

Association for Information Systems AIS Electronic Library (AISeL)

PACIS 1997 Proceedings

Pacific Asia Conference on Information Systems
(PACIS)

December 1997

Analysis of Telemedicine's Impact on Organizational Competitiveness and Consumers' Value Adding

Ali Farhoomand
University of Arizona

D. Drury
National Sun Yan-Sen University

Follow this and additional works at: <http://aisel.aisnet.org/pacis1997>

Recommended Citation

Farhoomand, Ali and Drury, D., "Analysis of Telemedicine's Impact on Organizational Competitiveness and Consumers' Value Adding" (1997). *PACIS 1997 Proceedings*. 43.
<http://aisel.aisnet.org/pacis1997/43>

This material is brought to you by the Pacific Asia Conference on Information Systems (PACIS) at AIS Electronic Library (AISeL). It has been accepted for inclusion in PACIS 1997 Proceedings by an authorized administrator of AIS Electronic Library (AISeL). For more information, please contact elibrary@aisnet.org.

Analysis of Telemedicine's Impact on Organizational Competitiveness and Consumers' Value Adding

Paul Jen-Hwa Hu¹, Olivia R. Liu Sheng², and Chih-Ping Wei³

*1 : {phu@bpa.arizona.edu, paulhu@usthk.ust.hk}
Department of Management Information Systems
College of Business and Public Administration
University of Arizona, Tucson, AZ 85721, USA*

*2 : {olivia@usthk.ust.hk, sheng@bpa.arizona.edu}
Department of Information Systems and Management
College of Business and Management
Hong Kong University of Science and Technology
Clear Water Bay, Kowloon, Hong Kong*

*3 : {cwei@mis.nsysu.edu.tw}
Department of Information Management
College of Management
National Sun Yan-Sen University
Kaohsiung, Taiwan, R. O. C.*

Executive Summary

Telemedicine is about the use of telecommunications technology to facilitate and possibly enhance the practice of medicine and other healthcare activities at a distance. Past telemedicine research has concentrated on the technological issues, including systems development and clinical applications. However, the ultimate success of telemedicine services and operations requires several managerial issues be appropriately addressed. This study investigates two important managerial issues for telemedicine services and operations: organizational competitiveness and consumers' value adding. Based on the Porter's Structural Analysis model, we evaluate the impact of telemedicine on the important structural features of organizations and illuminate the analyses with appropriate empirical evidence drawn from some real-world telemedicine projects and programs. In addition, we propose a consumption model for healthcare services and use this model to discuss the potential areas where telemedicine can add value to the consumers.

1. Introduction

Telemedicine can be broadly understood as the use of telecommunications technology to facilitate and possibly enhance the practice of medicine and other healthcare activities at a distance (Bashshur 1995; Gerneth 1994). In essence, telemedicine services are "electronic house calls" because they bring medical expertise and information to those in need rather than transporting the service consumers to the service facilities using mechanical means. The interest in and clinical role of telemedicine have significantly increased with recent advances in technology as well as the improvements in the national and global information infrastructures. As a result, an ever increasing number of telemedicine research projects and programs have emerged in almost every corner of the globe (Asian Communications 1995; Mekhjian et al. 1996; Mothobi and Massingue 1995; Nymo 1993; Trott 1995).

Since its inception in the late 1950s (Wittson, Afflect and Johnson 1961), telemedicine has been extensively researched and applied to a wide array of medical specialty areas with varying degrees of success (Baer et al. 1995; Cunningham, Marshall and Glazer 1978; Franken et al. 1989; Grundy, Jones and Lovitt 1982; Ito et al. 1994; Korsoff et al. 1995). Retrospectively, telemedicine has been primarily deployed to provide consultation and diagnosis services rather than treatment administration. Recently, the use of telemedicine for treatment and procedure administration with remote monitoring and guidance has progressively increased (Kavoussi et al. 1994). The past telemedicine research has

concentrated on the technological issues, particularly on systems developments and clinical applications (Perednia and Allen 1995). However, technological superiority and clinical applicability represent necessary but insufficient conditions for the success of the telemedicine services. Several challenges remain to be addressed before the ultimate success of telemedicine can be achieved. Most of these challenges are of managerial, including organizational competitiveness and consumers' value adding (Perednia and Allen 1995).

