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Customer Service and Network Completeness

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Abstract

Companies are increasingly replacing functions traditionally performed by human servers with network-based customer service systems (NCSSs). Based on an analysis of 30 Web sites of leading service providers and in-depth field studies of NCSSs currently used by five major companies representing a variety of customer-service contexts, we introduce "network completeness" as an important concept for understanding how to deliver effective customer service. Various forms of network completeness are discussed and an analysis of its effects presented.

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1.   Introduction

One goal of research is to make sense of the observed environment. This sense making can have a number of different outcomes. The dominant perspective is that it builds theory, but there can be other outputs that can be just as valuable as theory and often set the stage for theory building. For example, Mendeleyev's periodic table marked the emergence of chemistry as a science [16]. Similarly, Linnaeus' binomial system for classifying plants and animals first introduced in 1735 is still the basis of modern taxonomy [4]. Mendeleyev made sense of others' observations about the properties of elements, and Linnaeus of what he saw in his field expeditions. In this article, we first try to make sense of what we observed in our field research and then develop some theory to advance our sense making.

The network has become an influential concept when thinking about the structure and operation of the enterprise, industries, and society [e.g., 9, 12, 14]. One concept that we believe is missing from network literature is the notion of network completeness. In this paper, we introduce the concept of network completeness and discuss its implications for customer service.

The genesis of this paper is work that we started in early 2001 on network-based customer service systems (NCSSs). Our findings are built on an analysis of 30 Web sites of leading service providers and field visits to five leading service companies.[1] In this article, we describe the research methodology, present our findings, introduce a tool for analyzing network completeness, and conclude with a discussion of the implications of network completeness.

2.   Research Methodology

Case studies were used to investigate existing organizational NCSSs, the dimensions that differentiate these systems, and the benefits to the organization. As research on NCSSs is in the formative stages and the relevant theoretical foundations are unclear, a case study approach was appropriate [2]. To gather a rich understanding of key concepts, semi-structured interviews were conducted in each of five participating organizations. Participants represented three organizational levels: two executives (i.e., design and implement the NCSS strategy), two operational (i.e., operate the NCSSs), and one technical (i.e., develop the NCSSs). In nearly all situations, two researchers conducted the interviews to minimize bias and strengthen the validity of the conclusions. An interview guide was developed

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1 We plan to visit 10 field sites for the complete study and have completed interviewing at Alamo (car rental), Bank of Montreal (banking), Marriott (hotels), Mutual of New York (insurance), and Sun Canada (computers).

based on Yin's [20] approach to case study design and Merton et al.'s [10] recommendations on focused interviewing. The interviewers used discretion in asking questions to encourage participants to explore concepts that were unanticipated and used probing to investigate pertinent revelations.

The sample frame consisted of five organizations that represented three customer-intensive industries, two finance, two travel, and one computer equipment company. All were large North American organizations that had implemented at least one form of NCSS (e.g., interactive voice response (IVR) system, Web site, call-center).

All interviews were taped and transcribed verbatim. Transcriptions were sent to participants for verification. Once verified, the four researchers reviewed all interview documents and participated in two interactive, face-to-face data analysis meeting where major themes and concepts were identified and discussed. The results from these meeting were documented, and a literature review was conducted to further define primary themes and concepts and to create coding categories for analysis. Interviews were analyzed using a qualitative analysis software tool (AtlasTi) based on Miles and Huberman's [11] qualitative data analysis model.

3.   Findings

One of the insights we quickly gained from the field interviews was the concern that many companies have for creating a single view of the customer: a complete, integrated representation of all interactions the company has with the customer over the duration of the relationship. Data integration has been a long sought goal as the integrated database offers many opportunities for improving organizational performance [18]. The underlying aim is to integrate data from multiple applications to give a single view of the customer that the company can then use to actively promote, as well as service, products[2] to customers in a channel independent environment. This is not a particularly novel finding, but it has gained considerable currency with the recent emphasis on customer relationship management.

Our major revelation was to recognize that the lack of customer data integration is just one of several forms of incompleteness. We found several instances where firms were unable to achieve organizational goals because some critical element was missing (e.g., bank branches not having intranet access, incomplete details of a customers' financial transactions). We recognized that these were various forms of network incompleteness.

