
Small Companies in the Digital Economy

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Introduction

Some of the most exciting developments in the digital economy are in the realm of digital products, as reflected in the current burst of activity involving the creation, assembly, procurement, and distribution of digitized content and services. One projection for the future of content provision foresees a world in which rich digital content is distributed to customers as customized bundles of reusable components, based on dynamically updated customer profiles (Parameswaran, Stallaert, and Whinston 1999). This new arena for commercial competition opens the door for the proliferation of small, innovative digital companies.

Small companies have always played an important role in the economy. In fact, many economists argue that a truly competitive economy requires the existence of small companies. Yet the share of total business volume attributable to such companies is declining. In the digital product industry in particular, their share is rapidly shrinking, and we must therefore question the market potential and competitiveness of small companies in this market.

Digital products are often loosely defined to include software, multimedia education and entertainment products such as music and video, and other information-based products that can be digitized and delivered via electronic networks (Choi, Stahl, and Whinston 1997). What binds these products together is the fact that they have been or can be liberated from the physical forms that

were once necessary for their delivery, allowing a much greater degree of customization and differentiation.

Naturally, in the digital economy, companies with a large inventory of digital components and the ability to control delivery channels can customize more readily, giving them greater access to consumers. This is the reason for the recent surge of acquisitions and alliances between media and telecommunications giants. Small digital companies usually have a restricted product selection and limited resources to reach consumers. Moreover, electronic commerce involves risks and uncertainties, one of which is the fact that consumers don't have sufficient signals on product quality—what is known as the “asymmetric information problem.” Because most small companies do not have a strong brand name to help mitigate the problem, they may have a difficult time attracting customers. This situation will clearly influence competition, and it raises questions about the viability of small firms engaging in such activities. How are small digital companies going to survive in the digital economy? What needs to be done to improve their chances?

In this chapter, we argue that the creation of what we will call *digital intermediaries* could help encourage the growth of small companies in the digital economy. We envision a framework in which digital intermediaries, interacting with both small companies and their potential customers, facilitate product customization and content development. The framework is market-based, unlike a hierarchic structure in which each company does everything on its own. The coordination process is made possible by modern technologies that significantly lower transaction costs (Malone, Yates, and Benjamin 1987). By pooling resources (content from multiple small players) through the market structure, digital intermediaries achieve economies of scale in infrastructure building. They provide quality assurance to consumers, maintain digital components from participating content providers using dynamic catalogues, and ensure content compatibility by enforcing open technology standards.

Products provided to consumers would be customized product bundles generated on the fly from multiple sources according to each customer's preference. Individual content providers would not need to build a relationship directly with consumers.

Another type of intermediary, a trusted third party (TTP), will provide authentication and product or service quality evaluation to both consumers and digital intermediaries. Using reports from TTPs, digital intermediaries will be able to choose the highest-quality content providers, and consumers can get information on which digital intermediaries provide the highest-quality products and services.

The next two sections summarize the opportunities presented to small companies in the digital economy and point out the main challenges facing them. We then outline our framework for helping small companies compete in the new economy, and we conclude by highlighting some public policy issues related to small companies and pointing to future research directions.

The New Opportunities for Small Companies

Only five years after the introduction of the World Wide Web, the digital economy already rivals century-old industries, and it is still growing at an astounding rate (Barua et al. 1999).

On the forefront of the new economy are digital products. Software programs, newspapers, and music CDs no longer need to be packaged and delivered to stores, homes, or news kiosks. They can now be delivered directly to consumers over the Internet. Electronic transactions involving airline tickets and securities already occur in large numbers. Other industries such as consulting services, entertainment, banking and insurance, education, and health care face hurdles but are also beginning to use the Internet to change the way they do business. Over time, the sale and transmission of goods and services electronically is likely to be the largest and most visible driver of the new digital economy (Department of Commerce 1998). These digital products can be assembled, customized, and packaged to meet changing customer demands, and can be delivered instantly when needed.