This study investigates the contributions of telemedicine in organizational competitiveness and consumers' value adding. We subscribe to Porter's Structural Analysis model (Porter 1985) to make analytical argumentation about the areas where telemedicine may bring desirable competitive advantages to hospitals. The analyses will be supported with empirical evidence drawn from appropriate real-world telemedicine projects and programs. In addition, we propose a model for healthcare service consumption to analyze the areas where telemedicine can add value for consumers. The organization of the remainder of the paper is as follows. Section 2 overviews some unique characteristics of healthcare services. Section 3 discusses telemedicine's impact on organizational competitiveness with illustrations from some real-world telemedicine projects and programs. Section 4 analyzes telemedicine's potential value adding to the consumers, based on a proposed service consumption model. The paper concludes with a summary, a discussion of its contributions and limitations, and some suggestions for future research directions in Section 5.

2. Characteristics of Healthcare Services

Healthcare services are unique because of their interesting characteristics in service nature, provision and consumption. First of all, healthcare is of critical importance to the consumers and usually has few substitutes. In many cases, healthcare services are largely price inelastic and their resource allocation and access become not only economic but also social-political considerations. To varying degrees, the healthcare industry has been partially regulated and often managed by the government (Ginzberg and Ostow 1994; McCarthy 1995). Healthcare services are commonly considered nonsatiated. As such, consumers prefer more over fewer services. Determination of the optimal level of healthcare services is difficult and greatly depends on the meaning of health for which a universal definition has yet merged (Field 1973). Healthcare is differentiated services and embraces dual aspects: curing and caring. The curing aspect is essentially technical and is concerned with clinical decision making and patient management. On the other hand, the caring aspect is non-technical and usually involves the interactions between service providers and patients.

In addition to the nature of service, the provision of healthcare services is also interesting. Healthcare services usually require the use of highly trained medical professionals and advanced technology, which are both of limited supply. Therefore, the resulting services are subject to considerable capacity constraints. By and large, service providers, including physicians and specialists, have a relatively high degree of professional dominance in the service transactions. At the same time, autonomy is also high among physicians and specialists and is often preserved at an individual level. The professional dominance together with individual autonomy enables medicine professionals to "create" demands for their services. As described by the Reomer's law, healthcare services are in demand and are consumed to the extent that they are available (Feldstein 1983). Contemporary medicine is built upon the principles of specialization and lowest level of efficient care (Nymo 1993). As such, the provision of proper care to a patient is beyond any individual physician or specialist and often requires a service network consisting of medical professionals of different specializations who collaborate in the forms of patient referrals (transfers) and consultations. In the presence of the increasing malpractice disputes and their detrimental implications, service providers may and in some cases do practice defensive medicine by providing "excessive" care, explicitly or implicitly.

The consumption of healthcare services is also significantly different from that of other services. The patients usually lack the necessary knowledge to evaluate service quality, *ex ante* or *ex post*. As a consequence, service providers usually act as their agents in deciding on healthcare services as well as evaluating the service quality. Furthermore, patients often resort to such non-technical proxy indicators as physician-patient relationships and amenities of care to select service providers or evaluate the service quality (Hill and Garner 1991). To a great extent, consumption of healthcare services is ad hoc because the services are needed in response to diseases and injuries whose onset are unpredictable and acute. The urgency and associated anxiety substantially preclude comparative shopping for healthcare services and promote the market segmentation based on geographical

service areas and healthcare provider networks (McCarthy 1995). To many patients, the costs of switching to a new service provider are high because the establishment of mutual understanding and trust takes time, and the transfer of the institutional archives of the patient's clinical history are costly and time-consuming, if possible at all. As a result, patients usually demonstrate an undivided brand loyalty by staying with the same service providers until encountering a drastic negative service experience (Jacoby and Chestnut 1978). The separation of service consumption from direct patient payments is also important. In many cases, direct payment for the provided services by the patient is nominal with the principal payment being made indirectly through an organized third-party, including government healthcare programs and commercial insurance companies.

