

## Chapter 7.24

# Integrated Process and Data Management for Healthcare Applications

**Stefan Jablonski**

*University of Bayreuth, Germany*

**Rainer Lay**

*ProDatO Integration Technology GmbH, Germany*

**Christian Meiler**

*ProDatO Integration Technology GmbH, Germany*

**Matthias Faerber**

*University of Bayreuth, Germany*

**Bernhard Volz**

*University of Bayreuth, Germany*

**Sebastian Dornstauder**

*University of Bayreuth, Germany*

**Manuel Götz**

*University of Bayreuth, Germany*

**Sascha Müller**

*University of Erlangen-Nuremberg, Germany*

### ABSTRACT

Healthcare applications are demanding with respect to their IT needs. Due to their complexity they need strong IT support which must provide enough freedom to their users in the medical domain because of the high degree of flexibility required by them. We have chosen a process based technology, called data logistics, which can cope with these almost conflicting requirements. Data

logistics is based on clinical processes. However, when data logistics processes are executed, this happens transparently to the users and provides them a huge degree of freedom in determining the sequence of process execution. In order to cope with these challenging features, the process execution environment for data logistics processes is generated according to our model driven development approach called process driven architecture (PDA). Several clinical studies illustrate

the feasibility, effectiveness, and efficiency of the data logistics approach. This article both exposes the rationale of the data logistics approach and provides a deep inside into the implementation concepts.

## **INTRODUCTION**

### **General Factors**

The medical application domain has been a great challenge for information technology solutions for decades (Anderson, 1997; Berg & Toussaint, 2003; Lenz, Elstner, Siegele, & Kuhn, 2002) and is sometimes even considered as the “killer application” in the field of process support (Dadam, Reichert, & Kuhn, 2000). This estimation is based on the high complexity of the medical domain (Anderson, 1997; Lenz et al., 2002), which results from multiple factors. According to Anderson, J. G. (1997), Berg, (1999), and Kuhn, Giuse, Bakker, Ball and Gel (2001), these factors can be divided into two groups: technical and socio organizational.

### **Technical Factors**

There are several technical factors that lead to high complexity. First, medical processes are by nature not static and thus require high flexibility during execution (Dadam et al., 2000). Depending on the current health condition of a patient, various treatments must be made possible (Dadam et al., 2000). Consequently, the challenge during process execution is “not to restrict the physician or the nurse” (Dadam et al., 2000), but to silently assist and support decisions of the medical staff. Second, the underlying process models need to be quickly adaptable to new requirements, as medical processes change constantly over time (Lenz & Kuhn, 2004). Typical reasons for that are new medical research findings and organizational or juridical amendments. An organically grown

heterogeneous process landscape is the third factor; this heterogeneity leads to isolated integration islands. Processes differ in their characteristics like complexity, duration, number of actors, and so forth. Dadam et al. (2000) require either sophisticated or radical integration solutions.

### **Socio Organizational Factors**

The unique combination of several socio-organizational factors is typical for the medical application domain. First, clinical routine is characterized by high workload and continuous high demands on all process participants. This is not surprising, as the medical staff is “responsible for many patients and they have to provide an optimal treatment process for each of them” (Dadam et al., 2000). Second, the process participants differ in their knowledge about the clinical applications. So, “cooperation between organizational units as well as the medical personnel [becomes] a vital task” (Dadam et al., 2000) for the clinical application domain. Third, the complexity of processes is very high, which results from the numerous and sophisticated dependencies within and between processes. This complexity is hard to manage for all process members. Last but not least, IT is often considered critically by the medical staff. According to Anderson (1997), “physicians have been unwilling to change their traditional practice of using the paper medical record.” Anderson (1997) also notes that physicians accept information systems that allow for an improved patient treatment process but resist against information system that try to automate medical decisions. By involving process participants in information system development at an early stage, it can be assured that the realization of a medical process complies with their way of organizing work. This early involvement can increase IT acceptance (Anderson, 1997; Berg, 1999; Handler, Feied, Coonan, Vozenilek, Gillam, Peacock et al., 2004; Lenz, Buessecker, Herlofsen, Hinrichs, Zeiler, & Kuhn, 2005). We will now replenish and con-

20 more pages are available in the full version of this document, which may be purchased using the "Add to Cart" button on the publisher's webpage: [www.igi-global.com/chapter/integrated-process-data-management-healthcare/26366](http://www.igi-global.com/chapter/integrated-process-data-management-healthcare/26366)

## Related Content

---

### A Review on Noninvasive Beat-to-Beat Systemic and Pulmonary Blood Pressure Estimation Through Surrogate Cardiovascular Signals

Ana Castro, Paulo de Carvalho, Jens Muehlsteff, Sandra S. Mattos and Miguel Coimbra (2018). *Biomedical Engineering: Concepts, Methodologies, Tools, and Applications* (pp. 1038-1070).

[www.irma-international.org/chapter/a-review-on-noninvasive-beat-to-beat-systemic-and-pulmonary-blood-pressure-estimation-through-surrogate-cardiovascular-signals/186717](http://www.irma-international.org/chapter/a-review-on-noninvasive-beat-to-beat-systemic-and-pulmonary-blood-pressure-estimation-through-surrogate-cardiovascular-signals/186717)

### Soft Statistical Decision Fusion for Distributed Medical Data on Grids

Yu Tang (2009). *Medical Informatics: Concepts, Methodologies, Tools, and Applications* (pp. 2484-2497).

[www.irma-international.org/chapter/soft-statistical-decision-fusion-distributed/26387](http://www.irma-international.org/chapter/soft-statistical-decision-fusion-distributed/26387)

### Portable Subcutaneous Vein Imaging System

S. N. Sravani, Sumbul Zahra Naqvi, N. Sriraam, Manam Mansoor, Imran Badshah, Mohammed Saleem and G. Kumaravelu (2013). *International Journal of Biomedical and Clinical Engineering* (pp. 11-22).

[www.irma-international.org/article/portable-subcutaneous-vein-imaging-system/101926](http://www.irma-international.org/article/portable-subcutaneous-vein-imaging-system/101926)

### Content-Based Image Retrieval for Digital Mammography

Issam El Naqa, Liyang Wei and Yongyi Yang (2010). *Ubiquitous Health and Medical Informatics: The Ubiquity 2.0 Trend and Beyond* (pp. 485-508).

[www.irma-international.org/chapter/content-based-image-retrieval-digital/42947](http://www.irma-international.org/chapter/content-based-image-retrieval-digital/42947)

### From Bench to Bedside: BACE1, Beta-Site Amyloid Precursor Protein Cleaving Enzyme 1, From Basic Science to Clinical Investigation

Yong Shen (2011). *Early Detection and Rehabilitation Technologies for Dementia: Neuroscience and Biomedical Applications* (pp. 118-124).

[www.irma-international.org/chapter/bench-bedside-bace1-beta-site/53429](http://www.irma-international.org/chapter/bench-bedside-bace1-beta-site/53429)