Modelling eCRM Systems with the Unified Modelling Language

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INTRODUCTION

Electronic commerce requires the redefinition of the firm's relationships with partners, suppliers, and customers. The goal of effective Customer Relationship Management (CRM) practice is to increase the firm's customer equity, which is defined by the quality, quantity, and duration of customer relationships (Fjermestad & Romano, 2003). The proliferation of electronic devices in the business environment has determined the companies to implement electronic customer relationship management (eCRM) systems, which are using advanced technology to enhance customer relationship management practices.

The successful implementation of an eCRM system requires a specific bundle of IT applications that support the following classic domains of the CRM concept: marketing, sales, and service (Muther, 2001). Electronic marketing aims at acquiring new customers and moving existing customers to further purchases. Electronic sales try to simplify the buying process and to provide superior customer support. Electronic service has the task of providing electronic information and services for arising questions and problems or directing customers to the right contact person in the organization.

The eCRM system comprises a number of business processes, which are interlinked in the following logical succession:

- **Market Segmentation:** The collection of historical data, complemented with information provided by third parties (i.e., marketing research agencies), is segmented on the basis of customer life-time value (CLV) criteria, using data mining applications.
- **Capturing the Customer:** The potential customer is attracted to the Web site of the firm through targeted promotional messages diffused through various communication channels.
- **Customer Information Retrieval:** The information retrieval process either can be implicit or explicit. When implicit, the information retrieval process registers the Web behavior of customers using specialized software applications such as cookies. On the other hand, explicit information can be gathered through direct input of demographic data by the customer (using online registration forms or questionnaires). Often, these two categories of information are connected at database level.
- **Customer Profile Definition:** The customer information collected is analyzed in relation to the target market segments identified through data mining, and a particular customer profile is defined. The profile can be enriched with additional data (e.g., external information from marketing information providers). This combination creates a holistic view of the customer, its needs, wants, interests, and behavior (Pan & Lee, 2003).
- **Personalization of Firm-Customer Interaction:** The customer profile is used to identify the best customer management campaign (CMC), which is applied to personalize the company-customer online interaction.
- **Resource Management:** The company-customer transaction requires complex resource management operations, which are partially managed automatically through specialized IT applications such as Enterprise Resource Planning (ERP) or Supply Chain Management (SCM) and partly through the direct involvement and coordination of operational managers.

BACKGROUND

The effective functioning of the eCRM system requires a gradual process of planning, design, and implementation, which can be greatly enhanced through business modeling. The selection of an appropriate business modelling language is essential for the successful implementation of the eCRM system and, consequently, for evaluating and improving its performance (Kotorov, 2002). The starting point for this selection is the following analysis of the specific characteristics and requirements of the eCRM system (Opdahl & Henderson-Sellers, 2004; Muther, 2001):

- eCRM is an Internet-based system; therefore, the modelling language should be able to represent Web processes and applications;
- The interactive nature of eCRM systems requires a clear representation of the interaction between customers and Web applications as well as between various business processes within the organization;
- eCRM systems are using multiple databases that interact with various software applications; the modelling language should support data modeling profiles and database representation;
- The necessity for resource planning and control requires a clear representation of each business process with its inputs, outputs, resources, and control mechanisms;
- The implementation and management of an eCRM system requires the long-term collaboration of various specialists such as business and operational managers, programmers, and Web designers, which are sometimes working from distant locations; the modeling language should provide a standard, intuitive representation of the eCRM system and business processes in order to facilitate cross-discipline interaction and collaboration;
- The complexity of the eCRM system requires a modelling language capable of presenting both the organizational and functional architecture at the level of system, process, software applications, and resources; this will facilitate a multi-user, multi-purpose use of the same busi-

ness model, although the detail of representation might differ, depending on the required perspective.

The Unified Modeling Language (UML) is the notation presented in this article to support the business process modeling activity. The UML is well suited to the demands of the online environment. It has an object-oriented approach and was designed to support distributed, concurrent, and connected models (Gomaa, 2000; Rumbaugh, Jacobson, & Booch, 2004).

THE UNIFIED MODELLING LANGUAGE (UML)

UML was developed in 1995 by Grady Booch, Ivar Jacobson, and Jim Rumbaugh at Rational Corporation (Maciaszek, 2001; Rumbaugh et al., 2004), with contributions from other leading methodologists, software vendors, and users. Rational Corporation chose to develop UML as a standard through the Object Management Group (OMG). The resulting cooperative effort with numerous companies led to a specification adopted by OMG in 1997.

UML has a number of specific advantages:

1. **Simplicity of Notation:** The notation set is simple and intuitive.
2. **Standard:** The UML standard achieved through the OMG gives confidence to modellers that there is some control and consideration given to its development.
3. **Support:** A significant level of support is available to modellers using the UML:

   - Textbooks that describe the UML notation and consider specific application areas (Stevens & Pooley, 2000).
   - Papers in journals and publications/resources on the Internet spread knowledge of the UML (e.g., Rational Resource Center and UML Zone).
   - Software tools, often referred to as Computer Aided Software Engineering (CASE) tools, are available. These provide support for documentation of UML

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