

Network, Externalities, and the Economics of On-line Services

類別：應用實務，學術理論

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Abstract

In information industry, the existence of network externalities makes sense of the increasing returns to information technology. This paper questions that whether the on-line services enhance economic performances, or are they efficient? The argument is simple: On-line service will enhance economic performances if it economizes transaction cost while organizing transactions. On-line service develops a market for information, then whether it enhances economic performances depending on if there is an information management system which can minimize the transaction costs while using the internet market to organize transactions of commodities or information. In most on-line cases, the transaction costs are related to the existence of network externalities, because consumers have to form expectations about product quality when they choose on-line consumption. I will not use sophisticated analytical procedure to analyze this issue, I will simplify this analysis by examining two types of on-line services: on-line public services and on-line profit-oriented services.

1. Introduction

On-line service can be divided into two types: public service and private service. On-line public services indicates the case that a web site is established to gather information from the society, or offer information to the society. The private service refers to the profit-oriented economic organizations using the internet to advertise their products and organize transactions, such as virtual bookstore. Both types are based on a design of a transaction cost minimizing information management system process information. In this paper, three concepts for subsequent analysis are necessary:

First, the information cost. Information cost is the transaction cost arising due to asymmetric or incomplete information, for instance, Akerlof (1970) and Stiglitz (1985). Akerlof's "Lemons Principle" is stated as: When information asymmetries exist that create the possibility of opportunistic behavior, then bad products (lemons) will drive out the good. Clearly, information problem can be viewed as a particular source of transaction costs. Moreover, the problems of "adverse selection" and "moral hazard" have been found to be relevant for a large class of problems where asymmetries of information are present between parties to a contract. Secondly, the network size. The network size can be defined as the number of consumers using the service (Bental and Spiegel, 1995). Thirdly, the network externalities. According to Katz and Shapiro (1986, 1992), if the value of one user to another is positively affected when another user joins and enlarges the network size, such markets are said to exhibit "network externalities", or "network effects."

2. The On-line Public Service

2.1 Market for Information or Market for Lemon?

On-line public service provides public goods. The purpose of on-line public service is firstly, to provide people of the society with the information they need to make decisions that are coherent and to motivate them to carry out parts of the plan. Secondly, to procure information from people of the society to minimize the social cost of public policy that is derived from incomplete information. Examples below illustrate. Recently, the WEB sites for "reporting criminal cases" (線上報案系統) and "articulation of public affairs" (線上民意表達) were established by the public sector which allow people to report criminal cases to the police and express their views concerning public affairs.

Do they work? It probably works, but several problems have to be identified: First, for any criminal case, victims will not use on-line services, but go to the police department directly; so that the on-line public service can merely gather information of a known case from the society, not from the victims. Effective network size of on-line public service depends on whether the cost and benefit satisfy the optimal conditions at the margin. The cost of public on-line services consists in two components:

(1) The fixed cost. In addition to the sunk cost for service station, there is cost to serve minimum network size. The quality of on-line public service is determined by whether the public sector actually and efficiently processes minimum information inflow, because it determines service quality (reputation) and people's preference to use this service to offer information. A person obtains disutility provided that his request will not be processed until half a year, or not be processed at all. That is, the number of those who used to or are using this service will be an index to service quality, therefore, the inframarginal network externalities are present; in other words, the critical level of users determines the fixed cost.

(2) The variable cost. The cost to process additional information beyond the critical level determines the variable cost; when critical mass is served efficiently, more information will flow in, which determines the variable cost. Since on-line public service reduces the cost to procure information and the cost to offer information, thus information will be over-supplied. That is to say, on-line public service may increase information cost

paradoxically. Moreover, under almost zero access cost, the government has also to confront with the potential problem of *adverse selections* (Friedman, 1990, pp. 529-530); in other words, the on-line service paradoxically creates a *market for lemons* (Akerlof, 1970), rather than a market for information. If "adverse selection" is present, the marginal conditions of cost is hardly optimized, because it is costly for the government to organize an efficient exchange of information, especially when we take into account the allocation of tax revenue.

2.2 A graphical illustrations

Incomplete information is related to information flow, the cost of information can be decomposed into two parts: the cost associated with information supply and the cost associated with information demand. Followed by our example, the on-line service provided by the government is the demand side of information. Thus, the higher the information cost, the less the information flows, the more information is demanded-- the demand curve is *positively* sloped.

