



A structural analysis of business-to-business digital markets[☆]

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Received 30 April 2000; received in revised form 27 November 2000; accepted 13 March 2001

Abstract

Digital markets allow sellers and buyers to conduct transactions electronically and are becoming major driving forces in business-to-business e-commerce. This article explores the theoretical and managerial foundations of digital markets. This study first investigates the structure and components of digital markets. A comprehensive sample of 196 digital markets is then examined to uncover the structural dimensions and success factors of digital markets. The findings of this study provide important managerial insights into various issues that are pertinent to the functioning of digital markets, such as how the nature of founding companies may affect the dominant function chosen for a digital market and what factors may affect the market-making mechanisms used by the digital markets. © 2001 Elsevier Science Inc. All rights reserved.

Keywords: B2B; E-commerce; Digital exchanges; Vertical hubs; Functional hubs

1. Introduction

Electronic commerce (or e-commerce) represents a new way of conducting business transactions, including buying, selling, or exchanging products, services, and information, usually through communications networks such as the Internet, intranet, and extranet. According to Kalakota and Whinston [1], e-commerce provides the business world with the following functions: electronic delivery of information, products, services, or payments; automation of business transactions and work flow; reduction in service costs while improving the quality of goods and increasing the speed of service delivery; and use of online services. E-commerce is rapidly reshaping the marketing domain and many of its traditional practices, such as business-to-business transactions [2].

E-commerce can be classified by the nature of business transactions, including business-to-business (B2B), business-to-consumer (B2C), consumer-to-consumer (C2C), consumer-to-business (C2B), and intraorganizational

e-commerce. Among them, B2C and B2B e-commerce have attracted the most attention so far. B2B e-commerce reflects that both sellers and buyers are business corporations. B2C e-commerce, however, reflects that buyers are individual consumers.

Although B2C e-commerce and its glamorous high fliers (such as Amazon.com) often capture the media headlines, B2B e-commerce actually enjoys the biggest slice of e-commerce pie and has been growing rapidly during the past 1 or 2 years [3]. According to the forecast by Forrester Research, B2B e-commerce transactions in the U.S. will total US\$2.7 trillion by 2004. The B2B side of e-commerce is seen as more lucrative than B2C e-commerce because it is 10 times larger than the retail market and business consumers are generally less fickle than retail consumers [4].

A conspicuous occurrence in B2B e-commerce is the rapid development of digital markets. A digital market is an online business transaction platform for buyers and sellers. The new business models in digital markets include auctions, aggregators, bid systems, and exchanges [5]. Forrester Research estimates that by 2004, digital markets will capture 53% of all online business trade.

B2B e-commerce is restructuring the global business pattern. As indicated by Gartner Group, by 2000, the US will no longer be the dominant B2B e-commerce player in the world. North America accounted for 63% of the B2B digital market in 1999. However, Europe is investing

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heavily in the B2B digital market and North America's share of the B2B market will drop to 40% by 2004. The growth of B2B e-commerce in Asia and the Pacific will also be significant in the near future. As Gartner Group pointed out, B2B e-commerce will be truly worldwide by then [6].

B2B e-commerce covers a broad range of applications that allows companies to form electronic relationships with their distributors, resellers, suppliers, and other partners. The Internet allows B2B e-commerce players to link their companies to the digital market easily and inexpensively. B2B also facilitates supply chain management. Supply chain management involves the coordination of order generation, order taking, and order fulfillment/distribution of products, services, or information [1].

Electronic payment is a financial exchange that takes place online between buyers and sellers. A successful digital market possesses the capability for electronic payment, thus reducing operational and processing costs, decreasing technology costs, and speeding up completion of transactions.

B2B e-commerce also can play an important role in procurement management for purchasing companies. They can reduce purchase prices and cycle time by taking advantage of the digital market's liquidity and transparency [7]. Purchasing companies can eliminate redundant steps from the buying processes through streamlined electronic workflow.

A digital market typically offers a wide variety of supplementary services as needed by the trading members, such as authenticating buyers and sellers and streamlining procurement workflow; electronic payment services, risk management, contractual and settlement services; conflict resolution and legal services; and logistics services. Therefore, a capable B2B digital market could lower purchasing costs, reduce inventory and warehouse costs, enhance the efficiency of logistics and procurement, lower marketing cost, and increase sales in the market.

This article provides a structural analysis of the B2B digital markets. A structural analysis allows marketing researchers and practitioners to uncover the underlying dimensions, structure, and various characteristics of the subject. The purposes of this research are fourfold: identify the types of existing B2B digital markets, investigate the key characteristics of current digital markets, identify successful factors of running B2B digital markets, and assist start-up companies' investment decision making on participating digital markets. The article first identifies various business models in e-commerce, including B2C- and B2B-based business models. The objectives, design, and findings of structural analysis on 196 digital markets are presented in the later sections. Management implications and conclusions are given in Section 8.

2. Business models in e-commerce

Business models for e-commerce are classified into three categories by Jutla et al. [8,9]: the e-broker or cybermediary

model, the manufacturer model, and the auction model. The cybermediary or e-broker model is characterized by use of an intermediary between suppliers of goods and/or services and the customer. The intermediary or cybermediary adds value to its online supplier sites, either by marketing a large range of similar products from one site, enabling comparison shopping, or facilitating coalition industries that provide multiple company listings. This model can support the sourcing of a product or service from many suppliers and may provide customers with more products/service choices, better delivery terms, or bulk discounts [8,9]. Companies such as Amazon.com and 1-800-FLOWERS belong to the cybermediary model. The cybermediary model has several advantages. It reduces the inventory management overhead, in terms of staffing and space, and it reduces capital tied in inventory. Most importantly, it provides expertise (such as marketing and delivery) across the supply chain from manufacturers to customers. Cybermediary companies are marketing specialists that provide services to reduce the market prices of products/services.