In this work, we settle on the definition that a network is "any system or group of interrelated or connected elements" – called nodes [1]. We opt for this meaning of a network so that we can embrace interrelated sets of computer files (i.e., a database),

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[2] We use the term "product" for simplicity to refer to both products and service. Our discussion applies equally well to both.

connected computers systems (e.g., an intranet), and a related set of information required to complete a typical transaction (e.g., making travel arrangements). We then define **network completeness** as "a state where a network contains all the important elements or connections." Under this definition, circumstances such as not having a single view of the customer and no access at a customer touch point are instances of network incompleteness.

Why not system completeness? We considered using system completeness to describe the goal we found companies pursuing. However, we opted for network over system because we saw a of focus attention on interconnectedness between systems and networks of systems. Thus, companies want to link their systems to other companies' systems to create networks that serve customers.

We now use this definition to explore forms of network completeness and incompleteness. One way to classify different network modes is to categorize them as hierarchies or markets, using Williamson's fundamental dichotomy of the economics of organization [19], and discriminating between either physical or information networks. We further break up the information network component into its fundamental elements: data, process, and communication. The result is **Figure 1**, which identifies six arenas for investigating network completeness. We first discuss physical networks and then consider various forms of information network completeness, the major substance of this article.

		Hierarchy	**Market**
Physical		Firm	Industry
Information	Data	Customer data base	*Über*-customer data base[3]
	Process	Customer service applications	Inter-organizational systems and Web site linkages
	Communication	Public and private networks	Public and industry networks

Figure 1: *Customer service network elements*

3.1   *Physical Networks*

Physical networks are not the central interest of this study, but for the sake of completeness, we provide a brief coverage of the central ideas. The typical hierarchical physical network organization is a firm. The firm decides how to allocate resources within its network to achieve its goals. Mastery of the physical

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3 A German prefix meaning over, beyond, and above.

structure is paramount for an operational entity. Thus surviving industrial age firms have become skilled at the physical organization of resources within their control.

The typical market physical network is an industry. Consider the travel industry, comprised of airlines, car rental firms, lodging, ground transport, ferries, trains, and so forth. Travelers use this network to satisfy their travel needs. In contrast to the firm, customers decide how resources are allocated in an industry (i.e., market) network since they determine which elements of the network they will use. Moreover, relationships among the network nodes (i.e., firms) are governed by market mechanisms.

Not surprisingly, most physical networks work satisfactorily and have a high degree of completeness. After all, they are the product of the industrial age and have had sufficient time to evolve to become comprehensive interconnected systems. They are complete in the sense that firms and customers can use them to effectively and efficiently meet their goals. Thus, our focus in on the completeness of information networks.

3.2   Information Networks

For every physical network, there is a corresponding information network designed to support its operations. At the industry level, information networks enable customers to determine how they use the physical network (e.g., what flight to catch, where to find an ATM). Some infomediaries (e.g., Travelocity) combine information from a variety of service providers to create a single point of contact, but the interface is still accessed via a public network (i.e., the Internet). Furthermore, customers are not required to conduct all their business via an infomediary.

Our findings focus on the prevalent lack of information network incompleteness. This incompleteness can result from failure to complete the data, process, or communication components of a network. *Data incompleteness* occurs when there was often the lack of a consistent, single, repository of the information required to support operation of the physical network. Consistency refers to the uniformity and agreement among the nodes of the information system (e.g., there is single unique identifier for every customer used by every database). *Process incompleteness* occurs when there is a need to access multiple systems to handle a customer transaction (e.g., a hotel with multiple brands, or flags in the language of the hospitality industry, has multiple reservation systems). *Communication incompleteness* arises when all the organization's representatives who need the system's support to serve customers do not have systems access (e.g., branches in one banks could not access the same systems as the corporate call center agents).

We maintain, and illustrate in the following pages, that information network completeness requires data, process, and communication completeness. Incompleteness for anyone of these components leads to network incompleteness. We also assert that he higher the degree of network incompleteness, the lower the level of service.

We now discuss the several forms of information network incompleteness detected. Furthermore, we identify the steps an organization might employ to reduce or eliminate incompleteness.

3.3   Firm Communication Network Incompleteness

Firm communication network incompleteness occurs when there is not universal access within the organization. In one case, branch offices did not have network access and could not deliver full customer service at this contact point. A complete communication network is a necessary, but not sufficient condition, for information systems network completeness. All customer contact points must have the same level of accessibility to customer service systems.

To reduce this form of incompleteness, analysts must first identify all the potential touch points that a customer can have with an organization. Next, they must determine the range of information that is typically requested at these points. Finally, the firm needs to install information systems at these contact points. It essentially has three options.

