

Chapter 2

The Impact of Location-Aware Systems in Hospitals: A Tri-Core Perspective

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ABSTRACT

This paper focuses on the impact of information systems providing real-time or near real-time knowledge of location, described as location-aware systems. The study utilizes a qualitative, interview-based approach to guide our understanding of the benefits associated with the increased information transparency made available with location-aware information systems. The goal of this study is to examine the benefits of location-aware information systems on managing mobile assets in the hospital context. The Swanson's tri-core model of innovation is used as the theoretical framework. The tri-core model provides a framework for understanding the role innovations play in administrative, technical and operational effectiveness. This distinction is important for the regulatory intensive environment of hospitals.

INTRODUCTION

Organizations of all types are under increasing pressure to operate more effectively. Location-aware systems have been identified as a promising innovation for achieving this objective. Simply put, location-aware information systems can improve process effectiveness and quality by reducing the search times for an object through

increased visibility of the object's location (Legner & Thiesse, 2006). Many companies, most notably Wal-Mart and other retailers, have been using location-aware technologies such as radio frequency identification (RFID) tags for tracking materials throughout their inter-organizational supply chains (Angeles, 2005). However, an area that has received less emphasis is the use of location-aware systems for improving operational effectiveness *within* the organization.

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Hospitals in the United States represent one particular type of organization that are under increased pressure to improve effectiveness in both operational efficiency and regulatory compliance. A combination of increasing regulation and expensive diagnostic technologies and treatments has resulted in an intense focus by hospitals to innovate. Hospitals are recognizing the potential effectiveness gained by using location-aware technologies. For example, Presbyterian Healthcare Services in Albuquerque, NM and Beth Israel Deaconess Medical Center in Boston are implementing location-aware systems based on RFID to quickly locate and track medical equipment such as crash carts and wheelchairs (Havenstein, 2005).

In order to study location-aware information systems, we utilize a qualitative, interview-based approach with Swanson's (1994) tri-core model of IS innovation as its theoretical foundation. The tri-core model is used to examine location-aware systems and the diffusion of this innovation across the organization's core functions. Using the tri-core model, we study the functional uses and benefits of location-aware systems within the hospital setting.

This paper is organized as follows. In the next section, we begin with a brief review of background literature on location-aware technologies such as RFID. This is followed by an initial round interview-based data collection to explore the *anticipated* benefits of location-aware systems in hospitals. Next, we review the Swanson (1994) tri-core model and discuss its applicability in predicting IS innovation diffusion. We then provide the results of a second round of interview-based data collection focused on the *actual* benefits experienced by a U.S. hospital. The paper concludes with a discussion that synthesizes the results of the study.

BACKGROUND

In this study, we use the terms "Location-Aware Information Systems" and "Location-Aware Systems" to refer to information systems that integrate location information with other information system applications in order to provide real-time or near real-time knowledge of location. Location information describes the physical location of an object. Technologies such as Radio Frequency Identification (RFID) and Global Positioning Systems (GPS) are perhaps the most widely known location-aware systems and are used to provide specific location information on different types of objects. Location-aware systems typically use one of these three techniques to determine a given location: (1) triangulation which uses multiple distance measures between known points; (2) proximity, which measures the nearness to a known set of points; and (3) scene analysis, which examines a view from a particular vantage point (Hightower & Borriello, 2001). Location information can be integrated with existing database systems and other information systems in order to provide real-time or near real-time knowledge of location. Context awareness is a part of location information and is the concept of sensing and reacting to dynamic environments and activities (Hazas, Scott, & Krumm, 2004). One potential application of location-aware systems is in improving the operating efficiencies of an organization in the management of mobile assets.

Mobile asset management refers to the tracking and managing of assets that are capable of moving from one location to another. The goal of mobile or movable asset management is to make these assets available when needed and to ensure their efficient use (Lampe & Strassner, 2003). As such, mobile asset management not only includes locating an

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