The manufacturer model, unlike the cybermediary model where the finished good is bought from suppliers and resold, indicates that the manufacturer creates value-added products through its internal manufacturing processes. This model works best for organizations with configurable products, mature marketing staff, and sophisticated customer service processes. Established businesses such as car and computer product manufacturers fit this model; Dell, Cisco, and General Electric (GE) are examples of companies that pursue this business model [9].

The auction model, or the Internet exchange model, allows buyers to set the price of the product by soliciting bids and determining the willingness of suppliers to sell at the bidding price. Many auction sites charge suppliers a small fee when a sale is made and also may charge a fee for a listing of goods for sale at their sites. Buyers, however, are not charged any fees. Businesses that use this model need large customer bases in order to make profits [9]. Companies such as priceline.com and eBay.com are examples of companies that pursue this business model.

The above three models that involve customers and product/service suppliers or manufacturers are also called "industry hubs" [7]. They are two-way networks that deal directly with buyers and create benefits mostly for sellers. The value created by industry hubs tends to increase *linearly* in the number of buyers. However, the value created by B2B hubs increases as does the *square* of the number of participants [7]. Because of their importance in B2B e-commerce, we need to closely examine the business models associated with B2B digital markets.

2.1. B2B e-commerce model

The B2B e-commerce model can be classified by the market's operators, including supplier, customer, and intermediary [10]. Most of the manufacturer-driven electronic

stores (such as Dell and Intel) belong to the supplier-oriented business model. Big buyers such as GE and Wal-Mart, which open their own digital markets for potential suppliers to bid on the announced RFPs, are examples of the buyer-oriented business model. The third business model is the electronic intermediary market where business buyers and sellers can meet and conduct businesses.

Other business models include virtual corporations, networking between headquarters and subsidiaries, and online services to businesses [10]. A virtual corporation is an organization that consists of several business partners sharing costs and resources for the purpose of producing a product or service. The B2B e-commerce infrastructure can facilitate the communication and collaboration between headquarters and subsidiaries or franchiser and franchisee by providing intranet-type online messaging and services within a corporation. There are specific online services available for businesses, including travel services, electronic payments and banking, online stock trading, online auction to business bidders, online publishing and education, etc.

Business networks influence B2B digital markets as well. In each industry, large companies are forming digital market alliances and soliciting their suppliers to join their preferred hub or digital market. Each business that joins a digital market presumably brings along dozens of suppliers [11].

2.2. Vertical and functional hubs

A hub is a contextual digital market and can focus on a specific dimension of it [7]. It can specialize vertically along a specific industry, or horizontally along a specific function or business process. Based on these dimensions, hubs boil down to two primary types: vertical and functional. Together, they form the domain of digital markets in B2B e-commerce [7].

2.3. Vertical hubs

Vertical hubs serve a vertical digital market or are industry-focused. Vertical hubs usually serve the industry by automating and hosting corporate procurement processes and taking care of other industry-specific needs. For example, Altra Energy is a vertical hub for the energy industry, e-Steel is a hub for the steel industry, and PaperExchange is a hub for the paper industry.

A vertical hub can be created by buyers themselves or by a service-specific intermediary. For example, IBM declared itself a one-company digital market and welcomed its suppliers into an Ariba/i2/IBM-powered digital market. Wal-Mart relied on its gigantic retailing chain to establish its own digital market for suppliers. General Motors, Ford Motor, and DaimlerChrysler announced their partnership to form an automotive industry digital market for their suppliers, which is supported by Commerce One and Oracle Technology. The service-specific intermediaries are highly

specialized. Most digital markets offer one-stop shopping for their products and services.

Corporations' procurement officers and larger buyers are the leading players in vertical digital markets. They use the liquidity and transparency of digital markets to reduce shopping costs and time. Success of a vertical digital market may rely on the following attributes [7]: (1) greater fragmentation among buyers and sellers; (2) greater inefficiency in the existing supply chain; (3) creating critical mass of key suppliers and buyers; (4) increasing domain knowledge and industry relationships; (5) creating master catalogs and sophisticated searching; and (6) adjacent vertical digital markets for leveraging existing suppliers or buyer bases.

2.4. Functional hubs

Functional hubs focus on providing the same functions or automating the same business process across different industries. The expertise of a functional hub provider may suit a specific business process across vertical digital markets. Possible business processes sponsored by functional hubs are procurement assistance, logistics monitoring and tracking services, project management, human resource management, credit checking and electronic payment services, and others. For example, Celarix is a functional hub for global logistics monitoring and tracking services, BidCom is a digital market for project management, and YOUilities is a digital market for energy management.

Success of a functional digital market may rely on the following attributes [7]: (1) increasing degree of process standardization; (2) increasing process knowledge and workflow automation expertise; (3) complementing process automation with deep content; and (4) increasing the ability to customize the business processes to respond to industry-specific differences.

3. Structural analysis of B2B digital markets

Our structural analysis focuses on the formation, classification, and functional attributes selection of B2B digital markets. The main purposes include identifying different types of B2B digital markets, investigating key characteristics of digital markets, pinpointing successful factors of running B2B digital markets, and assisting companies to select the right B2B digital markets.