1.   Equip personnel with the necessary equipment, system access, and training to provide customer service.

2.   Install self-service information kiosks, which has been the approach taken by some hotels to providing information about local restaurants, public transport, and the like to guests.

3.   Deploy information displays that page through the information that customers typically request (e.g., Delta Airlines has at many of its gates screens informing customers when particular rows will board, where customers are on the wait list, the weather at the destination, and other pertinent information).

3.4   Customer View Incompleteness

Customer view incompleteness, the major form of data incompleteness observed, results when a firm does not have a single view of the customer. The dream of a single integrated database is not new, but the reality is that few organizations have attained this aspiration. It would appear that many leading edge service providers, the constituency of this study, are still striving to achieve this goal.

Conventionally, customer view completeness is achieved by extracting data from a firm's disparate operational systems to create a single customer database (sometimes called a customer data warehouse), which we label **firm-customer completeness**. It is all the data a firm can amass based on its interactions with a customer. This is, however, partial completeness, because customers interact with many organizations.

The next stage, from the firm's perspective, we label **industry-customer completeness.** It represents the aggregation of firm-level customer views of all firms in the industry as they pertain to one customer. That is, the focal firm has been able to document (i.e., build a database of) all products its customers own and

use, even if not produced or bought directly from it. For example, one computer manufacturer has a built a database detailing all the equipment—its own and competitors'—installed by its customers. Since computer troubleshooting is difficult without an understanding of the customer's infrastructure, it is only by having this complete picture that the firm can provide high quality advice to its customers, because it knows exactly what they have purchased from all the firms in the computer hardware industry.

Industry-customer completeness can be achieved through a combination of two factors. First, the controlling party can be the firm, an infomediary [6], or the customer. Second, data can be exchanged in an ad hoc way or standardized through an industry consortium. Ad hoc methods include screen scraping[4] and customer supplied. Such improvisations are major shortcomings. When the structure of the scraped screen is altered, the data collection program will have to be amended. Alternatively, if the customer supplies data, integrity issues emerge (i.e., the data may not be kept current).

Standardized data exchange is the only viable long-term solution. A good example of this approach is Open Financial Exchange (OFX), an XML compliant specification for the electronic exchange of financial data between financial institutions, business and consumers via the Internet [13]. OFX is a financial industry standard that many credit card issuers deploy for providing customers with details of their transactions, which can be readily imported to Quicken and other personal financial management programs.

A critical question with standardized data exchange is the willingness of the various parties to permit data exchange. Will customers let a firm or infomediary collect and maintain a database of their transaction within or across industries? If they won't, will customers develop the skills or have the willingness to manage integration of their data?

Finally, we might conceive of **customer completeness** as the combination of industry-customer completeness with the customer's preferences, profile, future wants, and so forth. This level of completeness provides the best foundation for interacting with a customer because of the richness of a complete industry transaction history and customer profile.

Customer completeness requires the customer to supply willingly details of personal preferences and other information that is essential to providing sound advice. The readiness of customers to supply information will likely be determined by their expected return from such an exchange and a widespread and secure standard for data exchange between individuals and firms. The Liberty Alliance Project (www.projectliberty.org) is a step in the direction of customer completeness that is gaining support [3].

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4 Capturing data by reading the contents of a display. It is an inefficient method of data capture and will usually fail if any change is made to the format of the displayed data.