3. Telemedicine and Organizational Competitiveness

Technology is not important for its own sake but rather for its impact on the competitive advantages of the adopting organization (Porter 1985). Critical to its long-term profitability, the competitiveness of an organization can be analyzed in terms of its relative strengths vis-à-vis the environment. Porter (1985) has proposed a Structural Analysis model to analyze organizational competitiveness. The competitiveness of an organization can be evaluated along its important structural features, which include potential entrants, buyers, suppliers, substitutes, and inter-organizational competitions. In a broader sense, an organization can be considered competitive when the bargaining power of its suppliers and buyers is relatively weak, the substitutes for its products and services are limited and non-threatening, the entry barriers to the industry are high, and the inter-organizational competition is not intense. Figure 1 provides a graphical depiction of Porter's model, which will be used in this paper to analyze telemedicine's impact on the organizational competitiveness of hospitals.

[Insert Figure 1 here]

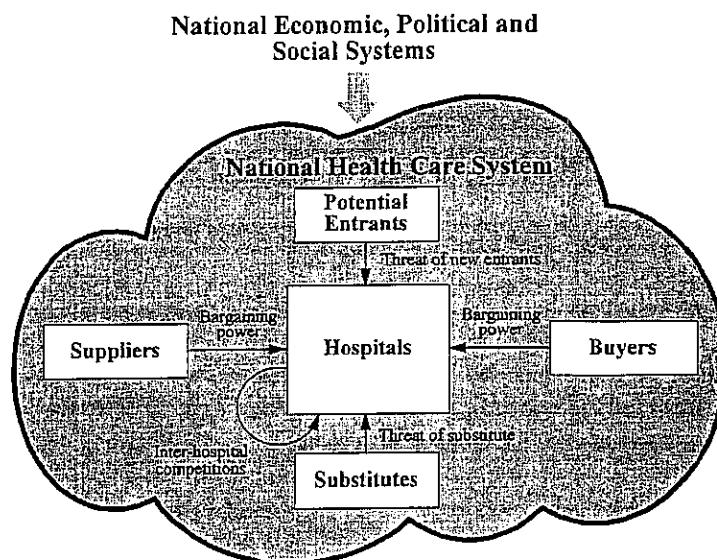


Figure 1: Porter's Structural Analysis Model for Organizational Competitiveness

A hospital, in this study, refers to an organization whose primary services lie in short-term, general and/or tertiary acute care (Kovner 1990). To improve the continuity of care and at the same time expand the patient base, many hospitals also operate outpatient clinics and rehabilitation facilities. Hospitals have been and still are the largest sector of the healthcare industry. For instance, hospitals were the largest healthcare sector in the United States in 1994, accounting for approximately 40% of the total annual healthcare expenditures (Ginzberg and Ostow 1994).

While its impact on the entry barriers may be marginal at best, telemedicine may have considerable effects on other structural features of hospitals. In many situations, the entry barriers to the hospital sector are high because of the substantial investment requirements, operations complexity, and government regulations. The use of telemedicine may not significantly increase or decrease the existent barriers. However, the impact of telemedicine on buyers, suppliers, substitutes and inter-hospital competition can not be neglected and are discussed as follows.

3.1 Buyers

The term buyers, in this study, refers to the individual end-consumers of healthcare services (i.e., patients). The bargaining power of the patients has traditionally been limited, due to the professional dominance of and patient dependence on the service providers. Compared with those operating without telemedicine technology, a hospital that provides telemedicine services may be more competitive because of further reductions in the bargaining power of the buyers. Telemedicine enables a hospital to expand its service area beyond the tyranny of geography. As a result, the hospital can tap into additional and possibly larger and more desirable patient bases for its service outlets. Moreover, telemedicine usually requires considerable investments measured in monetary or other terms on both ends. The investments in the learning of the technology, the familiarity with the service processes, and the establishment of the valuable understanding and trust represent steep switching costs to the service consumers. These switching costs may enable the service providing hospital to lock-in desirable patient bases and gain competitive advantages.

Telemedicine projects and programs that are deployed to improve access to healthcare services have the potential in weakening the bargaining power of the service consumers. Take the Telemedicine Project funded by the State of Arizona for instance. This project connects the radiology department of a medium-sized teaching/tertiary hospital located in southern Arizona with seven rural townships using telephones lines. The radiologists practicing with the teaching hospital routinely perform remote readings of the examinations taken in the connected townships located several hundred miles away. These townships lack medical specialists including radiologists because of their inferior geographic locations, limited population size and bitter economic conditions. The purpose of the project is to demonstrate the value and applicability of communications technology in improving the imbalanced access to healthcare services in the rural areas. However, its ultimate goal is to establish routine, post-project examination reading services for the residents of these townships. In this vein, the service areas of the teaching hospital can be expanded. In addition, the service-providing hospital may be able to monopolize the remote patient bases, thanks to the learning curve for the technology and service process, and valuable understanding and trust built at both professional and personal levels. The service area expansion together with high switching costs may weaken the bargaining power of the patients and as a result the hospital's competitiveness is enhanced.