B2B digital markets can employ a variety of market-making mechanisms to mediate transactions between participants. These mechanisms can be either a fixed-price model (such as catalog purchasing) or dynamic pricing models (such as auctions, exchanges, or barter) [7]. First, a fixed-price model, such as catalog purchasing, creates value by aggregating suppliers and buyers. It works best in industries characterized by fragmented buyers and sellers

who transact frequently for relatively small items. This model also works well when most purchasings take place with prequalified suppliers and with predefined business rules, where demand is predictable and prices do not fluctuate frequently [7].

Auction models, another market-making mechanism, create value by spatially matching buyers and sellers. These models work best in industries or settings where nonstandard or perishable products or services need to be bought or sold among businesses that have very different perceptions of value for the product. For example, capital equipment, used products, unsaleable returned products, and hard-to-find products fit this digital market [7].

Exchange models create value by temporally matching supply and demand. They require a real-time, bid–ask matching process, market-wide price determination, as well as a settlement and clearing mechanism. Exchanges create value in markets where demand and prices are volatile by allowing businesses to manage excess supply and peak-load demand [7].

Finally, barter models create value by matching two parties with reciprocal assets within an asset class or across asset classes. Barter has traditionally been used to minimize currency risk in inflationary economies with shortages of hard currency [7].

A digital market can offer more than one market-making mechanism. Customers may choose the appropriate market-making mechanism to participate. It is important for the company to identify a suitable market-making mechanism. For this purpose, we identify a framework with three for companies to determine the best market mechanism to use in a digital market.

3.1. Customer identification

Customers play many different roles in B2B digital markets, including end users, influencers, decision makers, buyers, and maintainers [11]. Identifying the right customer group should be the highest priority for sellers in the digit market. Digital markets possess various difficulties for sellers to locate the right buyers. For instance, “consumers” are automatically identified in extranets (e.g., Wal-Mart is the default customer for the thousands of suppliers linked to its extranet). While sellers may move less aggressively in an auction digital market (i.e., customers come and bid), they have to work much harder in a digital market where sellers have to proactively search for their buyers.

3.2. Market reach

The market reach for a seller in a digital market depends on the market-making mechanism of the digital market. While the seller can only reach a limited number of buyers in its extranet, it can reach a much broader set of potential

buyers in the open digital markets either with the “auction” format or the “marketplace” format.

3.3. Competitive intensity

Companies that intend to move into the digital market need to survey the market and identify their current competitors. Determining the ways that competitors compete, especially with e-commerce initiatives and new products, is vital to a new company’s success. In a company’s extranet, competition among sellers may be less because the access of this network is limited to approved suppliers only. On the other hand, competition on open digital markets (with either format) can be quite intensive since potential sellers may come from anywhere in the world to join the network with low entry barriers.

3.4. Formation of digital markets

Based on the above analysis of three critical dimensions of digital markets, we propose a conceptual framework that delineates the formation of three types of digital markets (see Fig. 1).

When market competition is low, it is not difficult to find (and identify) desired customers, and companies are not eager to broaden their market reach; they can just utilize extranets for digital transactions and communications. Implementing a corporate extranet improves its external communications with customers, suppliers, and collaborators [12]. Using an extranet is an effective way of decreasing corporate overhead and increasing revenue, thus increasing business profits.

When the digital market becomes competitive and desired customer groups are not difficult to identify, corporate extranets would lose their advantage to auction-based

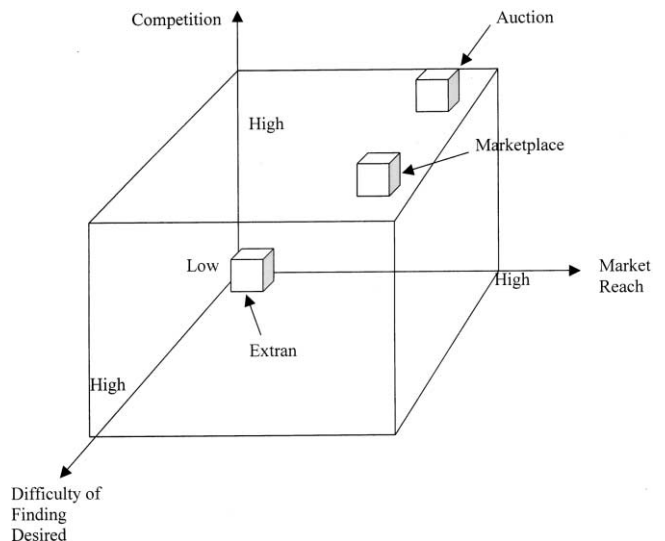


Fig. 1. Formation of digital markets.

digital markets because they are able to reach more customers cost-effectively. Many auction sites charge suppliers a fee for sales at their sites. Companies that use the auction model need a large customer base in order to make a profit.

Finally, when the digital market is competitive, it is difficult to find the right customers and the desired market reach is high — participating at a digital marketplace will be the best choice. Digital marketplace refers to a portal that primarily serves as a platform or broker for buyers and sellers to quickly locate each other. This marketplace will generally provide additional value-added services to facilitate transactions.

4. Study objectives

The emergence of digital markets as a vibrant business model in B2B e-commerce presents many challenges to researchers. First, their proliferation within the past 1 or 2 years makes it almost impossible for researchers to track them. Further, the scale and scope of digital markets are unrivaled in the traditional B2B domain; thus, many traditional practices may not apply any more. As very little empirical research on digital markets is available, business professionals are in desperate need to acquire knowledge to help them grasp this new phenomenon. A number of intriguing questions about these digital markets need to be answered. For instance, what are the key characteristics of digital markets? Are there different types of digital markets and how can firms utilize them differently? Why are some digital markets choosing the “auction” format while others are choosing the “marketplace” format? Do start-up companies have an edge over industry insiders in setting up digital markets?