A large digital product market means vast business opportunities and provides a major arena for small companies to sprout, blossom, and grow. Concentrating on their core digital contents, small companies have an opportunity to play a critical role in the new economy. Moreover, the new information technologies make it easier for small companies to collaborate in the electronic market.

Economists have long recognized the importance of small companies to the economy. The active existence of numerous small business firms, each exercising a reasonable degree of freedom and independence, is considered basic to the maintenance of a competitive market (Beckman 1944; Acs 1999). In addition, small companies are the essential mechanism by which millions enter the economic and social mainstream of the society. In Canada, for example, 57 percent of economic output is generated by an SME (small and medium-sized enterprises) sector consisting of more than 2.2 million firms (OECD Report 1999). In the United States, 47 percent of firms have fewer than ten employees (Acs 1999). In the digital economy, where innovation and change are the rule, it is important to note the crucial role played by new small companies in the experimentation and innovation that lead to technological change and productivity growth.

The New Challenges for Small Companies

The digital economy provides a golden opportunity for small companies, but that does not necessarily mean that they can succeed in the electronic marketplace. In this section, we focus on two sets of issues that will have significant impact on competition in the electronic market: the cost of information infrastructure and information asymmetry.

The Cost Structure of Information Technology

As the digital economy grows, the importance of a widely recognized brand name becomes ever clearer. Consider the case of Amazon.com, which started out as a bookseller but has now expanded its offerings to include a wide variety of products and auctions. The economic explanation for this expansion is that information technology infrastructure has increasing returns to scale. It requires a large initial investment to create an infrastructure that allows efficient processing of information, handling of heavy traffic, and delivery of goods. Once the infrastructure is in place, however, the cost of adding product lines decreases (see figure 1). Given the tremendous investment Amazon.com has made in infrastructure, it is a natural evolution to expand its

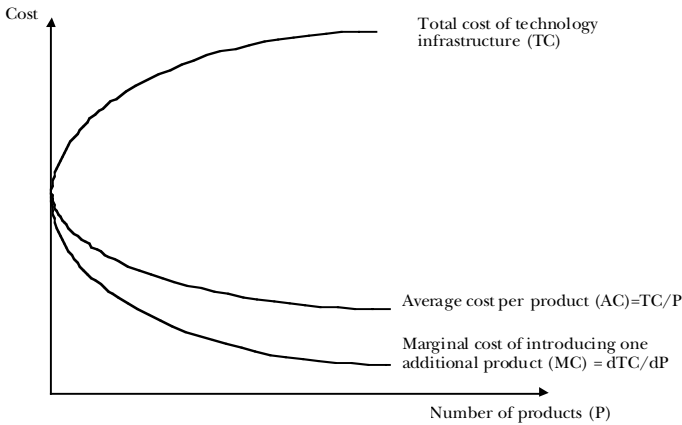


Figure 1 The cost curves of technology infrastructure and product offering.

product lines to take full advantage of that infrastructure. There is also a prestige that people connect with bigness (Beckman 1944). Many consumers take it for granted that firm size is synonymous with progress, efficiency, and economy. Therefore, the bigger a company gets, the easier it is to win consumer confidence and trust, which makes it easier to lure business away from small companies that do not have an established name in the market.

Asymmetric Information

In a traditional business environment, customers and vendors get to size each other up through direct contact, and the customer can literally get a feel for the quality of the products under discussion. A good reputation stemming from a history of satisfactory transactions will then further enhance the consumer's trust (Johnston 1996; Milgrom, North, and Weingast 1990). The use of trust as a factor in determining interorganizational and interpersonal behavior has been studied extensively (see, e.g., Anderson and Weitz 1989).

In the electronic marketplace, everything is more distant, and two-way trust becomes more difficult to establish. After all, web sites can be counterfeited, identities can be forged, and the nature of transactions can be altered. In order to instill public confidence,

companies must find new ways to ensure that consumers trust in their authenticity and in the integrity of their transactions.

