

# Management of Address Information to Improve Quality of Customer Contact \*

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**Abstract** *Customer relationship management systems are gaining importance in today's business environment since customer satisfaction is crucial to the success of an enterprise, and especially so in e-business environment where customers can find substitute suppliers quite easily. In CRM, the quality of customer information is very important, and the address information even more so. It is because the address information plays a major role for customer contact channel and for timely and effective marketing service. Furthermore, it gives the basic source of geographic information for the offline delivery, the terminal activity of the e-commerce. In this study, we analyze various standards and proposals for the address information, and propose data models for the management of the information focusing on address components, and proto-type systems for management and service.*

**Key words** *customer relationship management; customer information; address information; address component*

It is widely known that it is important to manage customer relationship since the cost to attract a new customer is higher than the cost to maintain an existing one. Even when a marketer established a marketing strategy using methodologies such as segmentation study, it would become meaningless if one could not make contact with the customers. In this sense, customer-data forms the foundation stone to build effective customer relationships in the business environments and it is important to manage the customer information from the viewpoint of customer service and promotion.

The customer information consists of various components. Among them, the address information, which is the basis for location and logistics service, is also the core information for the customer contact, and it is of utmost importance to maintain the quality of the information at very high level.

The importance of the address information goes

up even more in the cases of e-Business. For instance, it is necessary to manage the customer addresses up to date for the accuracy of goods delivery, the terminal activity of the business. Especially, management of location-based information with geographic information is required in offline delivery logistics. Furthermore, the contents of the information become more complex in Internet era because the business area has now become global.

Addresses, which reference and uniquely identify particular points of interest, are used to physically access and deliver goods to specific locations, and they usually take the form of aggregate data about location. In case of postal services, increased use of automated facilities such as OCR-based mail sorting facilities has motivated the development of address structuring conventions with more precise semantics.

In this study, after reviewing the standards of United Postal Union (UPU) and Organization for the

Advancement of Structured Information Standards (OASIS), the address components in particular, we propose data models for address information with regard to the postal environments in Korea. And we define the address elements and explain briefly the implemented prototypical systems.

This paper is structured as follows. In section 1 and section 2, we give an introduction to the standards and examine the elements and the relationships among them. Section 3 discusses the information models for address. In section 4, we describe the information systems that are based on the models. Finally, we discuss the further studies and draw our conclusions in section 5.

## 1 Related Standards

Among the various specifications about names and addresses, UPU S42 and OASIS extensible name and address language (XNAL) are gaining more attention as international standards. S42 is for the postal services and xNAL is mainly for the management of customer information.

S42 contains two parts, components and templates. The components, sets of address elements, are based on the standard of the European Committee for Standardization (CEN), EN14142-1 Part 1. It defines minimal meaningful sets of the name and the addresses in the world including non-European nations, and considers the terminological differences. The templates describe the combination and the sequence of the

address elements in two types, natural language and XML that is named postal address template description language (PATDL). By using these templates, it could be possible to store the address data in parsed form and to recompose them when needed<sup>[1]</sup>.

One of the OASIS technical committees, CIQ establishes three standards, xNAL, extensible customer information language (xCIL) and extensible customer relationships language (xCRL). While xCIL defines the customer's unique information such as telephone number and email address, xCRL defines the relationships like person to person, person to organization and organization to organization. xNAL consists of xNL as the name part and xAL as the address part. It defines inclusively the address elements and the relationships among them to make most application including the postal service use it<sup>[2]</sup>.

Besides these two standards, there are several local ones that are based on them or are supplement of them. However, it is difficult to apply them in the outer world directly since they are initiated and developed by the United States of America. International address element code (IAEC) of ECCMA codes 159 elements for an address. Address data interchange specification (ADIS) is specified by IDEAlliance to support information management and mail production. The FGDC in the United States defines the contents for digital geospatial metadata, and they are applied to the postal addresses. We compare them in Tab.1.

