An Activity Theory Analysis of RFID in Hospitals

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ABSTRACT

Although there have been many proposed applications of RFID in hospitals, few of those applications have received sustained use in hospitals, to-date. As a result, this paper investigates the use of RFID in hospitals in an emerging application, that of using RFID as part of the prescription process, including pharmacists’ generation of the prescription and nurses’ administration of the medicine. Using activity theory, activity templates are generated for pharmacists, nurses and the hospital to investigate the introduction of RFID. This paper finds that the introduction of RFID involves changes in the activities, as measured by changes in context variables, not just changes in technology. Also, the RFID-based approach eliminates substantial “medicine” slack. Further, using activity theory, the activity design for using RFID facilitates “technologically insulated” of pharmacists and nurses, from each other and doctors. Finally, such “digital specification” of activities likely leads to fewer errors, and constrains action, limiting inappropriate use of prescription drugs.

Keywords: Activity Theory, Activity Theory Organization Aggregation, Digital Specificity, Hospitals, RFID, Technology Eliminated Slack, Technology Insulation

INTRODUCTION

Many intriguing potential uses have been suggested for radio frequency identification (RFID) in hospitals (Collins, 2004). As a result, RFID has been highly touted as an integral part of the hospital of the future (e.g., Furher & Guinard, 2006). Unfortunately, there are far fewer implementation stories (e.g., Baker, 2005; Halamka, 2006, 2007b) than there are potential applications. Further, there have been a number of concerns that “RFID implementation is not moving fast enough” (e.g., Young, 2006a). Accordingly, this paper investigates one hospital RFID application that has received recent attention within the context of a theoretical framework in order to anticipate some of the potential opportunities and limitations of that application. Specifically, this paper investigates the impact of introducing RFID into hospitals, in the emergency room processes of prescribing and administering prescription medicines to patients.

This analysis is done using a theory-based approach to analyze a case application. In particular, this application is investigated using “activity theory” as a basis of analysis. As its name suggests, activity theory is based on an analysis of activities in which people participate. Activity theory provides a rich set of context variables that can facilitate deep insights into the particular activities. Although originally...
developed as a psychological approach, the focus of activity theory has centered on taking into account the “context” on which the activity is based, rather than treating the technology independently.

**Purpose and Findings**

This paper applies activity theory to facilitate the analysis of the introduction of RFID technologies into hospitals, and the corresponding impact of those technologies on those organizations and their processes. The approach allows us to garner insights into the impact of RFID after its introduction, and in contrast to the use of previous technology and supporting processes. In addition, this approach allows us to investigate the different groups (e.g., pharmacists, nurses, etc.) affected by the introduction of the RFID, and how the introduction of the technology facilitates alignment with the overall organization.

The use of activity theory to analyze the introduction of RFID into a hospital organization lends us to three key insights and evaluative bases. First, the RFID-based approach appears to potentially eliminate particular kinds of organizational slack. Using RFID, medicines can now be specifically assigned so there is no “slack” medicine. Second, the RFID-based approach facilitates what I call “technology insulation” between different groups of actors, including nurses, pharmacists and doctors. The technology insulates the users groups from the actions of other groups. For example, nurses are limited in their set of actions because of and by the use of the technology. Third, the analysis finds what I call “Digital Specificity”: Prescriptions are specifically prescribed by doctors, and a prescription must be specifically generated by a pharmacist and that specific dosage must be administered to specific patient by a nurse, whose identification also is captured. The technology drives the activities and workflow with digital specificity as to who does what when.

In this paper, we also advance the use of activity theory to include disaggregation to different homogeneous groups and consideration of both input (pharmacists and nurses) and output (patients) activity groups. Further, we consider the resulting alignment that we find between the different groups in their use of RFID in this hospital setting.

**Outline of This Paper**

This paper proceeds in the following fashion. Sections 2 and 3 outline general RFID hospital applications and lay out the case study area that is the focus of this paper. Then sections 4 and 5 provide a review of activity theory and discuss how activity theory can be used to analyze organizations. In sections 6, 7, 8 and 9, I discuss pharmacists, nurses, the entire hospital, and the alignment between different groups, based on activity theory. The final section provides a summary of the paper, discusses the paper’s contributions and briefly analyzes some extensions.

**RFID HOSPITAL APPLICATIONS**

Starting in the early 2000’s there were a number of proposals for the use of RFID in hospitals (e.g., Hendrickson, 2004). RFID was identified in many news stories worldwide as a technology component that would facilitate some type of activity, such as control of hospital assets or prescription drugs.

As an example, RFID has been proposed as a basis to track the location of almost everything found in a hospital, including doctors, patients, pharmaceutical stocks and medicines, and medical hardware (e.g., Hendrickson, 2004; Caffrey, 2005; Godinez, 2007). With location information, would come the ability to provide greater security and control of those people or things being tracked. For example, Godinez (2007) describes another system that could be used to control medical supplies inventory that automatically captures who removes an item.

Fixed asset control seems to be the application of RFID that has gathered the greatest level of actual application. For example, in a survey by CIO, asset tracking was found to be the most...
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