Clearly, answers to these questions will help business professionals understand the functioning of digital markets and decide which type of digital market they would use in the future.

5. Research questions

Our research questions are related to the formation and functioning of digital markets. Specifically, we closely examine the following questions using a combination of quantitative and qualitative analysis techniques:

1. Which industries have the biggest number of industry portals?
2. Which common business tasks or processes are pursued by functional hubs?
3. What factors may propel a digital market to choose “auction” as the major form of business transaction?
4. What factors may propel a digital market to choose “marketplace” as the major form of business transaction?

In addition to providing empirical answers to the above questions, we also plan to test two research hypotheses concerning (1): whether a “start-up” or “industry insider” may choose to pursue a particular type of digital market, and (2) whether a “start-up” or “industry insider” may choose to take on a specific market-making function.

As vertical hubs require significant domain knowledge and strong relationships with a specific industry [7], we posit that industry insiders are more likely to pursue industry-specific vertical hubs than start-up companies that may not possess deep domain expertise. On the other hand, functional hubs require knowledge of the standardized process across different industries, (e.g., the process of managing used capital equipment). Reduced reliance on expertise in a particular industry provides more room for entrepreneurs to maneuver the virtual landscape across a variety of industries even though they may not be the experts on all areas. In addition, the start-ups may reasonably assume that competitor’s reactions may be more intense if the start-ups plan to establish industry-specific vertical hubs since existing industry players may view this as outsiders encroaching on their turf. Hence, start-up companies may favor functional hubs since they offer a relatively fair playing ground and less competitive risk. Thus we reach the following hypothesis:

Hypothesis 1: Compared to industry insiders, start-up companies are more likely to favor functional hubs than vertical hubs.

In addition to affecting the choice of digital market types, the founder of the digital market (either industry insider or start-up) may also have a bearing on which type of market-making functions the digital market employs.

Among the three hub functions of digital markets described in the NetB2B directory, *information* and *auction* are not entirely novel to B2B e-commerce since they have been widely used in traditional B2B marketing. Industry information has been traditionally provided by trade associations or industry intelligence publishers. Auctions have a long tradition of usage in a variety of industries, such as agricultural products, used equipment, and automobiles [13]. The establishment of digital markets in the cyberspace simply extends the reach of the *auction* market and enhances the delivery of *information*.

On the other hand, *digital marketplaces*, with their complicated transactions actively brokered among diverse sellers and buyers in real time, have virtually no exact equivalents in the brick-and-mortar world. Clearly, this is an innovative business model rooted in cutting-edge e-commerce technology and infrastructure. Therefore, we expect this innovative B2B e-commerce model to significantly stimulate entrepreneurial spirits and to generate excitement for start-up companies. In addition, start-up companies that challenge the status quo of B2B marketing practices often take on a drastically different e-commerce model that may signal their aggressiveness to shift the

rules of competition [14]. Such attempts to strategically differentiate a company can often mean the creation of new services that may have never been provided before [15]. As the digital marketplace model requires quick assimilation of the relevant technology and business concepts, it is something that cannot be quickly imitated by industry insiders. In addition, start-ups, because of their lack of organizational resistance from the brick-and-mortar mindset, may be able to move on to such innovative models much quickly. By choosing to work on a digital market-making model and using technology that requires a steeper learning curve, start-ups may leapfrog the industry insiders and establish a first mover advantage that may be difficult to be established by other two easier-to-imitate market-marking mechanisms (i.e., information and auction). Thus, we reach the second hypothesis:

Hypothesis 2: Start-up companies are more likely to engage in digital marketplaces than in auctions or information dissemination.

6. Study design

In this empirical study, we used the *B2B Portal Directory*, a comprehensive sample of digital B2B markets provided by *BtoB* [16], a newly launched publication on B2B e-commerce by the venerable *Advertising Age*, a preeminent source of marketing and advertising information for over 65 years. The sample contains a total of 196 digital markets that span 51 different industries, from food services to printing. All of the digital markets in this list have been functional for a year or more. Thus, these real world digital markets possess significantly more experiences than other recently announced and highly hyped digital markets, such as the Auto Exchange Hub proposed by DaimlerChrysler, Ford, and GM, which may still be months away from actual operation.

This list of current US B2B digital markets is a well-regarded source of B2B information for our empirical study. By examining this set of diverse digital markets, we can gain a better understanding of newly developed B2B digital marketplaces and uncover managerial implications to B2B e-commerce professionals.

6.1. Data collection

The *B2B Portal Directory* provides the following information about each industry portal (or digital market): (1) name and URL; (2) industry to which it belongs; (3) major function of the portal; and (4) brief description of its operation. The directory classifies portals into the following three categories:

- **Information/Resource:** This is a digital market that strives to provide the most comprehensive information about an industry (e.g., autolink.com for information

about the auto industry) or a common business function (e.g., datagalaxy.com for technical knowledge).

- **Auction:** A digital market with auction as its major function. It will serve primarily as a platform for sellers auctioning off their products to potential buyers.
- **Marketplace/Shop:** This refers to a digital market that primarily serves as a platform or broker for buyers to quickly locate the right sellers and for sellers to reach the right buyers. The portal generally provides additional value-added services (e.g., grading of vendors) to facilitate transactions.