The online market certainly offers abundant product choices for consumers. Abundance can lead to confusion, though, when too many choices and too much information make it difficult for consumers to tell which vendors offer quality products. When one agent in a transaction is better informed than the other, we say that information is distributed asymmetrically. For example, a seller may know that a product can vary in quality, but the buyer probably will not (this is the lemon problem). Such situations can lead to market failure (Akerlof 1970).

In the absence of indicators of trustworthiness, online consumers may choose to interact only with firms whose names they recognize. As Kevin O'Connor, the CEO of DoubleClick, has said, "On the Net, consumers have a lot of choices, so brand wins" when consumers don't have enough quality signals (Colvin 1999). A recent study by researchers at Xerox PARC shows that the most popular Web sites command a disproportionate share of Internet traffic—a signature of what economists refer to as a "winner take all" market (Adamic and Huberman 1999). Asymmetric information thus affects market efficiency by skewing competition to favor established brand names.

Will asymmetric information in the electronic marketplace and the cost structure of technology lead to a world of natural monopolies, with Microsoft as *the* software provider and Amazon.com as *the* retailer? Such a situation would lead to market inefficiency and the death of innovation.

Under these circumstances, building an infrastructure to help small companies survive and prosper becomes a top public policy issue. How can we help small digital companies build trust, develop innovative content, and compete with well-established brand names? We next outline a blueprint for a digital product intermediary to illustrate, without going into technical details, what can be done to address this issue.

A New Framework for Small Digital Companies

Adam Smith (1776) used the example of a pin factory to demonstrate the benefits of coordinated specialization and cooperation.

He described how the various stages of pin manufacturing could be most efficiently carried out by workers who specialized in a single task such as pulling wire, straightening it, or cutting it to appropriate lengths. He argued that such specialization, if properly coordinated, would lead to increased output volume. Alchian and Demsetz (1972) took up Smith's argument to assert that resource owners in capitalist society can increase productivity through cooperative specialization and that this results in a demand for economic organizations that facilitate cooperation. These classic economic arguments still hold in the digital economy, although they may no longer be limited to the boundaries of a single firm.

Information technologies and open standards make specialization and cooperation possible within society as a whole. They also reduce transaction costs among collaborators, allowing us to shift resource coordination from a hierarchic approach to a market approach (Malone, Yates, and Benjamin 1987). Like the workers in Smith's pin factory, different digital companies can specialize in different products and collaborate by using the services of digital intermediaries. Conversely, digital intermediaries can customize and integrate digital products from different companies according to consumer demand. This type of collaboration will help small digital companies blossom in the electronic market.

We foresee an electronic marketplace that includes small companies, digital intermediaries, and customers. These small companies may have only a few employees and concentrate on a few specialized products (e.g., accounting software, or educational programs for 3 to 5 year olds). The digital intermediaries will contract with such companies to procure content of different types, with provision for bundling content from different sources for reselling. The content will include both static and dynamic information. Static content may be articles, reports, news items, or books; dynamic content may be sports tickers, stock quotes, and so on. There may also be multimedia content such as digitized music, video clips of news stories, movies, recorded events such as concerts or conferences, live coverage of events, multicast channels of entertainment and news, online radio stations, or distance learning programs. Customers will be able to buy digital products from the digital intermediaries or directly from the originating companies based on the intermediaries' services.

Currently, products are often prebundled by content producers, whether they are in the traditional print business or involved in the electronic delivery of digital content. For example, magazines are bundles of articles. Subscriptions to cable TV are bundles of different types of programs: under the normal basic agreement, a viewer interested only in sports channels is forced to buy a package that includes the home-shopping channel as well. Consumers don't have wide choice about the kinds of bundles they can have. In this type of bundling, product customization is limited because of economies of scale in printing, binding, and shipping. As we move to a world where digital content is delivered electronically, however, printing, binding, and shipping will no longer be necessary, and the opportunities for customization increase.

