

# How should local government integrate the information of affected people to support their life recovery continuously and effectively? A case study at Kashiwazaki City, Niigata, Japan -

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#### **ABSTRACT :**

Once disaster occurs, local government has responsibility to provide various services to the affected people. But it is very difficult to identify who are really affected because there is no master database about them. In addition, each department of local government performs their activities simultaneously and independently due to bureaucratic sectionalism. Accordingly, services provided by local government tend to be fragmented and uncoordinated to the affected people to support their life recovery process continuously. To provide a more coherent and timely services to the affected peoples, we develop a standardized operation procedure to construct a new database of the affected people with geo-reference as well as an information management system for a more integrated assistance for the life recovery of the disaster victims to Kashiwazaki city in Niigata prefecture, Japan in her recovery efforts from the 2007 Niigataken Chuetsu-oki Earthquake which occurred on July 16 in 2007. In this case study, a cooperative framework was established with city government to help her response by providing technical assistance for the construction of the geo-referential database of the affected people in this city as well as its information integration system that enabled Kashiwazaki city to provide all the necessary services for the affected people's life recovery in an integrated fashion.

# **KEYWORDS:**

Victims' Master Database, Life Recovery, Information Integration, Business Flow Diagram, Geo-Intelligence

#### **1. INTRODUCTION**

In Japan, local governments have to provide all the necessary services to the affected people once disaster occurs. But in the past, it was unable for them to identify who are really affected because of lack of victims' master database. To provide various services to victims, local government has to prepare so many kinds of victims' information because the qualification as a recipient of support programs for victims' life recovery is not uniformed. In addition, each department of local government performs their activities independently due to bureaucratic sectionalism. Reflecting these circumstances, we decided to develop a new database "Victims Master Database" with geo-reference and an information management system for Victims' Master Database.

Toward the realization of developing Victims' Master Database and an information management system, we designed the following three procedures. First, we analyzed the business flow of those assistance services provided by each department of local government. Second, geo-referential database was constructed to keep a track of all the services provided by all departments to assist the affected people and the resulting status of their life recovery. Third, we developed the information management system for all the department of the local government to make use of the geo-referential database of the affected people to provide the services to all the victims in an integrated and timely manner. In this paper, we describe how those three procedures were carried out at Kashiwazaki city in Japan that is affected by Niigataken Chuetsu-oki Earthquake occurred on July 16<sup>th</sup>, 2007.



# 2. DESIGN OF VICTIMS' MASTER DATABASE

First, we designed victims' master database by analysis of qualification as a recipient of support services for victims' life recovery. In this step, we provided flexibility to victims' master database (VMDB) by classifying all components to "Master Database" and "Updating Database" in order to grab accurately the whole picture of progress of victims' life recovery at any time. In this section, we describe the design of VMDB.

#### 2.1. Analysis of Qualification as a recipient of Support Services for Victims' Life Recovery

First of all, to design a victims' master database, we analyzed the publicly-provided qualifications as a recipient of victims' relief programs. Those qualifications are determined by "Victims' Situation" and "Recipient's Unit". Victims' Situation is consisted of their annual income, the degree of building damages, the family structure, household's age, their life recovery policy and so on. Recipient's Unit is a household or a person.

In this research, we organized those qualifications by two observing points of "Victims' Situation" and "Recipient's Unit". The result of organization is summarized in Table1.

Support Programs	Recipient's Unit		Victims' Situation						
	Reference Database	Unit	Degree of Housing Damage	Personal Suffering	Annual Income	Age	Vulnerable People to Disasters	Housing Demolition	Policy of Life Recovery
Property Tax Reduction	Residents' Ledger	Person	Main Housing						
Inhabitant Tax Reduction	Residents' Ledger	Person	Main Housing	Person					
Public Nursing Insurance Reduction	Residents' Ledger	Person	Main Housing						
National Health Service	Residents' Ledger	Household	Main Housing	Person	Household				
Welfare Servce	Residents' Ledger	Person	Main Housing		Household		Certification of care need		
First Relief Money	Residents' Ledger	Household	Main Housing						
Second Relief Money	Victims' Master DB	Household	Main Housing						
Disaster Relief Fund from Pref. (old)	Victims' Master DB	Household	Deemed Housing		Household	householder	Certification of care need	Main Housing	
Disaster Relief Fund from Nation (old)	Victims' Master DB	Household	Deemed Housing		Household	householder		Main Housing	
Disaster Relief Fund from Pref. (new)	Victims' Master DB	Household	Deemed Housing		Household	householder		Main Housing	
Disaster Relief Fund from Nation (new)	Victims' Master DB	Household	Deemed Housing					Main Housing	Housing Recovery
Demolition of Damaged Housing	Victims' Master DB	Household	Sub Housing					Main Housing	