3.5   Customer View Gaps Analysis

The different types of incompleteness each have specific consequences for the firm (see **Figure 2**). The **service gap**–the gap between the current customer view and firm-customer completeness–reduces customer service effectiveness. The firm is often unable to handle current service problems because the details of all a customer's interactions are not in a single database. This creates a gap between what customers expect and what the firm can deliver. For example, a customer might expect the catalog salesperson to have a record of his past purchases so that when he can reorder shirts of the same neck and sleeve length. If these data are not available to sales personnel, then customer service is less than what today's customer anticipates.
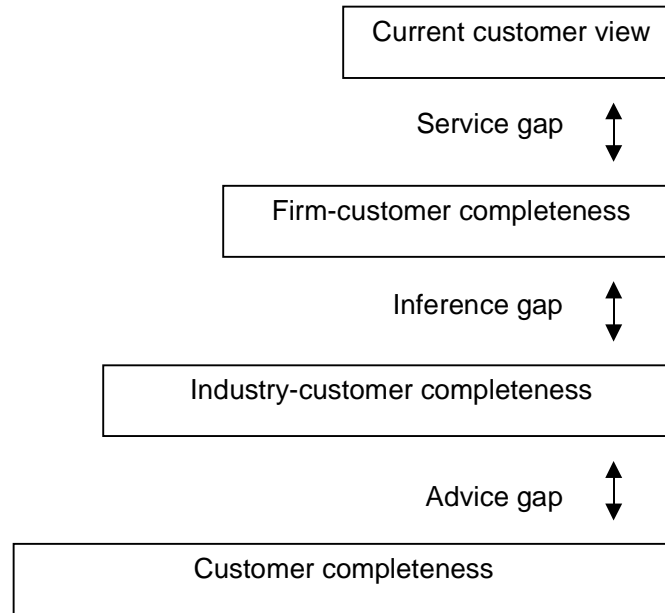
```
                    ┌─────────────────────────┐
                    │  Current customer view  │
                    └─────────────────────────┘

                         Service gap        ↕

              ┌──────────────────────────────────┐
              │   Firm-customer completeness     │
              └──────────────────────────────────┘

                         Inference gap      ↕

            ┌────────────────────────────────────────┐
            │    Industry-customer completeness      │
            └────────────────────────────────────────┘

                         Advice gap         ↕

          ┌──────────────────────────────────────────────┐
          │        Customer completeness                 │
          └──────────────────────────────────────────────┘
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Figure 2: *Levels of Completeness and Gap Analysis*

The **inference gap**–the gap between firm-customer completeness and industry-firm completeness–reduces customer relationship management effectiveness. The firm has an incomplete picture of a customer's interactions with an industry and this partial knowledge can easily lead to incorrect inferences about a customer. A mutual fund company analyzing a customer's holdings with it might determine that the person is over invested in Latin America and suggest a reallocation of assets. Such an inference is likely to be erroneous if the customer's investments are distributed across several mutual funds.

Finally, the **advice gap**–the gap between industry-customer completeness and customer completeness–limits the ability of a firm to provide appropriate advice because it has only the customer's history and no indication of current or future

needs. Usually a firm cannot detect life-changing events just from an analysis of prior transactions. The forthcoming birth of a child, for example, is certainly likely to change a person's future transactions. However, unless the customer provides details of this approaching event, the firm is unable to provide wise counsel.

These gaps are not pure in the sense that a firm without a single customer view might use screen scraping and collect customer preference data to move in the direction of higher completeness. Also, firms might mix firm-completeness with some customer profile information in order to improve their ability to provide effective advice.

3.6   Customer Service System Incompleteness

Customer service system incompleteness, the major form of process incompleteness observed, arises when there are multiple systems for serving customers. As a result, service representatives are often forced to integrate data from multiple systems in order to handle a customer and have to be cross-trained in multiple systems.

Customer service system incompleteness also happens when a firm appears to the customer like a hierarchy but operates more like a market. This is an industry-wide issue in the hotel business. Many hotels are independently operated, but fly the flag of a chain (e.g., Marriott). Customers think the flag service center or Web site should have complete knowledge of all the hotels flying the firm's flag. However, independent operators are often not part of the information technology network or fail to supply current information about their hotel.

3.7   Web Site Incompleteness

Web site incompleteness, a combination of data and process incompleteness, arises from customers' expectations that a Web site should allow access to all the information and business processes that the customer perceives is essential. In addition, they expect that nearly all transactions can be completed via the Web. They assume the Web site to be complete and equivalent to or better than alternative channels of interaction [8, 15].

