

## Strategic Graphic Dashboards for Improved Healthcare Technology Management Decisions

Elliot B. Sloane, Ph.D. – Villanova University Department of Decision and Information Technology,  
Villanova University College of Commerce and Finance, PA USA  
Eric Rosow, Joe Adam – Premise Development Corporation, Hartford, CT USA

### I. INTRODUCTION

This paper discusses the ongoing application of Strategic Digital Dashboard (SGD) technologies to a growing number of important medical applications. The growing number of medical data warehouses and repositories in military and civilian healthcare applications have proved challenging for useful application due to the sheer size and complexity of the knowledge-base (HighTechMaui 2002, Stratton and Dick 2002). Advances in graphical software development tools like LabView and others has allowed development of soft-configurable display systems that simplify human interpretation in several ways. First, such systems allow the developer to create graphical and audible display metaphors, like speedometers, bar displays, color- and brightness encoded symbols, and unique sound libraries, to focus user attention on the most important information (Rosow and Adam, 2003).

This paper is closely associated with a separate paper on the Joint Medical Asset Repository (JMAR). In that paper, the full details of the JMAR design and application is explained more fully. This present paper discusses a novel enhancement being developed for the JMAR system.

### II. SYSTEM DESCRIPTION

The latest application of an SGD is through a military-funded SBIR project (Stratton and Dick, 2002) to enhance their ongoing medical informatics and business reengineering research project known as the Joint Medical Asset Repository (JMAR). JMAR is a relational database system created to integrate very diverse medical supply information from the US military services existing information systems. JMAR was originally envisioned to correct medical supply and drug distribution problems that occurred during Operation Desert Storm, and it received additional strong impetus and urgency from the September 11<sup>th</sup> terrorist attacks (HighTechMaui, 2002).

The basic logistics and supply chain management issues are not dissimilar to published efforts in other industries (Clark and Crosson, 1997) simply stated, the Surgeon Generals of all three military branches would like to ensure access to any required drug, supply, or medical device regardless of which branch owns or inventories it. For example, an early JMAR module is one that integrates the information on available blood supplies from the three services existing information systems. By updating the JMAR knowledge base daily, the military's medical supply teams can locate needed plasma and blood types, deploy it

where and when necessary, and coordinate replenishment activities to minimize overall waste.

JMAR is based on a centralized Oracle engine, with a growing interface library to allow integrating information from the hundreds of heterogeneous systems in use by the medical services. This not only facilitates medical care to saves lives, but it also eliminates the hours and hours of staff time to make phone calls around the world that such searches required. Most drugs, supplies, and eventually most medical devices information will be integrated into the JMAR system, allowing it to serve as a global metadatabase for the military's medical leaders. Realization of the full scope of JMAR will take many more years, as it must eventually integrate complex information models like those used for medical equipment maintenance, updates, recalls, and repairs.

SGD's may have applications in the battle to manage alarm "overload," too. The large number of medical and information technologies deployed in healthcare settings have created a huge cognitive overload for clinicians. The JCAHO regulatory body has created a new set of alarm management goals for 2003 (JCAHO 2003) to begin the process of applying systemic thinking to resolving these problems. SGD's may show promise in this regard, because the convergence of information and medical technologies (Sloane 2001) will make it feasible to integrate the data, including alarms, from many, if not most clinically- and managerially-relevant systems. A properly-designed SGD should make it easier for a nurse or doctor to focus on critical, life-threatening alarms instead of delaying care by attending to less pressing alarms. Improvements in this area may make home health care safer and more effective, too, as lay users have great difficulty interpreting the significance, and selecting actions, when faced with multiple simultaneous alarms.

The SBIR-funded SGD project is intended to make the vast JMAR information resource more accessible to the military users at all levels, including inventory managers, financial planners, logisticians, and senior medical officers like the Surgeon Generals. JMAR's centralized information system will allow regression analysis, seasonal forecasting, wartime and catastrophic modeling, Pareto charting and other statistical tools to be mined. The SGD, in turn, will turn that information into usable symbols for rapid and accurate decisions instead of relying on complex, voluminous reports.

### III. CONCLUSIONS

Although many aspects of the JMAR system design must remain secret, the overall JMAR metadata design and implementation represents a valuable opportunity to explore the challenges and constraints of integrating a large amount of disparate information from any number of heterogeneous databases. In addition, the use of dashboard display techniques to reformat complex data into easily-interpreted, graphically-enhanced symbols will make enhance the users' ability to mine this data for statistically valid and important knowledge. The Strategic Digital Dashboards display critical information in a form that will allow rapid decisions, reduced costs, and better confidence. SGD development in the JMAR project will be another step in the evolution of complex medical information systems that can improve military and civilian medical supply logistics at a time when healthcare's economic losses and clinical errors continue to be headline news.

#### References:

Clark, Crosson. H.E. Butt Grocery Company. Harvard Business Review Case Study 9-196-061. 1997.

Highlight TechMaui Newsletter. [www.hightechmaui.com](http://www.hightechmaui.com). Spring/Summer 2002.

JCAHO (Joint Commission for the Accreditation of Health Care Organizations) [www.jcaho.org](http://www.jcaho.org). 2003.

Lewis, AG. Streamlining Health Care Operations: How Lean Logistics Can Transform Health Care Operations. San Francisco, Jossey-Bass. 2001.

Rosow E, Adam J. Digital Dashboards for Hospital Bed Capacity Management. HIMSS Annual Conference. San Diego. February, 2003.

Sloane E. Convergence of Medical and Information Technologies. Biomedical Instrumentation and Technologies. May/June 2001.

Stratton, D., Dick, M. Medical Logisticians Use JMAR As Their Tool Of Choice. Military Medical Technology Online (www.mmt-kmi.com) December, 2002.