In addition to the information provided in the *B2B Portal Directory*, the authors also visited every listed portal to identify and collect the following information about each site:

- **Vertical Hub or Functional Hub:** A digital market can be classified as either a vertical hub or a functional hub, according to Sawhney and Kaplan [7].
- **A Start-Up Company or an Industry Insider:** A digital market may be created by an existing company within a particular industry or it may be created by Internet-based entrepreneurs. During the past few months, a number of high-profile industry insiders (e.g., Kmart, Target, Safeway) have announced plans to launch their own digital market exchanges [3,17] that may compete with existing exchanges launched by start-up companies. Because there seems to be an inherent tendency for industry insiders to grab a big slice of the e-commerce pie, it will be important to know whether a digital market is set up by a start-up or by an industry insider. We classified the origin of the founding company based on information collected from each digital exchange web site (e.g., from the “About Us” section). The classification was further cross-validated through company information contained in the Lexis–Nexis database.
- **Unique Value Proposition:** The “unique value positioning” of each digital market signifies its unique identity and benefits to the users. To gather such information, we visited each digital market to find out the proposed distinct benefits of using each digital market. To achieve this goal, we located key sentences about the benefits offered by each digital market. Since each web site may arrange their information sections differently or use different headings, we conducted comprehensive searches to all relevant pages of each web site to ensure the identification of the proclaimed “unique value.” In some instances, digit markets explicitly state their unique value to users in the “Benefits” section. In other instances, users of digit markets may learn the unique benefits of each web site through answers to questions listed in a site’s “FAQs” section such as “. . . what are the benefits of using the auctionplace at this web site.” Also, a digital market site may build an entry page for “sellers” and another one for “buyers”, which may

clearly define the benefits of joining the digital market for each user group.

The data collection for identifying “unique value positioning” follows the guidelines in modified “content analysis” [18]. Application of the content analysis technique has long been reported in the advertising and marketing literature [19]. Since the evolution of the World Wide Web as a new communication medium [20], this technique has been used by researchers [21,22,23] as a systematic and objective method for analyzing web sites’ contents.

7. Findings

The findings of our empirical study are discussed in the following sections.

7.1. Industries and number of hubs

A total of 51 distinct industries are identified in the sample of 196 B2B portals. Fig. 2 shows the top 10 industries that currently have large numbers of portals.

In this analysis, we assumed digital markets pursuing the same business tasks as an “industry.” Table 1 shows the number of vertical hubs for each industry.

We found that digital markets which emphasize industrial products make up the biggest category (26). Interestingly, the food industry, which has traditionally been regarded as less technologically savvy, has the second biggest number of digital markets (13), slightly ahead of the next three industries that are commonly regarded as technologically savvy: finance (11), computers (10), and electronics (8). In fact, we speculate that the number of digital markets in an industry may reflect the perceived opportunity for developing a digital market as well as the likelihood of invasion by industry insiders. Therefore, the high number of digital markets in the food industry can be explained as start-up companies perceiving big payoffs and a lack of potential competition from industry insiders (who may be less technologically savvy).

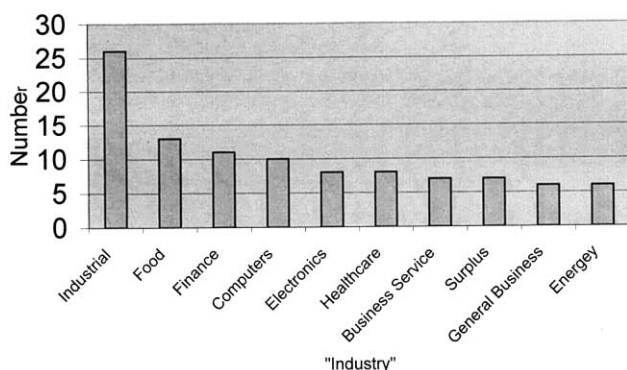


Fig. 2. Top 10 “industries” with the most portals.

Table 1
Functional hubs and their counts

Function type	Count
Procurement	13
Surplus/excess	8
B2B	6
Business services	6
Information	6
Advertising	3
General business	3
Shipping	3
Event planning	3
Licensing	3
Recruiting	3
Assets management	2
Government	2
Marketing	1
Web design	1
Leasing	1
Engineering	1
Raw material	1
Trade	1

On the other hand, the heavy concentration of digital markets in a specific industry may not bode well for the parties involved. Forrester Research predicted that a single industry would ultimately only support a handful of portals [5]. Thus, we could predict that a significant number of shakeouts or mergers may occur because companies that pursue digital markets in the top 10 “hot” categories are likely to be the first to experience such events.

7.2. Types of functional hubs

Sixty-eight out of 196 industry portals in the *B2B Portal Directory* are classified as “functional hubs.” Table 1 shows that 68 functional hubs belong to 19 functional categories. We found that functional hubs that focus on the general procurement aspect of businesses account for the biggest category (13), followed by hubs that specialize in liquidating surplus equipment for businesses (8), hubs that provide business services (6), and hubs that specialize in providing business information (6). A wide variety of functional hubs are found in a diverse spectrum of business functions, including: advertising, general business, shipping, event planning/trade show, licensing, recruiting, asset management, government, marketing, engineering, raw material, leasing, and trade.

While the range of functional hubs found here already covered quite a number of business processes or functions, there are still many other business processes (e.g., negotiation or contracting) and functions (e.g., human resource management) left for future development in corresponding functional hubs. Thus, we expect that in the next few years, more functional hubs will be developed to cater to special business processes or functions that may be needed.