The customer's view of a transaction is typically much broader than that of a firm. For instance, a customer traveling from her home to do business in another city would view the transaction as including multiple decisions and transactions (see **Figure 3**). Because she is using a physical network to travel physically, she has an expectation that there is a matching information network that will support this movement. Hence, she expects that some of the Web sites with which she interacts will supply the necessary information to complete her travel plans. She might expect that an airline's Web site has details of hotels at her destination and a hotel's site has information on shuttle services and the local transit system.
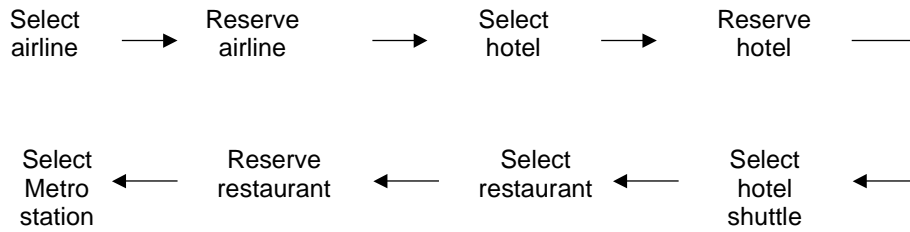
| Select airline | → | Reserve airline | → | Select hotel | → | Reserve hotel | ┐ |
| Select Metro station | ← | Reserve restaurant | ← | Select restaurant | ← | Select hotel shuttle | ← |

Figure 3: A travel Decision Path

Many service providers recognize that *information is service*, and customers have quickly seized upon this realization to develop expectations of Web site completeness. This means that a company's Web site will be judged not just upon how it supports the central transaction (e.g., reserving a room) but also on how well it supports related network transactions (e.g., getting to and from the hotel). Web site completeness is determined by customers' expectations and not by the legal boundaries of the firm.

In order to fulfill the customer's expectation of information network completeness, firms will need to develop decision path maps for a variety of typical customer activities within an industry. For each path, the firm can then determine what information customers might expect, or might survey them to find out what they want. This will then enable the firm to draw boundaries around the information it might be expected to provide to customers, as illustrated in Figure 4.

Figure 4: Web Site Boundaries

3.8   Theoretical Directions

Our field research leads us to the development of five propositions (see **Table 1**) that we believe underlie current developments in service systems. The first proposition asserts that information is service. In marketing terms, a service is "… any act or performance that one party can offer to another that is essentially intangible and does not result in the ownership of anything. Its production may or may not be tied to a physical product" [7]. Thus, traditionally we think of taking a flight, renting a car, and buying insurance as services. For competitive industries, performing the fundamental service of the business (e.g., flying the plane from Atlanta to New York) is necessary for survival, but does little to differentiate the firm. Now, it is the information that surrounds the central service that can make the difference, which is perceptively recognized by a former airline CIO, who stated "Most people will tolerate misconnects and changes when they occur in the airline industry—what they won't tolerate is not getting timely and accurate information. The airline business today is much more than a transportation business—it's an information business, prefaced with an 'e'" [17]. Increasingly, in consonant, with the information age, firms will use information to differentiate themselves.

Table 1: *Propositions*

P1: Information is service
P2: Network-based customer service systems improve customer service
P3: Firms will pursue greater network completeness as a means of improving customer service and knowledge about customers
P4: Network-based customer service systems lower customer's service search costs and lead to higher quality service
P5: Greater network completeness lowers the customer's service search costs and leads to higher quality service.

An NCSS should lower the cost of delivering information to customers since servers are substituted for people and customers undertake self-service for many service transactions. Since information is service, the cost of providing service is lowered. The original situation for the firm and customer is depicted as line S_1 in **Figure 5**. The firm has decided to offer information of value U_1 to the customer at a cost to the firm of C_1. With the advent of networks, the firm's information delivery cost curve shifts to S_2, which includes the cost of prior information delivery systems as well as the new network-based system. The firm could decide to continue to provide information of value U_1 and thus lower its costs to C_2. Alternatively, it can capture a portion of the cost savings and raise service quality by increasing utility to U^*, which is the outcome suggested by the theory of competitive rationality [5]. Thus we propose P2: Network-based customer service systems improve customer service.
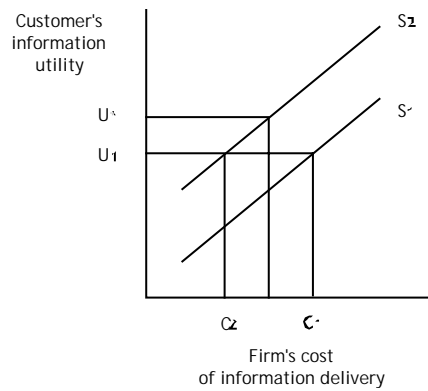
239

Figure 5: *Customer Service Options*