Small companies have long been good at finding niches in the marketplace. Bigger companies are often resistant to change and less flexible in responding to customer needs. Moreover, in a highly integrated company that markets bundled products using content components that they produce, there may be incentive problems. Current incentive systems, such as stock options, are mostly based on overall firm performance. This creates room for free riders, where individual content providers add only marginally to the value of the product yet derive benefit from the bundle as a whole. In the digital economy, however, small companies will have to develop core competencies and collaborate with each other to construct innovative content tailored to consumers' unique tastes if they are to compete efficiently. Customizing each individual bundle will eliminate the free rider problem because each company must provide its best digital content in order to compete with other content providers.

Figure 2 presents the framework for a digital intermediary specializing in multimedia products for children. In this example, parents can specify what educational programs will be presented to their kids, what music videos their kids can watch, and so on. What they get is a customized program bundle that is well suited to their kids in place of a prefixed bundle determined by a cable provider.

There will be competition among intermediaries both at the level of assembling and customizing bundles and at the level of building content components. (Consider, as an example of how this could

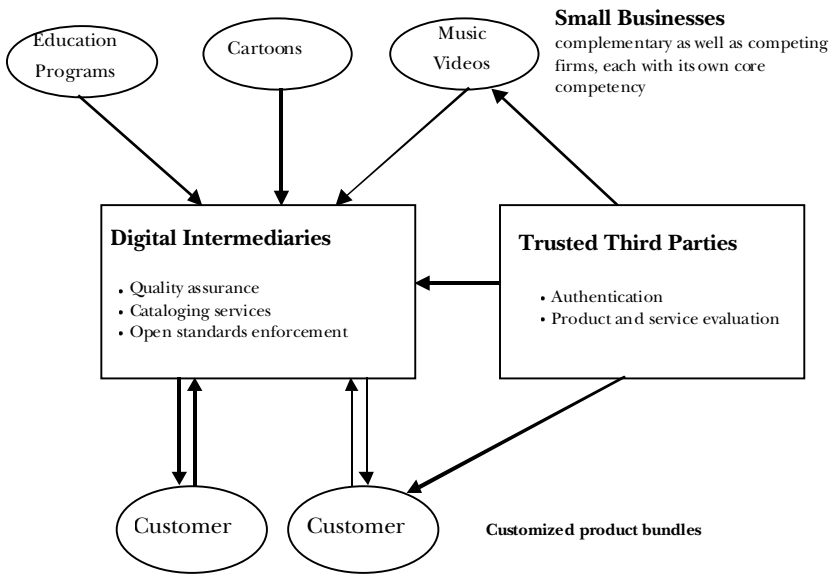


Figure 2 A framework for a digital intermediary.

work, the company Red Hat, which collects a premium for assembling customized versions of Linux, a public-domain operating system whose components are freely available; Red Hat adds value by testing components and using only the ones that are of the highest quality, thus saving users the cost of doing this for themselves.) Since the bundles will be assembled dynamically, firms will easily be able to switch to substitutes and component vendors will need to stay competitive. Thus, an incentive system will be in place that ensures maximum utility for end users.

Trusted Third Parties

Because there are likely to be multiple digital intermediaries providing bundling services, the challenges we outlined above for small companies still need to be addressed. That is, if consumers are to engage in business transactions with a digital intermediary, they must feel confident that the intermediaries are who they claim they are and have a good business reputation. Likewise, digital

intermediaries need to feel confident that the content providers are trustworthy players. For convenience, we focus here on the relationship between digital intermediaries and customers; the same issues apply to the relationship between content providers and the digital intermediaries. Trusted Third Parties (TTPs) are a possible solution to problems of authentication and product quality evaluation.