3.2 Suppliers

Medical professionals are the most important and costly suppliers to a hospital. In the conventional, face-to-face healthcare paradigm, the supply of medical professionals is greatly limited by geographic distance. To become a potential supplier, a physician or specialist needs to reside physically within a manageable distance from the hospital. The bargaining power of the medical professionals has been high because of their limited supply and high autonomy. The use of telemedicine may contribute to reducing the bargaining power of the medical professionals, especially in situations where demand exceeds local supply. Telemedicine puts all medical professionals around a unit circle. As a result, the supply of medical expertise is no longer bounded by the physical distance. The hospital can resort to distant medical professionals for their services (i.e., outsourcing). Thus, an alternative supply can be used by the hospital to leverage for more favorable terms in its negotiations with the medical professionals, resulting in desirable competitive advantages.

A good example of using telemedicine technology to outsource clinical services is St. John's Hospital[†], a small-sized, for-profit private general hospital in Hong Kong. This hospital provides its patients with services in radiological examinations using such advanced modalities as Computer Tomography (CT), Magnetic Resonance Imaging (MRI), and Nuclear Medicine (NM). However, the limited number of daily examinations cannot economically justify the employment of an in-house specialist. The acquisition of a commercial PC-based teleradiology system provides St. John's a valuable alternative. With this system, the hospital is able to outsource its examination reading to a London-based hospital. This example highlights the potentials of the telemedicine-enabled service outsourcing, which may contribute to reducing the bargaining power of the hospital's suppliers, leading to competitive advantages.

[†] Not its real name. Pseudonyms will be used throughout the paper when appropriate to preserve the necessary confidentiality.

3.3 Substitutes

The term substitutes refers to the services equivalent to or interchangeable with those provided by a hospital. To a certain extent, the services provided by a hospital can be substituted with those provided by compatible hospitals. In addition, technology has progressively empowered the moving of some services from costly facilities such as hospitals to those that are more economical, including ambulatory care and rehabilitation care centers. From the perspective of the hospitals, such service migrations represent the loss of patients. The use of telemedicine may relax the pressure of the substitute services offered by other hospitals and at the same time possibly reverse the direction of the economically motivated service migrations. Telemedicine can make healthcare services become distance insensitive. As such, a hospital can aggressively extend its service territory with satellite hospitals staffed with less costly medical professionals to administer patient treatment physically with remote supervision and guidance of their senior counterparts located in the home-based hospital. Similarly, the hospital can also take an offensive strategy to penetrate into the other healthcare sectors including ambulatory care and rehabilitation care by operating satellite clinics and rehabilitating care centers. This offensive strategy is particularly appealing to hospitals offering outpatient clinics and tertiary care.

One government-funded telemedicine project in Hong Kong connects the neurosurgical unit of a district general hospital located in the New Territories region with a tertiary neurosurgery center. The primary purposes of the deployed telemedicine technology are to improve the service quality - particularly the service timeliness, and reduce the unnecessary or undesirable patient transfers from the general hospital to the tertiary center. However, the deployed telemedicine technology may also have important implications to the service substitutions. An analysis of a patient transfer flow pattern shows that when an unnecessary patient transfer takes place, the general hospital in effect loses one patient to the tertiary center. By linking with the tertiary center with the telemedicine technology, the general hospital can effectively assess and monitor the necessity of the patient transfers and therefore reduce the pressure of the service substitutes from the tertiary center. At the same time, the general hospital can also provide alternative care for patients who have made satisfactory progress at the tertiary center. The combined effects of reducing unnecessary patient transfers and reserving the patient transfer flow may contribute to lowering the threat of service substitutes, resulting in competitiveness enhancements.