Table 2
Hypothesis testing results using chi-square analysis

Research hypothesis	Statistical null hypothesis	Cross-tabulation			χ^2 statistics	P value	Conclusion
Hypothesis 1: Start-ups are more likely to pursue functional hubs	Company type is independent of market type	Vertical hub	Functional hub		0.93	.34	Accept null; reject Hypothesis 1
		Start-up company	102	26			
		Industry veteran	58	10			
Hypothesis 2: Start-ups are more likely to favor marketplace hub function	Company type is independent of hub function	Auction	Information	Marketplace	11.23	.004	Reject null; accept Hypothesis 2
		Start-up Company	28	33	99		
		Industry Veteran	3	17	16		

7.3. Are start-ups more likely to take on certain type of hubs?

This section discusses whether start-ups are more likely to take on certain types of hubs. Hypothesis 1 states that start-ups are more likely to take on functional hubs because functional hubs do not require deep industry-specific expert-

ise. To test this hypothesis, a chi-square analysis was conducted with the null hypothesis that the creation of this type of digital market (i.e., vertical or functional hub) is independent of the type of company that establishes the digital market (i.e., start-ups or industry insiders).

The chi-square analysis yielded a statistic of 0.93 and a P value of .34, which cannot reject our null hypothesis. The

Table 3
Factors that favor auction format for digital marketplaces

Hub name	Industry or major product types	How the format helps
58k.com	Printing jobs	Low end printing tasks for which the buyers are price sensitive
Auction-it.net	Used/surplus goods	Hard to judge potential demand for such products and set reasonable prices
Assetline.com	Excess inventory	Stir the buying interest of bargain hunters
BLiquid.com		
Businesssurplus.com		
Camelot (also auctions new items)		
ComAuction		
Dovebid		
Ironmall.com		
Kitchenstuff.com (also new)		
Major international (wholesale apparel)		
Tradeo.com		
Tradeout.com		
Usbid.com		
Asset Exchange	Tax liens, municipalities	Common government practice for selling such items
Assetline.com	Construction equipment	Big ticket capital items
Ironmall.com		
Digibid.com	Special items	Special music equipment for the entertainment industry; not many vendors; scattered buyers
EcFood.com	Perishable items	Items need to move fast along the supply chain
Globalfoodexchange.com		
Poultryfirst.com		
Freemarkets.com	Raw material/commodities/	Common format for selling commodities; compete purely on price
MaterialNet	utilities/	
New York Nuclear	standard components	
Paperdeals.com		
Suppliermarket.com		
Farm.com		
Miniauction.com	Municipal bonds	Seller uncertain about potential market demand and degree of price sensitivity
Adauction.com	Advertising space	
PackagingExchange	Packaging products	As an option for hard-to-assess value products
Planettest	Instruments	

result implied that start-ups and industry insiders do not differ significantly in whether or not to pursue a vertical or a functional hub. Cross-tabulation results shown in Table 2 also support this conclusion.

About 64% of start-up companies chose to set up vertical portals and 34% of them chose to set up vertical portals. On the other hand, about 72% of the industry veterans chose to set up vertical portals and 28% chose to set up vertical portals. It indicates that even though the absolute percentage of industry veterans choosing vertical hubs is higher than that of start-ups, the difference is statistically insignificant.

A closer look at the background of the start-ups' top management teams provided additional insights into this observation. Most start-ups, when pursuing industry-specific vertical hubs, have managed to assemble a team that either had defected from the traditional industry to the dot.com business or had significant expertise in the industry. For example, before Jeff Arnold became the CEO of Heathon/WebMD (a medical information digital market), he was the CEO of a medical equipment company, Quality Diagnostics Services, for 6 years. Given that most start-ups have been able

to gain access to significant industry-specific talent, it is not surprising that they are equally as likely as industry insiders to build vertical hubs.

7.4. Do start-ups favor a particular hub function in the digital market?

This section explores whether start-up companies favor a particular type of hub function in a digital market, including auction, information, and marketplace. Hypothesis 2 posits that start-up companies are more likely to adopt the more innovative "marketplace" hub function as the dominant model for their digital markets. To test this hypothesis, we ran a chi-square test to evaluate the null hypothesis that the "primary function of a digital market" is independent of the background of the founding company (i.e., start-up or industry insider). The test results showed a chi-square test statistic of 11.2 and a P value of .004, which rejected the independence assumption. It implied that start-ups indeed favor one of the three hub functions in digital markets.