Table 1 Qualification as A Recipient of Support Programs for Victims' Life Recovery

It can be seen from Table1 that there is no unified qualification for any life recovery support. Against this issue, we developed "Victims' Master Database (VMDB)" which stores all information of victims' situation. Explanation of developing VMDB is addressed in next section.

#### 2.2. Development of Victims' Master Database by Integration of Independent Databases

In order to help relief programs, all information of victims' situation must be managed appropriately in integrated database that is VMDB. In developing VMDB, we connected many databases. Some of them are used in daily business in local government, and others are constructed in responding after disaster occurs. In connecting those databases, there is big problem that each database has no unified relational key. In this research, we tried to set appropriate relational key for each database, and connected all database one by one with individual relational key to develop VMDB that is shown in Figure 1. Especially, Granted Certification of the Degree of Building Damage has geo-reference information. VMDB should be given geo-reference of victims by inheriting the geo-reference of the damaged buildings.

In developing VMDB, we divided those databases to two categories that are "Master Databases" and "Updating Databases". While Master Databases include Residents' Ledger and Fixed Asset Tax Rolls, Updating Databases include Granted Certification DB of Degree of Building Damages, Public Temporary Housing Management DB and Relief Programs Management DB. By dividing those databases, we ensured the reliability of stored information. Especially, we set "Victim Certification ID" as a unified relational key since Updating Databases would be constructed by local responders after disaster occurs.





Figure 1 Configuration Diagram of Victims' Master Database

# 3. DEVELOPMENT OF MANAGEMENT SYSTEM OF VICTIMS' MASTER DATABASE

In the preceding section, we developed Victims' Master Database by connecting five databases. In this section, in order to manage VMDB, we developed a management system called "Victims' Master Database Management System (VMDBMS)". In developing this system, we defined system requirements, designed system user-interface and functions to aggregate stored information, and create system by coding the program.

## 3.1. Definition of System Requirements

3.1.1 Abstract of VMDBMS Users

To define the system requirements, we designed VMDBMS users by analyzing of actual work flow in Kashiwazaki City. As a result, we configure four types of users for VMDBMS that are described below.

(1) Users to browse victims' information for consultation

They can only browse victims' information in VMDBMS when some victims come to consultation counter for relief programs. They cannot update and aggregate victims' information in order to keep the reliability of information high.

(2) Users to input victims' information after consultation

They can input and update victims' information in VMDBMS after consulting or processing of relief programs.

(3) A User to manage victims' information stored in VMDB

He can manage victims' information in order to control its reliability. In managing VMDB, we have to prevent some users from controlling information reliability on each user's own accord, so it is very important that only one person should be assigned to this user.

(4) Users to aggregate victims' information from VMDB

They can aggregate victims' information in order to gain the common operational picture: for example, tallying up the amount of victims accepted for relief programs, revealing of victims who have not apply to relief program yet and so on.

#### 3.1.2 Definition of VMDBMS Requirements

Considering of interaction between users and VMDBMS, we defined major six system requirements. These system requirements make VMDBMS effective and usable for local responders with low level of IT literacy to consult to victims. Seven system requirements are shown below.

VMDBMS should:

(1) Improve the efficiency of consultation

(2) Present accurately the whole picture of current situation of the responding

(3) Make the required IT literacy level low



- (4) Control the quality of stored information
- (5) Able to be connected with other databases or other computer applications
- (6) Protect victims' personal information strictly

In these six requirements, "protection of victims' personal information" is most important because users must stop using VMDBMS once personal information leaks. If this accident happens, local responders cannot gain the situation of victims' life recovery and they would be at a loss about how to support for victims' life recovery.

