Chapter 36
Conservation of Information (COI):
Geospatial and Operational Developments in E-Health and Telemedicine for Virtual and Rural Communities

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ABSTRACT

The authors review telemedicine and e-health from an organizational perspective. To evaluate their effectiveness, they review organizational and system theory along with field and laboratory results. Theory of the conservation of information (COI) provides the means to study tradeoffs across space and over time as telemedicine and e-health management make operational decisions for virtual communities users. With the authors' three case studies, they evaluate COI for telemedicine and e-health networks operating in the state of Georgia. After analyzing the case studies with COI, the authors close with a review of future trends that includes an interaction rate equation, an agent-based model (ABM) using natural selection (machine learning), and a Monte Carlo simulation of return on investments (ROI).

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INTRODUCTION

We review the background of Telemedicine and eHealth from an organizational perspective. To evaluate the role of COI in organizational effectiveness, we review organizational and system theory along with past applications and field and laboratory results, three case studies using Telemedicine and eHealth, a model using natural selection (machine learning), and a Monte Carlo simulation of return on investments (ROI). Theory provides tools to analyze tradeoffs based on COI in eHealth management decision-making. In the three case studies, we provide an overview of a Telemedicine and eHealth network from the State of Georgia operating in the Southeast Public Health District (SEPHD), East Georgia Health Cooperative (EGHC), and Island Health Care (IHC)/The Healthcare Alternatives (THA) Group. Next, we analyze the case studies with COI and the weaknesses and strengths of our theory and approach. Finally, we close with a review of Future Trends.

BACKGROUND

Digital technologies are transforming many areas of human endeavor from commerce and entertainment to government and communications (Miller & West, 2006). Policymakers are emphasizing Information Technology (IT) for healthcare to improve service delivery, promote efficiency, educate consumers, and increase satisfaction. But other than gathering information from websites, few people are using IT to communicate online with health care personnel or to purchase medical services. This digital divide has impeded e-health's acceptance. Less well educated, lower income individuals in rural areas use the web less often for health care than better educated, higher income urbanites. To gain the benefits of IT for healthcare, it needs to become more widespread and its benefits more evident to consumers of all types across the country.

Medical care depends on physicians to collect and process patient information (White, 2008). But increasing knowledge requirements for patients and doctors, the need to evaluate populations of patients whether treated or not, unmet healthcare expectations, the costliness of fragmented care, and the rising demand for chronic disease care challenge traditional healthcare models that refinements alone may not solve. Healthcare IT is the best option for future medical progress. According to Lucas (2008), IT includes computer-aided diagnosis and treatment monitoring; telemedicine; and IT to inform the public and physicians on health and healthcare. But incorrect beliefs about IT pose a deterrent to telemedicine. England and Stewart (2007) warn that even senior healthcare executives hold beliefs inimical to the increased adoption of IT in healthcare.

Definitions

Telemedicine. Telemedicine is the use of telecommunication channels to provide medical information and services (Perednia & Allen, 1995). The simplest form of Telemedicine is used daily by health professionals over the telephone. More sophisticated Telemedicine applications used by the military and large medical centers include satellite technology to consult among providers in different countries; videoconferencing; and distance-robotic technology. Telemedicine is based on two concepts: real time (synchronous communication) and "store and forward" (asynchronous communication). Real-time telemedicine can be a simple phone call or complex robotic surgery. Face-to-face consultations in real-time telemedicine occur with two-way interactive television. Asynchronous telemedicine transfers digital images between locations when an image is collected ('stored') and sent ('forwarded') to another location locally over a Local Area Network (LAN), across a city with a Wide Area Network or Metropolitan Area Network, or globally (world wide web). It is used for non-emergency situations,

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