A Normative Enterprise Architecture for Guiding End-to-End Emergency Response Decision Support

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ABSTRACT

This article examines the underlying architecture guiding the development and use of enterprise decision support systems that maintain the delivery of time critical public services. A normative architecture, developed from comparative cases involving San Mateo County and Mayo Clinic Emergency Medical Services systems, provides a collection of characteristics meant to guide an emergency response system toward a high level of performance and enable optimal decision-making. At a national symposium, academics and practitioners involved in promoting effective emergency response information systems provided validation for the architecture and next steps for enhancing emergency response information systems. Normative architecture characteristics and expert perspectives from the symposium are integrated into a framework that offers an enterprise approach for delivering time-critical emergency response services. This article provides recommendations for navigating toward a more incremental approach in developing enterprise-oriented emergency information services and examines future trends involving the application of normative architectural concepts to real-world emergency medical settings.

Keywords: Decision Support, Emergency Medical Services, Emergency Response, Normative Architecture, Performance, Time-Critical Information Services

INTRODUCTION

Information systems used by emergency response personnel must provide information and decision support anywhere and anytime it is needed, in a form and format that avoids “overload and miscues” and supports the “coordination of efforts of a great number of organizations and individuals” (Zwass, 2010, p. ix). For example, the perspectives provided by various emergency response organizations that received automobile crash data as part of the Minnesota Mayday System revealed that the new and additional data they received was...
a good “fit’ for them (Schooley, Horan, & Marich, 2010). The importance of receiving the appropriate data in a timely manner is significant since it improved their decision support mechanisms, which led to reduced response times and an increase in the quality of patient care that each organization was able to provide (Schooley, Horan, & Marich, 2010).

Such a need is consistent with findings from the broader Information Systems (IS) business community:, a top management concern is the ability for an enterprise system to make better use of information, while high on the list of supportive applications and technology is business process management (Luftman & Kempaiah, 2008). Making use of information for strategic, tactical, operational, or clinical decision-making has been a focal point for organizations for decades (Berner, 2006; French & Turoff, 2007; Turban et al., 2006). Decision support systems must be designed to “fit” within the context and purpose for which they are intended to support. The contexts in which decision support has proven valuable include a wide range of private and public sector organizations and their respective supply chains.

Recent research has also posited the importance of making better use of information for multi-organizational enterprise systems through information sharing and collaboration to support decision making and, ultimately, the delivery of public services to citizens (Dawes et al., 2004; Drake et al., 2004; Fountain, 2001; Scholl, 2005). These concepts have been extended to the specific context of public services where time is a critical factor, such as in the case of emergency medical services (EMS), homeland security, law enforcement, crisis response, hazardous material response, fire, search and rescue, and other disaster relief services (Horan & Schooley, 2007; Sawyer et al., 2005; Turoff et al., 2004). While several researchers have presented frameworks and heuristics for conceptualizing, designing, managing, and analyzing emergency information systems (e.g., Drury et al., 2009; Dwarkanath & Daconta, 2006; Horan & Schooley, 2007; Turoff et al., 2004), there is a need to investigate the underlying architectures for guiding the development and use of enterprise decision support systems for time critical contexts (Marich, 2008). Such an investigation would need to be context specific to emergency response, include a multi-dimensional understanding of information use from technological, organizational, and sociological (e.g., governance, management, institutional) perspectives (Manoj & Hubenko-Baker, 2007; Schooley & Horan, 2007), and allow for a prescriptive or normative architectural approach to guiding multi-organizational enterprise wide decision support systems.

This article aims to review findings from a multi-part research project and apply them to enterprise architecture concepts for emergency services, generally, and for the specific domain of emergency medical services (EMS). This article integrates research findings from conceptual framework development, two comparative case studies, and an expert practitioner symposium with an enterprise architecture framework referred to as the Emergency Services Enterprise Framework (ESEF). The ESEF is a framework “that provides an integrated process and technology methodology … [t]o ensure efficiencies and to promote collaborative information-sharing in the complex Emergency Services enterprise” (Dwarkanath & Daconta, 2006, p. 7). This article, then, applies a set of architectural imperatives to the ESEF derived from prior research and defined by EMS practitioners. These imperatives were designed to drive the EMS enterprise “away from inherent business silos and towards greater levels of standardization and integration of information and technology across all stakeholder groups” (Marich, Horan, & Schooley, 2008, p. 452). Recommendations are provided for navigating towards a more incremental approach in developing enterprise-oriented emergency information services and future trends involving the application of normative architectural concepts to real-world emergency medical settings are examined. An overview of the research approach is illustrated in Figure 1.
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