Chapter 7.24
Integrated Process and Data Management for Healthcare Applications

Stefan Jablonski
University of Bayreuth, Germany

Bernhard Volz
University of Bayreuth, Germany

Rainer Lay
ProDatO Integration Technology GmbH, Germany

Sebastian Dornstauder
University of Bayreuth, Germany

Christian Meiler
ProDatO Integration Technology GmbH, Germany

Manuel Götz
University of Bayreuth, Germany

Matthias Faerber
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-

Related Content

Recognition of Emotions in Gait Patterns Using Discrete Wavelet Transform

N. M. Khair, Hariharan Muthusamy, S. Yaacoband S. N. Basah (2012). *International Journal of Biomedical and Clinical Engineering (pp. 86-93).*

www.irma-international.org/article/recognition-emotions-gait-patterns-using/73696

Security of Electronic Medical Records

Ana Ferreira, Ricardo Cruz-Correia, Luís Antunesand David Chadwick (2009). *Handbook of Research on Distributed Medical Informatics and E-Health (pp. 30-47).*

www.irma-international.org/chapter/security-electronic-medical-records/19924

Approach Towards Non-Invasive Blood Type Method by Studying Optical Properties of RBC Using Double Beam Spectroscopy

Rishi Nailesh Patel, Makvana Mohit Vallabhdas, Safina Sahil Suratwala, Himanshu A. Pateland Palak Parikh (2021). *International Journal of Biomedical and Clinical Engineering (pp. 35-49).*

www.irma-international.org/article/approach-towards-non-invasive-blood-type-method-by-studying-optical-properties-of-rbc-using-double-beam-spectroscopy/272061

Quantification of Capillary Density and Inter-Capillary Distance in Nailfold Capillary Images Using Scale Space Capillary Detection and Ordinate Clust

K. V. Sumaand Bheemsain Rao (2017). *International Journal of Biomedical and Clinical Engineering (pp. 32-49).*

www.irma-international.org/article/quantification-of-capillary-density-and-inter-capillary-distance-in-nailfold-capillary-images-using-scale-space-capillary-detection-and-ordinate-clust/185622

Clinical and Biomolecular Ontologies for E-Health

Mario Ceresa (2009). *Handbook of Research on Distributed Medical Informatics and E-Health (pp. 165-179).*

www.irma-international.org/chapter/clinical-biomolecular-ontologies-health/19932