The supply side of information consists in the whole people of the society. Basically, people do not want to report case they know to the authority, because it was costly. For instance, if you want to report a case, you may either pick up your phone to call the police, or personally go to the police station. Both ways are costly, because you spend time to fill in several forms. On-line public service significantly reduces the cost to report criminal cases to the police, so the supply curve is a *negatively* sloped line. Figure 1 illustrates. In the presence of on-line service, the information cost of the police department can be approximated by the cost to process the information. The size of on-line public service is defined by the number of users, which is determined when the additional benefit of information inflow is equal to the additional cost to process it. Namely, the raw data gathered from the on-line public service has to be effectively processed in order to transform it into useful information by confirming its truth content. The government has to install a group of staffs to process these information in less than specific duration of time, and the size of this group is similar to the city size which defines the *capacity* of information processing. Since the network size is established by those who process information and those who supply information; thus, the benefit of on-line service will be exhausted at the margin, and any additional informational inflow does not enhance efficiency, but creates disutility. Conclusively, the network size is unconstrained and inefficient, as the problem of city size indicates, residents beyond capacity will cause negative externalities, such as pollution, over-crowded neighborhood, and others.

Let the additional cost needed to process incremental information inflow denoted by $C(\Delta q)$, where Δq denotes the incremental information inflow. The more the information inflow, the higher the additional cost required to process it. The problem can be understood in terms of the example of city size mentioned above. Figure 2 shows this point. When on-line service reduces access cost to p_1 from p^* , then there is excess information supply of $Q_2 - Q_1 = \Delta q$ which calls for the cost $C(\Delta q)$ to process them. Moreover, if adverse selection is present, then it will pivot the supply curve to S' , so that the incremental information inflow will be larger than Δq .

If the service provider is the public sector, then the processing cost $C(\Delta q)$ will be from taxation, the inefficiency problem is self-evident because such expenditure will be transferred from other uses. Consequently, in the presence of adverse selection, the on-line service will increase the processing cost because what have now is merely more raw data, rather than information. If the service provider does not plan to extract information from raw data, then

the on-line service is not an efficient institutional arrangement because it does not reduce information cost, instead it has to afford the sunk cost of maintenance. Further, as indicated by Arthur (1989), the inefficiency problem may persist in the long run and increase the social cost if adverse selection "lock-in" the on-line public service over time; since this problem goes beyond the scope of this research, I do not intend to explore it here.

3. Profit-Oriented Services in an Internet Market

3.1 The Market Structure

In the internet marketplace, the cost advantage is determined by which firm can use the internet to organize transactions efficiently. In other words, those who can internalize the transaction cost of market transactions will be able to survive in the marketplace. Lower barriers-to-entry and large potential hit-and-run competitors characterize the on-line profit-oriented services, so that the market structure could be viewed as contestable (Baumol and Willig, 1981) generally. On-line book-selling is a good example for explanation. Why the used-to-be largest on-line bookstore *Amazon.com* prospers only two years? Why most ISP (Internet Service Provider) cannot survive longer? Is market competition the answer? If it is, then how do the incumbents lose incumbency advantage?

Strategy of on-line competition is different from other product markets, because the entry barriers in this marketplace are different. The cost advantage here is unlike that implied in standard economic theory, the cost advantage lies in which firm can less costly to use the internet to organize transactions. In other words, it is transaction cost that matters, and the barrier to entry is characterized by transaction cost advantage. In short, the success of on-line business depending on who can internalize transaction costs.

3.2 Applications

The economic theory developed above are applicable to a variety of issues, ranging from market strategy to political reform. I will simply illustrate two cases below.

3.2.1 Why Most ISP Cannot Survive in the Long Run?

Low survival rate characterizes the market of internet service providers, the theory developed above can partly explain this problem. Transaction costs are potential in this market, the optimal strategy for transaction cost minimization is to design a pricing scheme corresponding to different demand patterns. For example, minimum-hour-per-month does not apply to most users; some users need more minimum hours as access incentive, but some may prefer less. If an ISP applies a pricing scheme which is suitable to one consumption pattern only, then it will find high transaction cost to use the market to obtain scale economy. In addition to demand-specific pricing scheme, the problem of ISP is related to network externalities, because when one consumer chooses an ISP, he has to form expectation about the service quality which is signalled by the total number of current users; therefore, the problem of ISP may not only involve the marginal impacts of pricing strategy, but also the consequences of the network externalities. Besides pricing strategy and network externalities, the ISP problem has too much to be discussed, I do not intend to detail it here.