#### 3.2. Development of Victims' Master Database Management System

We designed and developed the management system of victims' master database based on the system requirement definition. In this section, we describe the component of Victims' Master Database Management System called "VMDBMS".

#### 3.2.1 Design of Functions on User-Interface

VMDBMS is composed of major 6 functions. Those functions can process information that is collected and displayed on User-Interface of VMDBMS. Therefore, in this section, we describe those functions by each User-Interface.

#### (1) UI to Log-in to VMDBMS

Through this UI, users can be provided adequate authority to access VMDB. In order to protect victims' information, this function should refuse malicious users.

#### (2) UI to Retrieve from VMDB

When users select retrieval method and input some keywords, this function returns a list of target victims. Whenever victims come to consultation service, a consultee can easily gain their information by using this function.

#### (3) UI to Browse Victims' Basic Information

After specifying of victims, a consultee double-clicks on their name, and then this user-interface is open. On this UI, a consultee can gain the basic information of specified victims, such as name, address, the degree of building damages, annual income, and so on. By referring of those information, a consultee can introduce all public emergency aid that can be provided.

#### (4) UI to Confirm the Information of Provided Public Relief Programs

In consultation, a consultee can confirm the information of provided public relief programs to a victim. In Japan, the system of public relief programs is so complicated that victims cannot be accepted some relief programs once they have applied to other programs. By getting this confirmation from this UI, a consultee can propose appropriate programs that the consulter can apply.

#### (5) UI to Browse PDF Files

This system stores paper-based materials as PDF files. On this UI, consulters can browse PDFs, and gain an understanding of victims' real situation. Examples of PDFs are copies of savings passbook, mental disability certificate, tax withholding statement and so on. Those materials help consulter determine which relief programs can be provided to each victim.

#### (6) UI for Information Summary and Information Management

In order to make rational and effective decisions, it is necessary for local responders to gain the whole picture of the current situation of victims' life recovery. When users click the button on this UI, they can get lists of subjected victims. Based on the provided lists, they can design the action plan for the next step of their response.

Some results of these UI design are shown in Figure 2 and Figure 3.



consulters	中語に来た入     氏名     (統語 本人	▲本指数 世帯年収 3,708,183 □ 世帯状況確認
		世帯人数 2 人 世帯主年齢 80 歳 F 基本情報の確定
Information of		世蒂種別 A世帝 💌 世帝構成 演款 🔽 Basic Information of
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Ownership of Damaged Buildings	日本部  主張 「 パオ音も数   Emitting 「 居住形態  持ち家 ・ 納税義務者 所有者と同じ ・ 提示法の毎日	
	₩₩C 被災者生活再建支援台帳管理システム	4.ハル・カロ 1 U & U & 今回の交付番号: 新聞の交付番号:

Figure 2 User-Interface to Browse Victims' Basic Information



Figure 3 User-Interface to Confirm the Progress of Relief Programs

#### 3.2.2 Design of Function to Aggregate Victims' Information

In developing of VMDBMS, we focused on the function of aggregation of victims' information that can support local responders to make rational and effective decisions. This aggregation function has two aspects. One is to identify the victims who have not applied any relief programs by comparing victims' master database and updating databases for progress management of victims' application to relief programs. The other one is to find inappropriate information in VMDB for the quality control of stored information in early stage. VMDBMS should bundle functions based on these two aspects as shown below.

(1) Aggregation Functions to identify the victims who have not applied any relief programs

- To identify the victims who have never come to consultation counter

- To identify the victims who can receive amount owed of some relief programs
- To present a list of the victims who have already received full relief programs
- Etc.



- (2) Aggregation Functions to find inappropriate information in VMDB for the information quality control
- To present a list of the householders who share a name or an address
- To present a list of the logs to access to VMDB
- To present a list of the victims whose family structures are uncertain
- Etc.