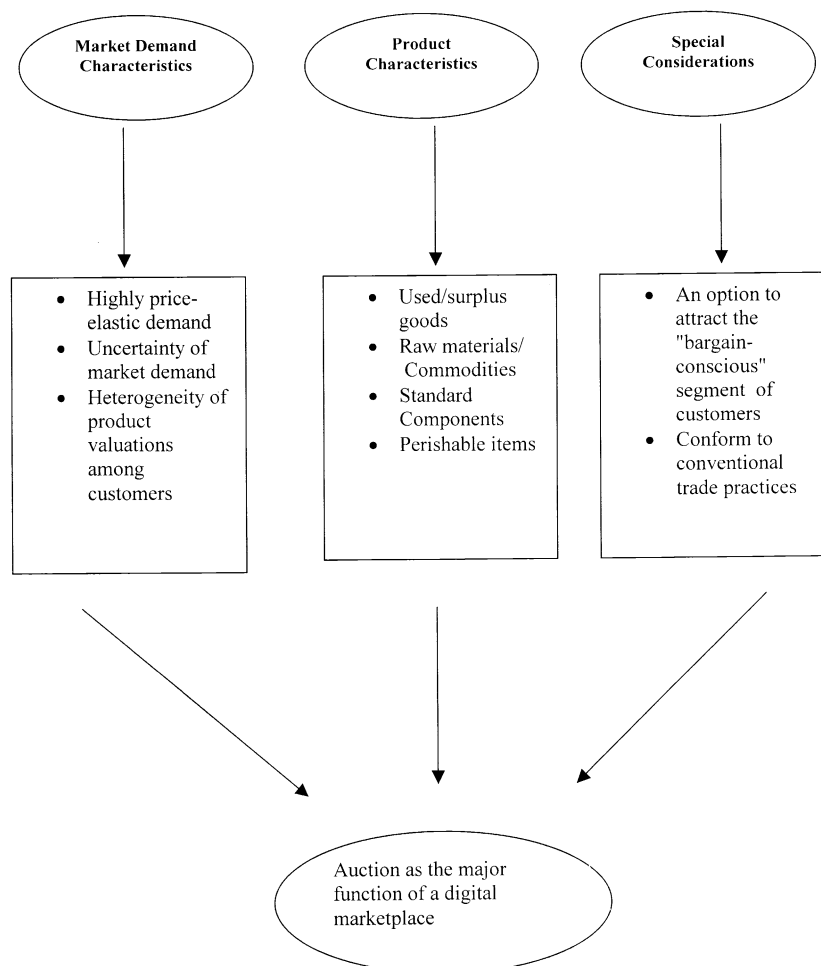


Fig. 3. Factors that favor auction format of digital markets.

Cross-tabulation data (see Table 2) supported the above conclusion and revealed further information. We found that 50% of industry insiders chose to build “information” dominant marketplaces, while only 25% of start-ups did so. A closer look at the background of “industry insiders” could explain why they tend to build “information-based” digital markets. We found that most of the “information” markets were built by business information publishers, industry trade associations, or trade magazines. For instance, TruckingNet, an information portal for the trucking industry, was built by Adams Media, a national publisher of trade magazines; GetCommStuff.com, an information portal for the telecommunications industry, was created by the Telecommunications Industry Association. Hence, we conclude that while start-up companies are likely to quickly pursue the pioneering “marketplace” function, trade publications seem to enjoy a natural advantage in building “information-based” digital markets.

7.5. Factors favoring “auction” as the dominant form of digital exchange

“Auction” and “Marketplace” are two primary ways that digital markets conduct e-commerce transactions. While both forms involve buyers acquiring products from sellers online, digital marketplaces do select one as a major function. Thus, it is intriguing to ask what factors may influence a digital

market to implement the “auction” format and what factors may propel it to decide on the “marketplace” format. While Sawhney and Kaplan [7] have mentioned that products of a particular nature (e.g., one-of-a-kind) may work best with the “auction,” we decided to critically examine their propositions through the investigation of empirical data and to provide broad perspectives about this issue.

First, we identified the statements that describe the “unique value proposition” at each digit market. We then summarized those stated benefits into Table 3.

Digital markets that promise similar benefits are collected in the same row, with only the name of one exemplary site. Various benefits discovered during this process are shown in Table 3, including the names of sample web sites examples, major industry or product type, and the benefits of the auction format. Based on the insights generated from the content analysis results as summarized in Table 3, we further grouped different types of benefits into three different factor categories that may lead customers to participate in auctions, including market demand characteristics, product characteristics, and idiosyncratic considerations. The three groups of factors are illustrated in Fig. 3.

Among market demand characteristics, highly elastic demand or seller’s uncertainty about potential market demand fits well with the auction mode. In addition, the potential heterogeneity of consumer valuations of products

Table 4
Factors favoring marketplace as the dominant for hubs

Company	Product	How the format helps
Adoutlet.com	Fragmented media inventory	Increase speed in execution Reduce buying staff
American IC Exchange	Semiconductor products	Reach diverse buyers
Arbinet Communications	Telecommunication capacity	Eliminate the need for negotiating with each supplier
B2bnow.com	Office and business supplies	Frequent purchases but no need for loyalty
Bidcast.com	Bids for government contracts	Aggregate and match otherwise scattered buyers and sellers
Bidnet.com		
Bizbuyer.com	Business products and offers	Pre-qualify sellers
Cattleinfo.net	Cattle	Active brokering of marketplace to facilitate deals
Celarix	Shipping options	Help piece together disparate information
Chemdex	Chemical products	One-stop shopping for a big shopping basket
Econstructors	Web site design	Lower search costs
Enermetrix.com	Energy	Provides integrated software solutions for participants, e.g., from contracting, scheduling, to billing
Imark.com	Industrial products	Enhance efficiency of transactions and reduce cost
Equipmentleasing.com	Equipment leasing	Buyer get multiple bids from sellers
Need2buy.com	Electronic components	
Fob.com	Purchasing	Aggregate buyers with similar buying interests into a group so as to get better deals
Onlinemro.com	MRO products	Pre-negotiated volume discounts
Iship.com	Shipping	Adding value by simplifying and streamlining the complicated process
Limitrader.com	Bond trading	Increase market liquidity; let sellers find buyers easily
Medical EquipNet	Medical equipment	Fragmented and inefficient markets
Mondus.com	Small business products and services	Diverse needs; one-stop solution
Plasticsnet.com	Plastics	Improve seller’s access to market
RateXchange.com	Bandwidth	Multilateral exchange

