicit attempt to classify the e-commerce industry in the same manner as the SIC codes. Nor, given a lack of empirical validation, do the models provide a ready basis for predicting how the e-commerce industry can or will develop.

To identify classes of the e-commerce industry, the research team used Q-sorting. Participants were asked to sort a set of cards with descriptive items related to the industry into short stacks based on perceived similarities among the items [2]. The descriptive items are termed e-commerce objects, that is, groups or organizations that offer products or services that are of value to e-commerce users.

Consistent with other studies [9], the sorting exercise was carried out in three phases. In the first phase, researchers examined the trade literature and searched the Web to identify salient and representative EC objects. From this, 61 e-commerce objects were created (see Table 1), which were transferred to index

### Table 1. Sample of e-commerce objects created for Q-sort task.

<table>
<thead>
<tr>
<th>E-Commerce Object</th>
<th>Definition</th>
<th>Example</th>
<th>URL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Digital Money Hardware Manufacturers</td>
<td>Organizations that manufacturer hardware that provides digital cash, tokens, or other monetary forms.</td>
<td>Mastercard</td>
<td><a href="http://www.mastercard.com/newways">www.mastercard.com/newways</a></td>
</tr>
<tr>
<td>“Electronic Community” Service Providers</td>
<td>Organizations that provide services to their subscribers which allow them to interact with and teach others, engage in discussions, and create common-interest resource Web pages.</td>
<td>Prodigy Chat, Tripod</td>
<td><a href="http://www.tripod.com">www.tripod.com</a></td>
</tr>
</tbody>
</table>

### Table 2. Sample object pairings for data analysis.

<table>
<thead>
<tr>
<th>Object number</th>
<th>occurred</th>
<th>times with object #1 occurred</th>
<th>times with object #2 occurred</th>
<th>times with object #3 occurred</th>
<th>times with object #5 occurred</th>
<th>times with object #6 occurred</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>14</td>
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<td>1</td>
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</tr>
</tbody>
</table>

### Table 3. Industry classes in the exploratory study.

1. Network access services
2. E-commerce-related hardware manufacturing
3. E-commerce management
4. Electronic billing and payment services
5. Electronic billing and payment software
6. E-commerce security
7. E-commerce infrastructure design, installation, and maintenance
8. Server and network administration software
9. Software for e-commerce content delivery and presentation
10. E-commerce publishing software

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cards. The initial list of products and services reflected what e-commerce providers thought to be representative, mutually exclusive, and exhaustive at the time.

During phase 2, categories were created that could conceptually contain a number of the descriptive items related to the industry. Forty academics studying e-commerce, client/server computing, telecommunications, and networking participated. Participants sorted the objects into a self-determined number of categories based on perceived similarities among these objects [7]. The frequencies of pairings of the objects were then analyzed to determine how often each object was placed into a category with others. For example, Table 2 depicts how object #4 was paired 14 times with object #1, once with object #2, and so forth.

To derive industry classes, frequencies of pairings among objects were analyzed. More than 50% of the participants classifying two objects together was used as a heuristic to form a preliminary class. For each object (#4 in Table 2, for example), all other objects with a pairing frequency greater than or equal to 50% were pooled together into one category.

Seven categories out of a total of eight clearly repeated. The cut-off pairing frequency for the eighth group was raised to a higher required frequency of pairings in order to identify more clearly which objects belonged together. As a result, three additional categories were created for a total of 10. Each group was labeled according to “themes” that repeated among the objects in each group. The resulting categories are shown in Table 3.

During phase 3, participants were asked to sort e-commerce objects into the 10 prespecified classes shown in Table 2. Participants were told, however, that they need not force fit objects and could have a separate group of unclassifiable objects.

The objective was to create classes of providers as perceived by users of the products and services rather than technological classes. Thus, classes reflect not how provider insiders viewed the structure of their own industry, but how informed outsiders viewed it. Since the goal was to obtain an external view of the industry, participants were chosen on the basis of their role as users of e-commerce, their role in their organizations, and their knowledge of the industry.

Organizations with a significant e-commerce initiative under way were selected. Within these large, medium, and small organizations in several regions of the U.S., managers in charge of the initiative were solicited. Fifty-five strategists and technologists representing a variety of organizational types participated. Table 4 shows the wide diversity in the sample. Nearly one-third of the participants represented firms whose annual revenues exceeded $1 billion or were Fortune 500 companies.

**E-commerce Industry Classes**

The results of empirical testing were industry subgroupings termed e-commerce industry classes, which describe roles and players in the industry.

Figure 1 gives an overview of the findings by placing the classes within the context of an industry value chain. Consumers are portrayed as users of “client-side” software and hardware. Businesses offering their
Some of the classified objects were a number of completely expected results, and others were some major surprises. It was anticipated, for example, that server hardware would be categorized by the majority of participants in the hardware manufacturing class—86% of the participants did, indeed, classify it as such. But other objects were put in classes not posited during the exploratory phase. For instance, the Visa and MasterCard SET (Secure Electronic Transaction) standards object was predicted to belong to an e-commerce management segment. However, 68% of the participants in the confirmatory phase chose to categorize it in the e-commerce security class. The results are summarized in Table 5.

**Class 1: Network access services providers.** In the network access services class, e-commerce objects were categorized as predicted. Common carriers such as AT&T and British Telecom were perceived as being...
in the same industry group as ISPs and cable companies. Interestingly, value-added services involved in creating electronic communities also appeared.

**Class 2: E-commerce-related hardware manufacturers.** The e-commerce hardware industry sub-sector is the most clearly defined part of the industry. With an average consensus level of 83%, this area had the highest overall agreement about constituency. Products such as PC hardware and server hardware were seen as being closely related. Even hardware specifically designed to support electronic billing and payment was perceived as being primarily a hardware product. Only 4 of the original posited 10 e-commerce hardware objects were retained. Six that were predicted to be associated with specific electronic billing/paying areas of e-commerce, such as “digital, money-oriented hardware,” were classified as plain hardware by participants.