**Tab.1 Comparison of the international standards for address information**

Standard	Organization	Objective	Subject area	Leading area	Domain	Components	Template	XML
S42	UPU	Structuring of printed postal addresses worldwide	World	Europe	Postal service	O	O	Schema
EN14142-1	CEN TC331 /WG3	Providing a standard dictionary of postal address component in Europe	Europe	Europe	Postal service	O	O	
xNAL	OASIS CIQ TC	Defining a global standard that is vendor neutral, open and application independent	World	USA/Australia	Overall	O	X	DTD
IAEC	ECCMA	Address elements codification	World	USA	Postal service	O	O	None
ADIS	GCA/ IDEAlliance	Address information management and mail production	World	USA	Postal service		O	
FGDC-STD -001-1998	FGDC	Definition of Content Standard for Digital Geospatial Metadata	USA	USA	GIS	O	X	None

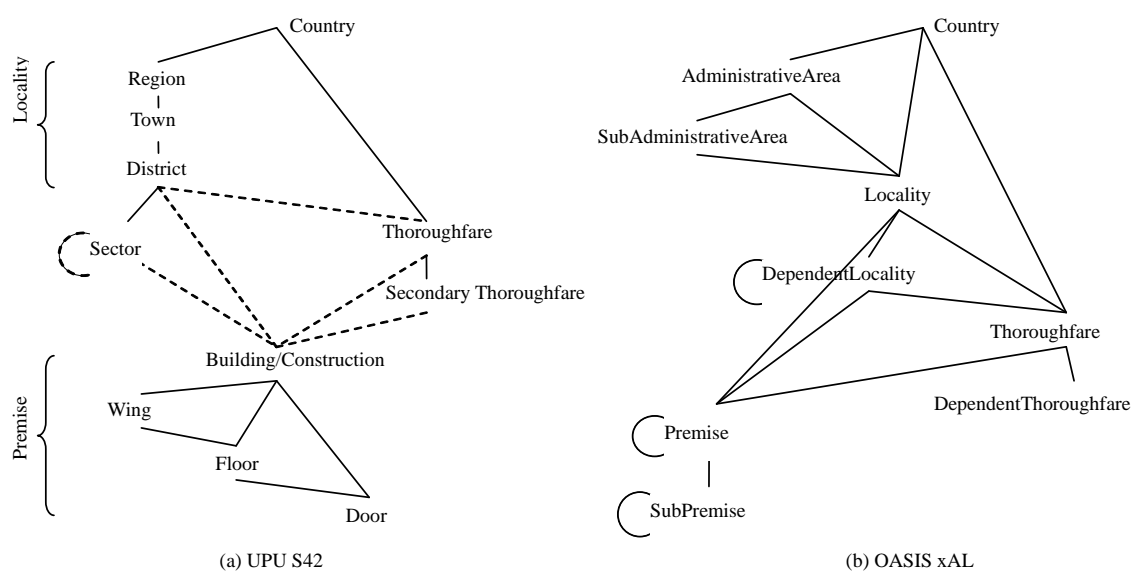


Fig.1 Trees of address elements for physical location

## 2 Trees of Address Elements

The address elements, which are defined in S42 and xNAL, are structured in hierarchical forms. However, there is a difference between the standards in a way to define the elements.

S42 subdivides the locality and the premise into several elements, and recommend each nation to map them onto the appropriate elements by nations. On the other hand, xNAL defines four basic elements for physical location and adds dependent or sub elements on them. Fig.1 shows trees of address elements for physical location in two standards. It represents the hierarchical relationships of the elements. For reference, dotted lines in Fig.1a represent the implicit relationships which are derived from the specifications and round arcs represent the recursive relationships.

Address elements could be classified into three groups; those for physical location, those for logical location of postal services, such as postal code, mail-stop code and postbox, and customer centric elements. S42 and xNAL also define the elements of customer information in part. However, S42 cover the information only about the addressee and the mailee. Additional elements of xCIL and xCRL, which are siblings of xNAL, should be considered to manage the customer information that is not related to the location-based applications.

## 3 Data Model

From a postal point of view, the address information is used to deliver mail accurately. For matters of concern, delivery points and customers' change of address should be managed<sup>[3]</sup>.

After we compose a data model for delivery points in Korea, which is named the postal address file (PAF), we design a PAF-based model for overall address information.

### 3.1 Postal Address File

Korean postal addresses are mainly organized in sector and house number. They are different from the street-centered western addresses. Since the address systems are various by nations and there is no common international standard, we design a postal address file in the concepts of following ideas to manage the address information in Korea. We consider and cover the elements and the hierarchical structure we examine in section 1 as well.