3.4 Inter-Organization Competition

Telemedicine has the potential in transforming healthcare transactions from the conventional marketplace to the technology-enabled marketspace (Bakos 1991; Malone, Yates and Benjamin 1987). In this projected marketspace, the effective distance between any two geographic locations is constant. As a result, the healthcare market can no longer be effectively segmented by physical service areas. The intensity of the inter-hospital competition will be inadvertently increased as some hospitals equipped with telemedicine penetrate into the service territories of the others. The market is more competitive and thus the overall competitiveness of individual hospitals decreases. Compared with those without telemedicine technology, a hospital that provides telemedicine services may gain competitive advantages by articulating and even selecting desirable competition forms. For instance, the hospital can use telemedicine to economize the scale of its services. As a result, the hospital may assume the cost leadership in its respective services and choose to compete on the cost dimension. Other forms of competition can also be desirable. For example, a tertiary hospital that houses elite physicians and specialists can pursue brand name recognition and compete on the service quality dimension.

Economy of scale using telemedicine has been achieved at a Texas-based private diagnostic clinic that provides sizable dialysis services to patients located in several rural areas around San Antonio. The specialists practicing with the clinics use a teleconferencing system to monitor remotely and instruct the local healthcare agents, including physician's assistants and practical nurses who administer treatments and procedures to the patients. With the deployed telemedicine technology, the average number of patients that a specialist can manage is considerably increased. The increased productivity can be translated into decreases in the costs of services, with the investments for the telemedicine technology taken into account.

4. Telemedicine and Consumers' Value Adding

In addition to organizational competitiveness, the consumers' value adding brought about by telemedicine is also essential. From the patient's perspective, changes in service process and technology deployment are not meaningful unless they can contribute to their value adding (Hammer and Champy 1994). To analyze telemedicine's value adding to the patients, we need to understand the activities required for their healthcare service consumption. Based on the common service consumption activities, we propose a service consumption model that serves as a necessary vehicle for our investigation of the areas where telemedicine has the potentials in adding value for the patients.

4.1 A Consumption Model for Healthcare Services

To consume healthcare services, patients usually need to engage in a series of activities, including search, coordination and consumption. Thus, the potential areas where telemedicine can introduce value adding to the patients can be identified by analyzing the required activities. Based on a common behavioral sequence for product/service consumption (Olson 1993), we propose a consumption model for healthcare services. Figure 2 graphically depicts the proposed model.

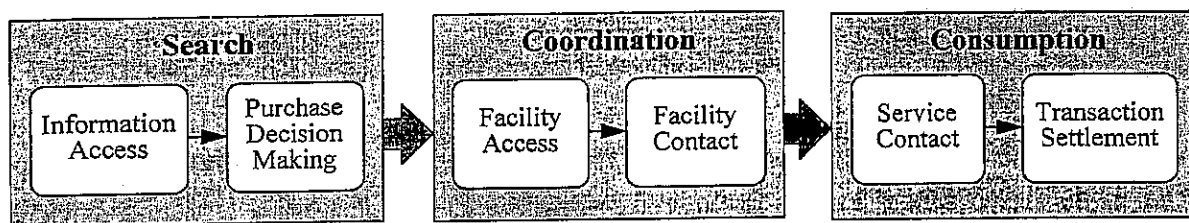


Figure 2: A Consumption Model for Healthcare Services

The activities that a patient engages in consuming healthcare services can be temporally classified into three phases: search, coordination, and consumption. The search phase includes information contact and purchase decision making. Information contact brings the patient into contact with information about service providers and their services. Information contact usually incurs search costs varying with information sources and accessibility. Credibility is also essential in information contact and literature seems to suggest that physicians and intimate friends and family are the primary information sources of credibility (Beltramini and Sirsi 1992). Purchase decision making is about the patient's deciding on the service provider from whom specific services will be purchased. Purchase decision making requires considerable amounts of information processing and usually consists of rounds of information comprehension, synthesis, evaluation, and alternative ranking, which together result in the final choice. The patient's purchase decision making can be multi-objective and thus involves trade-off evaluations among competing and possibly conflicting objectives. Purchase decision making is also knowledge intensive because the information processing and alternative evaluations require medical knowledge and expertise. Lacking such knowledge, patients greatly depend on the service providers for suggestions on and judgments of their consumption decisions.