Certification authorities (CAs) have recently emerged to provide authentication services for the digital economy. Major players include VeriSign and GTE CyberTrust. CAs authenticate the identity of each party in a transaction by issuing digital certificates based on technological mechanisms such as the public key cryptography (Schneier 1994) and digital signatures. A certificate is a digitally signed statement by a CA that binds the identity of an individual or organization to a public key. By digitally signing a certificate, a CA vouches for the identity of the public key holder. Digital certificates address some of the major security concerns in online business transactions, namely confidentiality, message integrity, and user authentication. A digital certificate goes a long way toward shoring up consumer confidence.

A digital certificate can be revoked after it is issued. For example, if someone fraudulently gains access to a company's certificate, the CA can revoke the certificate (recording the certificate's serial number in a database that keeps track of all the certificates that have become invalid) as soon as the incident is reported (Ford and Baum 1997). Since certificates must be verified with the issuer before being accepted, the revoked certificate will be easily detected. A stolen certificate therefore quickly loses any value.

One might ask what happens if a business changes its identity after committing a fraud, or if there are significant management changes in a business that could affect its product quality. Strong authentication will help address this issue. TTPs will keep track of the history of certificate holders to make sure they do not change their online identity without securing changes to their certificate stating that this has occurred. In addition, when issuing a certificate to a company, the TTP will tie the management team, key employees, and other critical company information with the certificate and keep track of the company's major business activities. When

there are significant management changes in a firm, users will be informed of possible changes in the product or service quality provided by the company. This level of authentication provides extra protection for consumers and endorses businesses that carry the certificate.

Strong authentication services provided by TTPs will be important to digital intermediaries. Carrying a valid digital certificate will help intermediaries overcome initial consumer concern by ensuring that they are who they claim they are. While it vouches for the identity of a certificate holder, however, the current model does not vouch for reputation. Therefore, TTPs need to provide another value-added service: evaluating the product and service quality of digital intermediaries.

For example, BizRate (www.BizRate.com), which calls itself a “trusted infomediary,” is a TTP that uses information from consumers to keep track of merchants’ reputations. As an independent shopping resource, BizRate evaluates merchants using information provided by actual customers on service attributes such as price, product selection, on-time delivery, and customer support. Only merchants that have undergone a positive evaluation by at least 30 customers are denoted “Customer Certified” (Gold) on BizRate.com. Consumers can check the ratings and review descriptions to find the merchants that best meet their needs. We believe that similar types of TTPs will emerge to establish the reputations of digital intermediaries and digital content providers. The services will be used by consumers to evaluate digital intermediaries and by digital intermediaries to select the best content providers.

Digital Intermediaries

The success of the digital intermediaries depends on the quality of the product bundles they provide to consumers. In addition, intermediaries will need to provide a high degree of product customization, in the form of a wide selection of content providers to meet a wide variety of customer demands.

By offering a digital company’s product through their services, intermediaries vouch for the reputation and product quality of that company. This service decreases or even eliminates the need for

individual companies to do extensive marketing to build brand equity and reputation, thus saving important resources for product development and innovation.

Small companies can reach a broad set of customers by using intermediaries. Marketing research has shown that renting a reputation—a seller without a brand reputation using reputation spill-over to sell through a reputable seller—is an effective entry strategy (Chu and Chu 1994). In the digital economy, renting a reputation can be used more widely since creators of digital products can be very diverse, and many of them will be small independent players. Investing in reputation building would be a major undertaking, which may not even pay off. Intermediaries, on the other hand, being long-term players, have an incentive to build and maintain a strong reputation.

To provide effective quality assurance to consumers, digital intermediaries need to establish and enforce rules for content creators. By signing up with an intermediary, the content provider guarantees product quality. Deviating would result in being sanctioned by the intermediaries. There are many examples indicating that community standards and extralegal mechanisms work effectively to regulate economic relations (Bernstein 1992; Ellickson 1991). Setting and enforcing quality rules will not only be effective but will be of the utmost importance for ensuring the reputation of the intermediaries.