PAF consists of five tables with the exception of a table for postcodes<sup>[4]</sup>. A table for administrative districts, ADMIN\_DIST, is consistently represented in a recursive way. It is designed for reasons that the administrative districts in Korea are broken down into several levels and the structure of them is too complex to adopt the locality classification of S42, region, town and district.

The house number in a minimum district and large mail users should be stored in a table, primary delivery point (PDP). The supplementary address that is added to the house number is represented in a table, DDP (detailed delivery point).

The tables, KEYWORD and SYNONYM, are designed to represent the common suffixes of address terms and the similar names of delivery points and administrative districts each. They could resolve problems in recognizing a variety of address expressions. The Keywords should be registered before address instances are stored and the Synonyms should be registered during the processes. The relationships of five tables are depicted in Fig.2.

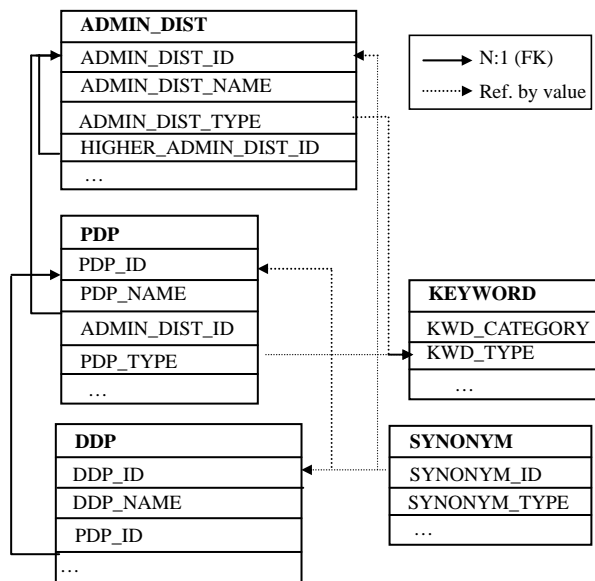


Fig.2 Schema of the PAF (postal address file)

### 3.2 Database Schema

Besides management and information providing service of PAF, it is necessary to manage additional information for systems and the database. Above all, customers' change of address concerning the past and present value of delivery points and history of them should be stored in order to maintain the contact point resulting in improving quality of customer information. Managing the data in the postal service, for example, could make the amount of return mail decrease and might make it possible to provide mail-forwarding services.

The geographic information is closely connected

with the delivery points. Therefore, in order to deal with the location-based information, the coordinates on a map should be linked with the delivery point codes. Because they have one to one mappings, the values of coordinates and the delivery point codes are included in a separate table, PDP\_LOCATION. If the location-based information is served by systems, it could be possible to monitor and control the delivery logistics and to employ the geographic CRM. As an example of the postal services, the carrier sequences could be represented on digital maps and could be edited easily.

A schema of the database that reflects these considerations is briefly shown in Fig.3.

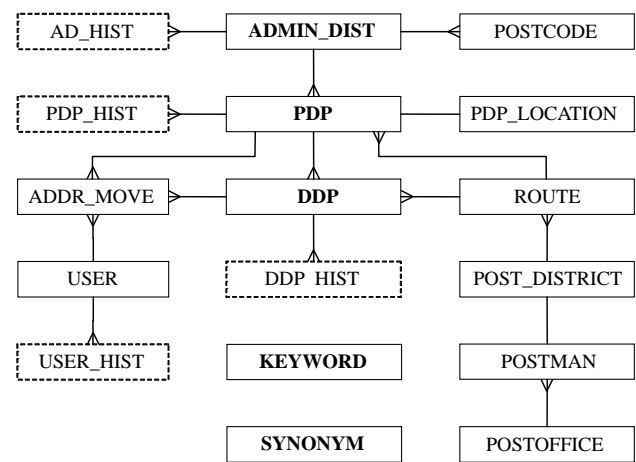


Fig.3 Database schema

## 4 Systems for Management and Service

### 4.1 Requirements and Functions

As stated above, it would be difficult to deliver goods and to make a location-based customer segmentation study without accurate addresses. To make matters better, the address information out of the customer-related information should be taken care.

First of all, the standard postal addresses should be treated as basic master data. And then, the address information should be provided to the customers in the form of processed data. In addition, application and receipts of the movement should be served. These requirements for the internal management and the functions for the external service are listed in Tab.2.