Coordination is about service access and usually requires a patient to perform facility access and facility contact activities. Facility access is to locate and negotiate an agreement with the service provider on service transaction conditions, including service time, location, fee, and pre-consumption conditioning. Appointment making is the most common facility access activity and can be made by either the patient or the referring physician's clinic, using such telecommunications technology as telephone and fax. Facility contact refers to the necessary traveling that brings the patient to the service facility, and the necessary pre-service preparations, which include the patient's signing in, having the vital signs taken, and providing brief descriptions of the current health problem and symptoms.

Consumption means the patient's actual experience and completion of the requested service. In most cases, consumption requires service contact and transaction settlement. Service contact is about the patient's actual experience of the delivered service and may involve varying degrees of the provider-consumer interactions, dependent on the medical specialty and service nature. Transaction settlement

punctuates a service transaction. The patient usually needs to work closely with the service provider's staff to arrange future service consumption and monetary compensation for the provided services.

4.2 Dimensions of Value for Healthcare Services

Access, quality and cost have been identified as the primary dimensions on which service providers are competing for the healthcare market (Johnson 1992). As such, these dimensions represent the specific aspects of healthcare services valued by the patients. Access means the right to and ease of using healthcare services. To a great extent, access to healthcare services is hindered by barriers of physical, temporal, informational, economic, social-political and cultural considerations. Quality of care is about the outcome of the provided care and can be broadly defined as the extent to which possible improvements in health status are achieved through the application of the science and technology of medicine in managing the patient's health problems. Healthcare services embrace both curing and caring and therefore the evaluation of the service quality needs to separate the technical from the non-technical aspect of care. In addition to clinical decision accuracy, timeliness and continuity of care are also important in patient management, which is a primary determinant of the curing effect of the provided services. When provided in a timely manner, healthcare services are usually more effective and less costly. Furthermore, the effectiveness of patient management is also contingent on the continuity of the provided care. For instance, the provision of proper rehabilitation or long-term care to the patients recently discharged from hospitals can greatly affect the outcome of the previously provided hospital care.

The total costs of an economic activity can be broadly expressed as the sum of production and transaction costs. The production costs depend on the employed technology and other inputs necessary to the provision of the transacted product and service, whereas the transaction costs are contingent on how the transaction is organized (Milgrom and Roberts 1992). The use of telemedicine technology has important implications to the production costs of healthcare services. However, the resulting impacts are usually reflected on the service fees on which the individual patients have limited negotiation positions (i.e., price taking). Furthermore, the portion of direct payment by the patient for the provided service is marginal. The combined effect of price taking and limited direct payment make transaction costs more relevant to the patients.

As Coase (1988) noted, "[I]n order to carry out a market transaction, it is necessary to discover who it is that one wishes to deal with, to inform people that one wishes to deal with and on what terms, to conduct negotiation leading up to a bargain, to draw up the contract, to undertake the inspection needed to make sure that the terms of contract are being observed and so on." In this light, the patients will incur costs in search, coordination and motivation in their consumption of healthcare services. Search costs refer to those incurred by the patient in obtaining information on service providers and their services, and deciding on the specific service to purchase. Coordination costs are results of negotiating the necessary agreement on the transaction conditions with the service provider. Motivation costs are results of informational incompleteness and asymmetries, and imperfect commitment (Milgrom and Roberts 1992). Informational asymmetries exist because the patients have incomplete information to evaluate the transaction specifications and service quality on which the service providers have considerable private information. That patients depend on service providers for consumption decisions is also problematic. This resembles a classic principle-agent problem whose correction requires monitoring costs on the patient's end to enforce the service provider's commitment in acting in the patient's best interest.

4.3 Areas of Consumers' Value Adding

The use of telemedicine can add value to the patients in their service consumption. Based on the proposed service consumption model, we have identified several areas where consumers' value adding is attainable with telemedicine. First of all, information access can be facilitated and improved by lowering the physical barriers and reducing the search costs. The search for desired healthcare services is no longer limited to those locally provided. Facility access is another area where telemedicine can add value to the patients because their efforts in locating and reaching agreements with the selected service provider can be reduced. The patient's physical traveling needs can be minimized. The necessary coordination for the service transaction can be managed by the local healthcare agent who can be a primary care physician, a physician's assistant, or a licensed practical nurse. As a result, the coordination costs incurred by the patients can be decreased. Service contact is also an important area where telemedicine can introduce value adding to the patients. With

telemedicine, the patient's actual consumption of healthcare services is free of geographic, temporal, and social-political constraints. Thus, service quality can be improved, especially in service timeliness and continuity of care. The amenities of healthcare services can also be significantly enhanced with telemedicine. In addition, the presence of local healthcare agents and explicit service documentation, which may include video clips obtained from the videoconferencing system, may make greatly facilitate quality assurance control of the provided services and thus induce greater efforts from the service provider in acting in the patient's best interest, resulting in reductions in monitoring costs. Table 1 summarizes telemedicine's potential value adding to the patients.