We now assume that a firm has adopted the network as a basis for customer service (i.e., its service cost curve is S_2). We propose that the firm will increase its level of network completeness as it attempts to use information to differentiate its services and create revenue opportunities. For example, reducing the service gap should improve customer service (and ultimately revenue) and closing the inference gap should reveal revenue opportunities. Thus, firms will move up the service cost curve (see **Figure 6**), with the cost of service systems increasing from C_2 to C_3. Any initial savings from moving some services to the Web will be absorbed by advancing network completeness to increase customer information utility from U_2 to U_3 and customer knowledge in anticipation of greater customer loyalty and better identification of customer needs. Thus we propose P3: firms will pursue greater network completeness as a means of improving customer service and knowledge about customers.
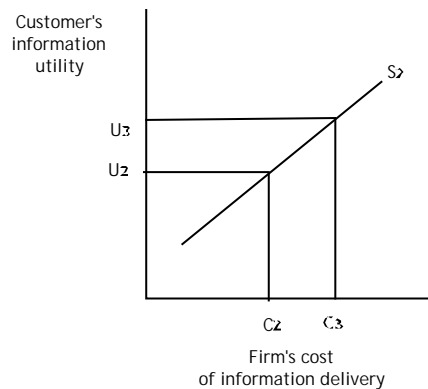

Figure 6: *Network Completeness Effects*

Obtaining service has embedded search costs. Search mechanisms used to obtain information include phoning a call center, visiting a service center, and accessing a

Web site. As customers' search costs are not uniformly distributed throughout time (e.g., it is often inconvenient for customers to search while at work and more convenient at home in the evening), they are likely to prefer information channels that are continuously available. They are also likely to prefer channels that are information rich and over which they have greatest control. Thus, in many respects an NCSS has major search costs advantages over traditional information sources. Again, we can undertake an analysis of the potential impact of lowering search costs for customers (see **Figure 7**). The logic parallels that related to the development of P2. The original search cost situation for customer is depicted as S_1 in **Figure 7**, which shows that the customer has decided to receive information of value U_1 at a search cost of C_1. With the advent of networks, the customer's information search cost curve shifts to S_2. The customer could decide to continue to receive information of value U_1 and thus lower the search cost to C_2. Alternatively, the customer could capture a portion of the cost savings and increase utility to U^* and gain higher quality information. This analysis leads to P4: Network-based customer service systems lower customers' search costs and lead to higher quality service.
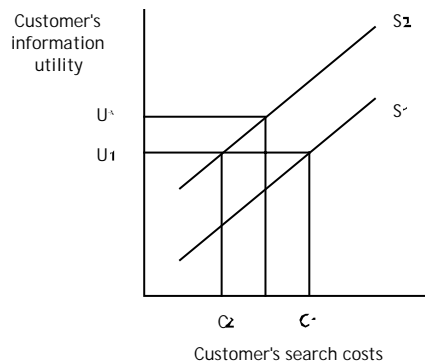

Figure 7: Customer Search Options

Now review the situation where a firm has adopted the network as a basis for customer service (i.e., its service cost curve is S_2). As a firm increases its level of network completeness it further lowers customer service search costs so that at some point we can distinguish S_3, a lower cost curve. Hence, customers' search costs are now lowered to C_3. Customers can take all their search cost savings or use some of the savings to increase their information utility. Thus we propose P5: Greater network completeness lowers the customer's service search costs and leads to higher quality service.
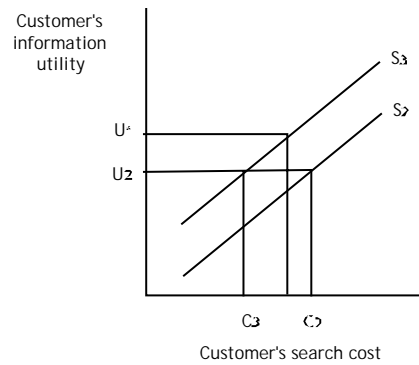
Figure 8: Search Costs

4.   Conclusion

As more customer service transactions are moved to networks, academics and practitioners will have to focus more attention on how to efficiently and effectively use these networks to deliver the services that customers expect. We believe that NCSSs are the foundation of much of business success in advanced economies, where a large proportion of the population works in service industries. In this initial report of the study of these systems, we have introduced and developed the notion of network completeness. We have attempted to provide a thorough coverage of the concept, within the limits of a conference paper, by exploring it from several angles. First, we examine completeness from the perspective of the customer, the firm, and the industry. Second, we report several findings from our field research to illustrate some observed forms of network incompleteness. Finally, we take a more abstract approach using economic analysis approach to explore some of the potential consequences of network completeness.

We have presented the models and thinking behind this work to individual executives and groups of practitioners. They report finding the work useful because it captures in a concise and readily understandable form issues with which they are currently grappling. As objective verification of the practical value of this work, we offer as evidence several invitations to present our work to in-house groups in major North American corporations.

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