**Tab.2 Required functions of the systems**

Classification	Functions
Internal management	- Mngt. of postal addresses (administrative districts, delivery points, synonyms and keywords)
	- Mngt. of the postal codes
	- Process of the applied address-movement
	- Process of the statistical information
	- Mngt. of the users
External service	- Mngt. of the location-based information (for link with GIS)
	- Search for the postal addresses and codes
	- Search for the statistical information
	- Download files and products of addresses
Common function	- Change of address form
	- Database management
	- Backup and recovery

**4.2 System Architecture**

The implemented systems are designed in the form of 3 tier considering security, business logics and convenience to use. And then, the required functions are distributed over each tier. The tiers are for presentation, application and data. The architecture of the systems is depicted in Fig.4.

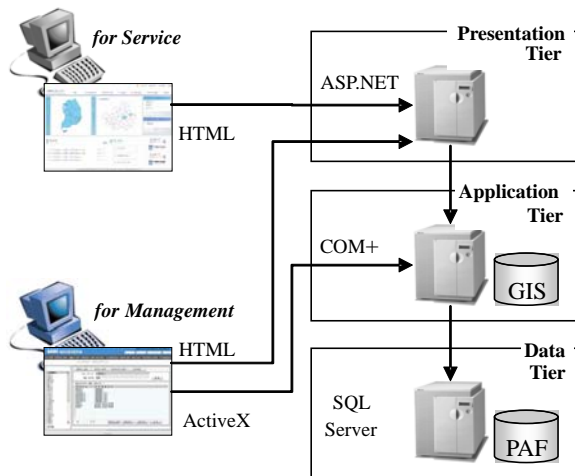


Fig.4 Architecture of the systems

In the viewpoint of management, users download the components, ActiveX controls, and connect the application tier directly networking the administrative dedicated line. On the other hand, general customers could connect the presentation tier by the Web.

Because the systems use a legacy engine for GIS for the present, it is impossible to separate the engine from the application tier and to store GIS data in the

integrated database. We should improve the architecture in the near future.

**4.3 Prototype**

The prototypical systems are developed with ASP and Visual C++ on .NET framework as depicted in Fig.4 and the database management system is MS SQL Server.

Among the developed functions up to the present, a function for management of delivery points and a function for management of geographic information with carrier sequences are shown in Fig.5 and Fig.6.

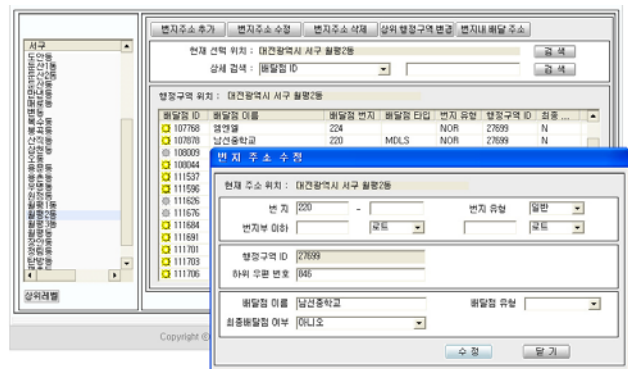


Fig.5 A screenshot for a function, information modification of a delivery point



Fig.6 A screenshot for a function, change of postal districts

**5 Conclusions**

It becomes necessary to manage the address information as contact points with customers for goods delivery and for marketing. Though several organizations make up the specifications for address information, it takes large amount of time and effort to settle them as de facto standards.

In this study, after we review the status of the international standards, and the address elements that are defined in the standards in particular, we analyze an illustrative hierarchical structure of the address elements. And we describe data models and the proto-type systems to manage the information and to serve customers with it. The database schema stands on the basis of the PAF. Through defining and managing the address information, it would be possible to improve quality of customer contact channel. In order to enable the developed systems to be effective, there needs to deploy manifold methods to provide other information systems with the address data.

Additional studies on UPU S42 and other standards need to be done in detail focusing on the address templates for statements and reports in e-Business later on. Adaptability of the standards should be checked in addition. Since a new address system is to be introduced in Korea soon, standardization of added address elements and design of supplementary system should be planned in proper time.

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