Service Consumption Activity	Dimension of Value Adding	Sources of Value Adding
Information Access	Access	Reductions in Physical Barriers
	Costs	Search Costs
Facility Access	Access	Reductions in Physical Barriers
	Costs	Reductions in Coordination Costs
Facility Contact	Access	Reductions in Physical Barriers
		Reductions in Temporal Barriers
		Reductions in Social-Political Barriers
	Costs	Reductions in Coordination Costs
Service Contact	Access	Reductions in Physical Barriers
		Reductions in Temporal Barriers
		Reductions in Social-Political Barriers
	Quality	Improvements in Service Timeliness
		Improvements in Continuum of Care
		Improvements in Service Amenities
	Costs	Reductions in Monitoring Costs

Table 1. Impacts of Telemedicine on Consumers' Value Adding

5. Conclusion

Telemedicine has the potential to solve many contemporary healthcare problems related to service access, costs and quality. However, the success of telemedicine in becoming a viable supplement of or alternative to the conventional, face-to-face healthcare services requires an understanding of its impacts on organizational competitiveness and consumers' value adding. In this study, we have provided analytical discussions on telemedicine's impact on the competitiveness of the adopting hospital, based on the Porter's Structural Analysis model, with appropriate illustrations from some real-world telemedicine projects and programs. In addition, we have also proposed a consumption model for healthcare services and used this model to analyze the consumers' value adding brought about by telemedicine.

This study has contributed to both the research and the practice of telemedicine. On the research front, we have responded to the need for investigating the important managerial issues of telemedicine using analyses built on the premise of an accepted framework for organizational competitiveness. The practitioners of telemedicine can also benefit from the discussions of competitive advantages induced by telemedicine and the areas where telemedicine can add value to the patients. However, the research results are largely limited to conceptual analyses and discussions. In addition, the included telemedicine projects and programs are mostly image-based. These limitations call for our intermediate research attention to develop a research framework for detailed analysis and to validate them with empirical case studies involving healthcare organizations that have adopted different telemedicine technology.

References:

- Asian Communications, "Telemedicine: When Distance is No Object," July 1995, pp.41-43.
 Baer, L.; Cukor, P.; Jenike, M. A.; Leahy, L.; O'Laughlen, J.; and Coyle, J. T., "Pilot Studies of Telemedicine for Patients with Obsessive-Compulsive Disorder," *American Journal of Psychiatry*, Vol.152, 1995, pp.1383-1385.