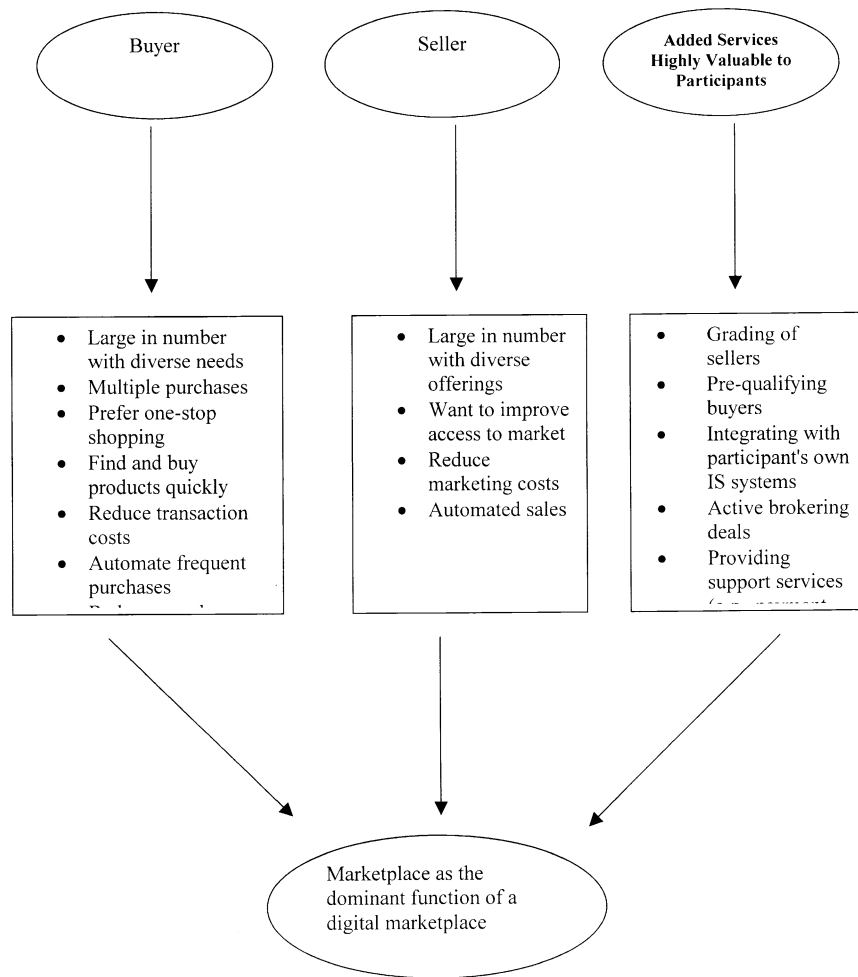


Fig. 4. Factors that favor marketplace format of digital markets.

may have exacerbated this demand uncertainty problem. We also found that surplus goods, commodities, perishable items, and standard components are well suited for auctions. Lastly, we also discovered that a digital market might simply use this format to attract a segment of bargain consumers or to conform to conventional trade practices in the brick-and-mortar world.

Since our observations are based on a comprehensive analysis of the promises and functions of the auction digital markets, we believe that the insights generated here can be used as managerial guidelines to help future digital markets decide whether or not they should use the auction format.

7.6. Factors favoring “marketplace” as the dominant form of digital market

In this section, we follow procedures similar to those described in Section 7.5 to pinpoint critical factors associated with the deployment of the “marketplace” mechanism in digital markets. Again, we adopted a content analysis approach to identify unique values associated with each

“marketplace” mechanism at each site. We summarized the major benefits associated with using “marketplace” in Table 4.

Based on the preliminary insights shown in Table 4, we then synthesized the findings and put them into three different groups: buyer side benefits, seller side benefits, and the importance of value-added services by the digital market. Fig. 4 illustrates the three important categories of factors that favor the “marketplace” mechanism.

Our analysis showed that when buyers are large in number, have diverse needs, require assistance to make choices, or desire quick transactions at low cost, they will surely be attracted by the “marketplace” function. It is also stipulated that if sellers are large in numbers, want to gain wide access to the market, or desire quick sales of their products, they are also quite likely to be attracted by the “marketplace” format. Finally, if buyers and sellers place a high premium on services such as grading of participants, integrating with participants’ own information systems, and providing support services, then the digital market should choose the “marketplace” format to better satisfy the needs of its users.

8. Management implications and conclusion

Digital marketplaces are becoming important in B2B e-commerce. While industry insiders are racing to enter the markets, start-up Internet companies seem to have an edge in this competition so far. However, it is too soon to determine the real winners of this heated race. As a number of digital exchanges fight for market share, a shakeout among them is likely to happen in the next few years. To survive in this competitive industry, vertical exchanges should form alliances with functional hubs to offer one-stop shopping conveniences for their customers, and vertical hubs should deepen their industry-specific content in order to serve more specific users' needs.

Users and builders of digital marketplaces should also critically evaluate the market condition, consumer needs, and product characteristics so as to decide whether to join or build an "auction" or "marketplace" type of exchange. For commodity type of products with highly price-sensitive demand, an auction model works better. For consumers with complicated needs who have to choose from a diverse set of manufacturers' offerings, a "marketplace" model seems to be more efficient in helping buyers quickly find the right sellers, or vice versa. Further, in this type of mode, participants' expectations about the value-added services from the exchange are high. Through active brokering of deals and the addition of value-added support services, the digital exchange can help sellers and buyers reduce transaction costs and enhance efficiency. In addition to creating value in areas such as marketing, customer service, and operations, developing new products and services is critical.

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