3.2.2 Will *Amazon.com* be defeated?

As recently as several months ago, the story of *Amazon.com* had the makings of a classic American success story. To Amazon's dismay, though, the final chapters may illustrate a lesson in the harsh economic realities of Adam Smith. With the entrance of *Barnes & Noble Inc.* onto the internet -- and with *Borders Group* and *Simon & Schuster* expected to follow suit -- Amazon has gone overnight from being the giant of on-line book selling to a potentially small player in an increasingly crowded field. So far, the most pessimistic observers believe that Amazon's best days have passed in the blink of an eye.

However, according to the theory developed above, *Amazon.com*'s fate may not be as what is predicted above, but as the recent story titled "Why Netscape isn't Dead." Both *Barnes & Noble Inc.* and *Amazon.com* undertake conventional limit pricing strategy, no one apply strategies to minimize transaction cost, they compete by deep pocket instead; for instance, *Barnes & Noble Inc.* offers 30 percent off all hardcover books bought on-line and 20 percent off paperbacks, *Amazon.com* offers 40 percent off hundreds of titles.

Price war does not result in a stable final winner in the long run, because of the contestability of internet market. Since transaction costs are not internalized, uncertainty will be present in the marketplace; under which, no one will be better off in the long run.

4. References

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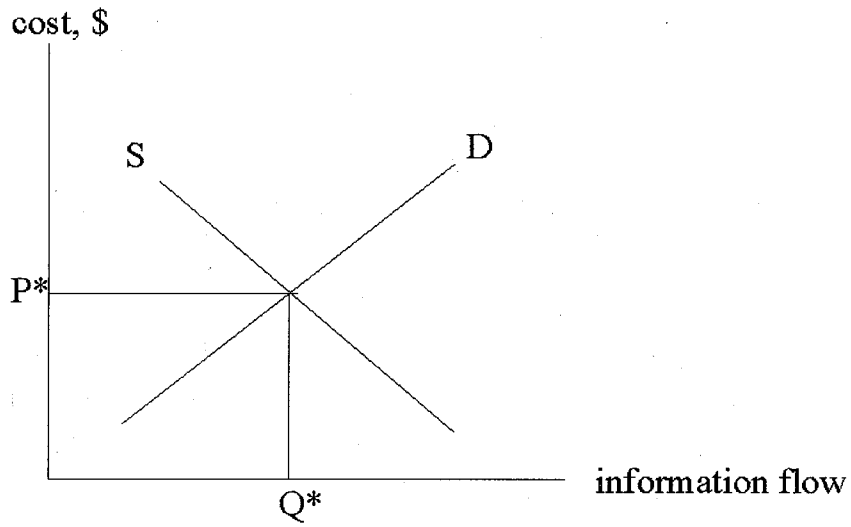


Figure 1. Demand and supply in the market for information

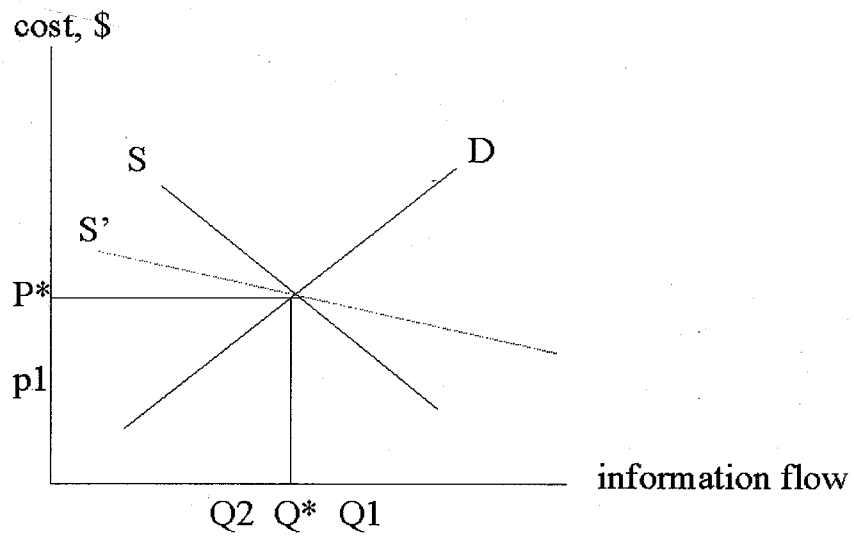


Figure 2. The market for information with on-line service