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An object-oriented development method for Customer Knowledge Management Information Systems

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Abstract

For the advances of Internet technologies in recent years, electronic commerce (EC) has gained many attentions as a major theme for enterprises to keep their competitiveness. Among all possible endeavors for the EC, research has shown that effective management of customer relationships by taking advantage of customer knowledges is a major source for keeping competitive differentiation. Therefore, it is commonly recognized as an important goal for an enterprise to promote its managerial effectiveness on customer relationships through a prospective customer knowledge-based information system to achieve the so-called Customer-Oriented EC. In this paper, we present an object-oriented method for the development of such a Customer Knowledge Management Information System (CKMIS). The method starts from the identification of customers and their desired knowledge-accessed behaviors, through the recognition of a system architecture that supports the identification and realization of these behaviors, and finally ends with the analysis and design of the architectural classes/objects that collaborate to identify and realize these behaviors. The method is use case driven with UML notations utilized and extended as its modeling tool. To illustrate, the method is applied to an exemplified CKMIS for a book publishing company.

Keywords: Electronic commerce; Customer knowledge; Customer relationship management; Information system development; Object-oriented method

1. Introduction

For the advances of Internet technologies in recent years, Electronic Commerce (EC) has gained many attentions as a major theme for enterprises to keep their competitiveness. Among all possible endeavors for the EC, research has shown that effective management of customer relationships by taking advantage of customer knowledge is a major source for keeping competitive differentiation. Therefore, it is commonly recognized as an important goal for an enterprise to promote its managerial effectiveness on customer relationships through a prospective knowledge-based information system to achieve the so-called Customer-Oriented EC. Particularly, as one may conceive for promoting customer relationships, such a customer-oriented information system needs to effectively capture and manage customer knowledge for providing customers with their desired behaviors under their preferable execution environments.

With respect to the above issue, several discussions about its two related managerial aspects, Customer Relationship Management (CRM) and Knowledge Management (KM), can be found in the literature [1–3] for CRM [4–7] for KM. Thereafter, based on these discussions, many researches that expand on CRM/KM for promoting further customer relationships by effective management of customer knowledge have also been presented in recent years [8–13], which result in the concept of the so-called Customer Knowledge Management (CKM). In contrast to CRM/KM that addresses on providing customers with desired behaviors based on knowledge *about* these customers (e.g., their characteristics and preferences prevalent in previous work), CKM focuses on providing customers with

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desired (*knowledge-accessed*) behaviors that allow them to access knowledge *from* themselves (e.g., knowledge resident in themselves). As studied in [9] with two dozens of enterprises that manage customer knowledge, CKM could make an enterprise much easier to fulfill/expand its value creation process by seeking and leveraging customer knowledge through direct interaction with customers. Therefore, in our opinion, CKM would play a more contributive role than CRM/KM does in the success of Customer-Oriented EC.

In addition to the managerial aspects, one other important consideration about Customer-Oriented EC is the use of information systems to provide vital support for CRM/KM/CKM [9]. For this consideration, several approaches have been presented such as those personalization methods proposed in [14–18], the architectures and functionality of customer decision support systems in [19,20], and those CKM systems and functions studied in [9]. There are thus plenty of technical solutions for capturing and managing knowledge about/from customers and providing them with their desired (knowledge-accessed or not) behaviors. Nonetheless, while these solutions address well various architectural/functional issues about CRM/KM/CKM support systems, any development methods that provide guidance on the construction of such systems to contributively make these systems provide customers with their desired behaviors by effective management of knowledge about/from them are still missing. Such methods, however, should not be negligible since it has well been recognized that development processes are a critical success factor in developing computer-based applications and any failures on them usually result in late delivery, poor quality, and high maintenance costs.

In general, systems development can be accomplished by using function- [21–23] or data- [24,25] or object-oriented [26–31] methods where the object-oriented ones were proposed by recognizing the drawbacks and problems in the other two kinds: the significant features and benefits of object-oriented techniques such as inheritance of object specifics and information abstraction/hiding in objects would make the constructed systems easier to be understood, maintained, and reused. Since CRM/KM/CKM information systems are often complex for satisfying those sophisticated requirements described above, it is therefore not uncommon to take advantage of object-oriented techniques for their development. Among existing object-oriented methods, nonetheless, the well-known use case driven one, Unified Software Development Process (USDP) [30,31], has already been ascertained by many researches and practices for its robust process and resultant sound UML [32–36] artifacts. Therefore, we presented in our previous paper [37] a development method that elaborates on USDP with UML notations extended for specifically supporting an enhanced analysis of a CRM Information System (CRMIS). In that work, our focus was on the analysis of a CRMIS that provides customers with their desired behaviors based on knowledge about them. Since our focus in this paper is on CKM that expands on CRM, we propose herein a refined method based on our previous work for the development of a CKM Information System (CKMIS) that provides customers with their desired behaviors for allowing them to access knowledge from themselves.

Our method proposed is use case driven[1] and hence starts from the identification of customers and their desired knowledge-accessed behaviors (i.e., use cases); those identified artifacts will be explicitly specified by adapted use case and activity diagrams. After identifying desired use cases, the method continues on the recognition of a system architecture that supports the identification and realization of these use cases, and finally ends with the analysis and design of the architectural classes/objects that collaborate to identify and realize these use cases. Like in our previous work, the method derives also from use cases with UML notations utilized and extended as its modeling tool. To illustrate, the method is applied to an exemplified CKMIS for a book publishing company.

This paper is organized as follows. Section 2 presents first our method that results in the creation of six UML diagrams, including use case, activity, component, class, sequence, and deployment ones. The method is then illustrated in Section 3 by applying it to the development of a CKMIS for a book publishing company. Finally, Section 4 has the conclusions and our future work.

2. The development method

Our method elaborates on the well-known use case driven USDP approach [30,31] with the following sequence of six steps:

1. Use case identification: described in a use case diagram that determines the prospective customers of a CKMIS and their desired use cases of using the system;
2. Workflow specification: presented in an activity diagram that specifies the workflow of the identification process of those desired use cases;
3. Architectural identification: described in a component diagram that determines an architectural partitioning of the system into physical components that collaboratively support the identification and realization of the desired use cases;
4. Class identification: presented in a class diagram that considers required classes for defining system- internal objects that collaborate to actually identify and realize the desired use cases;

[1] As defined in [32], use case represents external behavior (functionality) of a system as visible to outside users. Further, referred to [30], use case driven means that the development process follows a flow that derives from the use cases.