- Bakos, J. Y. "A Strategic Analysis of Electronic Marketplaces," *MIS Quarterly*, Vol. 15, No. 3, Sept. 1991, pp.294-310.
- Bashshur, R. L., On the Definition and Evaluation of Telemedicine, *Telemedicine Journal*, Vol.2, No.1, 1995, pp.19-30.
- Beltramini, R. F. and Sirsi, A. K., "Physician Information Acquisition and Believability," *Journal of Health Care Marketing*, Vol. 12, No. 4, Dec. 1992, pp.52-59.
- Coase, R. H., *The Firm, the Market and the Law*, University of Chicago Press, Chicago, 1988.
- Cunningham, N.; Marshall, C.; and Glazer, E., "Telemedicine in Pediatric Care: Favorable Experience in Nurse-Staffed Inner-City Clinic," *Journal of American Medical Association (JAMA)*, Vol.240, 1978, pp.2749-2751.
- Feldstein, P., *Health Care Economics*, 2nd Edition, John Wiley & Sons, New York, 1983.
- Field, M., "The Concept of Health System at the Macrosociological Level," *Social Science and Medicine*, Vol. 7, 1973, pp.763-785.
- Franken, E. A., Jr.; Driscoll, C. E.; Berbaum, K. S.; Smith, W. L.; Sat, Y.; Steinkraus, L. W.; and Kao, S. C., "Teleradiology for A Family Practice Center," *Journal of American Medical Association (JAMA)*, Vol.261, 1989, pp.3014-3015.
- Gerneth, M., "FEST: Framework for European Services in Telemedicine," *Computer Methods and Programs in Biomedicine*, Vol. 45, 1994, pp.71-74.
- Ginzberg, E. and Ostow, M., *The Road to Reform: the Future of Health Care in America*, The Free Press, New York, 1994.
- Grundy, B. L.; Jones, P. K.; and Lovitt, A., "Telemedicine in Critical Care: Problems in Design, Implementation, and Assessment," *Crit Care Med*, Vol.10, 1982, pp.471-475.
- Hammer, M. and Champy, J., *Reengineering the Corporation*, Harper Collins, New York, 1994.
- Hill, C. J. and Garner, S. J., "Factors Influencing Physician Choice," *Hospital and Health Services Administration*, Vol. 36, No. 4, Winter 1991, pp.491-503.
- Ito, H.; Dachi, H.; Taniyama, K.; Fukuda, Y.; and Dohi, K., "Telepathology is Available for Transplantation Pathology: Experience in Japan Using An Integrated, Low-cost, and High-quality System," *Mod Pathol*, Vol.7, 1994, pp.801-805.
- Jacoby, J. and Chestnut, R. W., *Brand Loyalty: Measurement and Management*, John Wiley & Sons, New York, 1978.
- Johnson, J., "Managed Care in the 1990's: Providers' New Role for Innovative Health Delivery," *Hospitals*, Vol. 66, March 20 1992, pp.26-30.
- Kavoussi, L. R.; Moore, R. G.; Partin, A. W.; Bender, J. S.; Zenilman, M. E.; and Satava, R. M., "Telerobotic Assisted Laparoscopic Surgery: Initial Laboratory and Clinical Experience," *Urology*, Vol.44, 1994, pp.15-19.
- Korsoff, L.; Kallio, T.; Korman, M.; and Heinila, J., "Experiences with A Teleradiology System in Pulmonary Diseases," *Acta Radiol*, Vol.36, 1995, pp.37-40.
- Kovner, A. R., *Hospitals in Health Care Delivery in the United States*, 4th Edition, Edited by A. R. Kovner, Springer Publishing, New York, 1990.
- Malone, T. W.; Yates, J.; and Benjamin, R.I., Electronic Markets and Electronic Hierarchies, *Communications of the ACM*, Vol. 30, No. 6, June 1987, pp.484-497.
- McCarthy, D., "The Virtual Health Economy: Telemedicine and the Supply of Primary Care Physicians in Rural America," *American Journal of Law & Medicine*, Vol. 21, No. 1, 1995, pp.111-130.
- Mekhjian, H.; Warisse, J.; Gailun, M.; and McCain, T., "An Ohio Telemedicine System for Prison Inmates: A Case Report," *Telemedicine Journal*, Vol.2, No.1, 1996, pp.17-24.
- Milgrom, P. and Roberts, J., *Economics, Organization and Management*, Prentice-Hall, Englewood Cliffs, New Jersey, 1992.
- Mothobi, C. and Massingue, V., "Re-engineering the Communications Process in Mozambique with A Focus on Primary Health Care," *Proc. of the International Conference on Telemedicine and Telecare (Telemed'95)*, 8-9 November 1995, London, United Kingdom.
- Nymo, B., *Telemedicine*, Teknionikk, Kjeller, Finland, 1993.
- Olson, P., *Consumer Behavior and Market Strategy*, Third Edition, Irwin, Homewood, Illinois, 1993.
- Perednia, D. A. and Allen, A., "Telemedicine Technology and Clinical Applications," *Journal of American Medical Association*, Vol. 273, No. 6, February 1995, pp.383-488.
- Porter, M., *Comparative Advantages*, The Free Press, New York, 1985.
- Trott, P., "The Queensland Northern Regional Health Authority Telemental Health Project," *Proc. of the International Conference on Telemedicine and Telecare (Telemed'95)*, 8-9 November 1995, London, United Kingdom, pp.173-181.
- Wittson, C. L.; Afflect, D. C.; and Johnson, V., "Two-way Television Group Therapy," *Ment Hosp.* Vol.12, November 1961, pp.22-23.