**Class 3: E-commerce management providers.** The lack of a cohesive set of beliefs about how the Internet and e-commerce should be managed is likely reflected in the few objects that remained in this class (8 e-commerce objects posited; 2 retained). This class showed more changes during the confirmatory phase than any other. It was expected that many of the standards bodies (other than the communication protocols standards bodies that was retained) would be associated with managing the development of e-commerce, but apparently the participants did not feel this way. Management groups intended purely for governance, groups such as the Internet Society, would likely fit into this segment. Curiously, groups interested in privacy issues were thought to be more closely related to e-commerce security by participants.

**Class 4: E-commerce payment/billing services providers.** Banks and information providers of various types were categorized into this class, as predicted (4 e-commerce objects posited; 4 retained). This class obviously includes major new intermediaries of e-commerce. Large and/or first mover banks, as well as credit card companies, will likely be competing for business in this industry class.

**Class 5: E-commerce payment/billing software providers.** This class also came out nearly as predicted (6 e-commerce objects posited; 5 retained). Participants viewed this type of software as being distinct from the class that services invoicing and payment portions of the value chain.

**Class 6: E-commerce security providers.** Originally, this class was expected to have only 6 objects. In the final analysis, however, 5 of those predicted were retained and another 4 were selected by participants from other exploratory classes, yielding a total of 9 objects. Participants chose to bundle anything related to asset protection, privacy, and security standards into this critical segment. Like the e-commerce hardware class, security involved an expansive set of activities, but one clearly organized around the central theme of security.

**Class 7: E-commerce designers/installers.** This is a purely service class that factored out exactly as anticipated in the exploratory work (6 e-commerce objects posited; 6 retained). Installation, maintenance, and design of Web-based and EDI products are at the heart of this part of the industry. The major systems integrators are likely to be in fierce competition with each other.

**Class 8: Server-side software providers.** This class was very restricted, with only 2 of the original 5 objects retained. Except for software for network operating systems or administrative support and software that clearly ran only on the server itself, no other server software fulfilled the criteria for this group. Notably, server applications such as email were not categorized in this class. Opinions were divided enough so that human communication software was not viewed as a client-side application either, with the final result being an unclassified e-commerce object “Organizations that build software for person-to-person communication.”

**Class 9: Client-side software providers.** This class underwent a great deal of transformation. Browsers and other server-client software were seen in a pragmatic, rather than technical, light by the participants. Technically, browsers interface network, server, and client processes, but participants chose to view them as client-side applications. A number of the other objects in this category underwent the same conversion, including Webcasting software and information retrieval/search software. Of the 4 objects predicted for this segment, all 4 were retained, but another 3 were added.

**Class 10: Web integrating software providers.** This class was more limited than expected (9 e-commerce objects posited; 2 retained). Participants did not choose to include backend software such as Cold Fusion, nor did they consider Webcasting or browsing software as belonging to this class, as originally expected. The category is strictly limited to software that allows one to convert documents, images, or multimedia to Web pages. Several of the objects predicted for this class moved to client-side applications.

**Opportunities and Challenges for Each Industry Class**

Several objects were not readily categorized by participants. Where software technically resides was much less critical to participants than where infor-
national results were delivered. Participants were inclined to categorize all Web applications that delivered information directly to the client as client-side applications, regardless of where these applications actually resided. Information retrieval applications such as Digital’s AltaVista search engine and PointCast’s Marimba were categorized by half of the participants as client-side software even though the software actually resides on the server side of the exchange. Software that integrates Web content for Web applications, such as browsers, was also considered a client-side tool.

Classifying other applications that utilize both servers and clients for their full functionality also proved to be distributed. The object for development of extranet software, for example, was almost evenly distributed between server, client, and Web design categories.

There could be important competitive implications underlying this finding. The server-side industry class is limited to server operating/communication systems and administrative support software. As articulated by one participant, software that resides on servers but presents its “face to the client” is perceived to be client-side software. Participants were likewise not generally sensitive to the distinction between software that converted content for Web use that happened to reside on the client and other client applications. In sum, user practitioners appear to apply a broad definition of Web client-side applications. Firms that now perceive themselves as being noncompetitors may, in fact, be competing in the eyes of their customers.

Managerial Implications

There are a number of important implications for both the supply and demand sides of e-commerce:

- Software for e-commerce billing and payment is distinct from traditional software for invoicing and payment.
- The e-commerce payment/billing class includes both banks and other types of information providers and will likely support major new intermediaries.
- There is a large security class, which includes all computer asset protection, privacy, and standards issues.
- The Web-integrating software industry class is restricted to software for converting documents, images, or multimedia to Web pages.
- Browsers, information retrieval and search engines are viewed as client-side applications.
- The server-side software class is very limited, including only network operating systems, administrative support software and software that runs solely on the server.
- The designer and installer class includes organizations that install corporate intranets, network hardware and software, maintain internet and Web technologies, and so forth. This class is likely to be a most competitive segment.
- E-commerce management is a class about which there is little agreement; this may reflect the present, generally chaotic state of the Internet.
- The e-commerce hardware class is the most clearly delineated segment.
- The network access services class includes com-
mon carriers as well as value-added services. Users see these services as competing for the same market.

**Conclusion**

E-commerce is a dynamic, quickly changing phenomenon. In such an environment, managers need to quickly assess where the industry is headed and learn how to compete, form strategic alliances, and create and dissolve virtual organizations. Information about how to segment this emergent industry should serve as a useful classification scheme for providers of e-commerce products and services.

**REFERENCES**


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