Interactions between customers and intermediaries will be mediated by directories, catalogue services, and agent-based systems, which are key elements in integrating content and customizing products. Directories, with information on what is available at what location, and what is included in the content, will allow intermediaries to procure and assemble content. Catalogues will allow customers to choose the types of products they wish to purchase. Currently there are several technologies that can be used to build directories and catalogues. For example, the Lightweight Directory Access Protocol (LDAP) (www.umich.edu/~dirsvcs/ldap/) can be used to retrieve and manage a variety of directory information. Resource location standards such as the Resource Description Framework (www.w3.org/RDF/) can be used to describe the content and content relationships available at a particular Web site,

and Extensible Markup Language (www.w3.org/XML/) is very flexible in defining new document types.

The catalogues will be dynamically created based on underlying databases available at content providers' sites and will provide an interface that is seamless regardless of the original source or nature of the content. They will provide a vast array of choices that could include a variety of combinations of information components. The agent-based systems will help retrieve information from the catalogues while at the same time assembling profiles of customers. (Incentive systems should be built in to assure customers that such profile information is not abused.) The key to useful agent-based systems and dynamic catalogues is the existence of an adaptive system that can rapidly update the catalogues to reflect individual customer preferences and to make products available on-demand. The agents, in turn, can communicate with each other, ensuring fast dissemination and synchronization of information on demand and supply. Such a seamless flow of information will also lead to efficient content procurement and inventory management.

Public Policy Issues and Future Research

We are still in the earliest moments of an economic revolution. As competition in the electronic market unfolds, a few issues come to mind concerning public policies for small companies and the government's role in helping small companies grow.

First, we need to recognize the tendency for businesses in the online market to grow to achieve economies of scale in the face of expensive infrastructure. Small companies will have to compete through their core competency. Collaborating with other small companies through digital intermediaries may be an effective countermeasure to the huge investment required to set up the technology infrastructure in the digital space. It also compensates for the lack of brand equity and deep pockets.

The second issue is concerned with promoting consumer trust toward small online businesses. Intermediaries are needed to rebalance the playing field and stimulate competition. They should have strong authentication to endorse small companies and quality assurance to protect consumers. This is not only a question of

survival for small companies, but also a public policy issue at a larger scale—when there are only a few players in the market, motivation to innovate diminishes. The government needs to recognize the importance of helping small companies build their reputation and establish trust among consumers.

Third, preserving open technology standards should also be a top policy concern. Integrating content, be it software or multimedia objects, from multiple sources requires that content provided by different creators written in different languages for different computing platforms be able to share data and functions. Substitutability of components and bundles will be feasible only if components are interoperable and follow open standards. Conforming to the interoperable standards will generate positive externalities for component vendors as they become candidates for multiple bundles. For the intermediaries, open standards give them a wider range of components to choose from, and make it easier for firms to switch to the bundles they offer. Interfaces between content components should be seamless, and the integration and customization processes should be transparent to customers. Technology compatibility and interoperability are critical, not only to the success of digital intermediaries, but to the wide adoption of electronic commerce in general. Technologies such as Java RMI (Remote Method Invocation) that is not tied to a specific platform or CORBA (Common Object Request Broker Architecture) that is not tied to a specific language or communications protocol are of paramount importance to the future of the digital economy.

The framework we put forward for small digital business raises several research questions, such as the implications of strong authentication, the pricing mechanism for product bundles customized to individual preferences, and the development of technology standards. We believe that these issues are critical to the growth of the digital economy and should be addressed in the near future by the research community as well as by policy makers.

As technology continues to develop, we are likely to see more changes in the economy. How will these changes affect industrial organizational structure? Will the core of the economy shift from large international enterprises to small firms competing and cooperating based on core competencies? Will firms contract in size

because coordination costs are significantly lowered by electronic commerce technology? At this stage, the framework we put forth is only a conjecture. Clearly, much empirical research is needed.

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