# 3.2.3 Design of PDF Managing Function for paper-based materials

In the process of providing some relief programs to victims, local responders collect many kinds of paper-based materials to determine whether they have the authority to apply to those programs or not. Those paper-based materials have to be managed rationally because those show victims' real situation to local responders. Some of those materials can be referred not only for consultation of relief programs but also for other job performance, so they should be shared in all departments permitted to access.

In this research, VMDBMS can share those paper-based materials by using PDF technology. VMDBMS establishes the links of PDFs to victims' basic information with victim certification ID, so any local responders can browse those materials at their desk. Those PDFs are organized to nine categories by the context of materials. These nine categories are established by the analysis of relationship between local responders' tasks and referred materials: (1) application sheets of consultation, (2) logs of consultation, (3) copies of saving passbooks, (4) evidence of residency, (5) evident materials of rented accommodations, (6) evident materials of demolition of damaged housings, (7) evidence of deemed household separated, (8) confirmations of the process of lire recovery, and (9) others.

#### 3.2.4 Implementation of VMDBMS

We developed VMDBMS based on the system design for one month. During the development of VMDBMS, we solved bugs as soon as users found some bugs, and improved functions reflecting users' requests. Total counts of improving VMDBMS were over 50 times for one month. Finally, VMDBMS was developed as stabled system.

# 4. IMPLEMENTATION OF RATIONAL SUPPORTING FOR RELIEF PROGRAMS AT KASHIWAZAKI CITY

In this section, we verify the validity of VMDB and VMDBMS in Kashiwazaki City that is affected by Niigataken Chuetsu-oki Earthquake 2007. In this verification, we observed how their action policies have been changed and how VMDB have been grown up.

#### 4.1. Summary of Application of VMDBMS to Kashiwazaki City

Kashiwazaki City is a typical provincial city in Niigata Prefecture with population of 94,644 and 33,684 households (2005 Census). This city was affected by Niigataken Chuetsu-oki Earthquake on July 16<sup>th</sup>, 2007. Concerning building damage, 1,110 buildings were fully damaged, 4,524 buildings were half damaged, and 22,510 buildings were partially damaged by Niigataken Chuetsu-oki Earthquake. Concerning human suffering, 15 people were dead and over 2,000 people were injured. In this verification, we selected this city and tried to apply VMDB and VMDBMS for 7 months, from October 1<sup>st</sup> 2007 to April 25<sup>th</sup> 2008.

#### 4.2. Development of Basis of VMDB at Kashiwazaki City

Kashiwazaki City had already opened the consultation counter for public relief programs, and they had collected victims' information before this verification. Therefore, in order to start to use VMDBMS, we had to store all victims' information into VMDB collected by local responders.

In consideration of this situation, we developed the basis of VMDB by importing Residents' Ledger, Fixed Asset Tax Roll, Granted Certification of the Degree of Building Damages, and some other logs of consultation. As a result of this integration of databases, 4,442 records of victims' information were stored into VMDB at Kashiwazaki City. Furthermore, all paper-based materials used in consultation were converted to PDF files in VMDB.



## 4.3. Continuously Development of VMDB by Using Management System

Local responders carried out their work to support for victims' life recovery by using VMDBMS continuously. In managing VMDB, 3 people were assigned to the input users of victims' basic information, 2 people were assigned to the users to convert paper-based materials to PDF, 3 people were assigned to the users to confirm victims' information by investigation of their qualification for relief programs, 1 people was assigned to the users to control the quality of stored information in VMDB, and 1 people was assigned to the users to aggregate victims' information to design the action plan. As a result of their work, VMDB have been grown up continuously, and finally VMDB was consisted of 5,959 records of victims' information. The transition of amounts of stored victims' information is shown in Figure 5.



Figure 5 Transition of Amounts of Stored Victims' Information

#### 4.4. Changing of Business Direction in Kashiwazaki City based on VMDB

As a result of managing of VMDB, some change of business direction has developed in Kashiwazaki City. Once a new program is established, local responders can identify who can be accepted the application to this new program, because VMDB manages not only victims' basic information such as name, address and annual income but also victims' affected situation such as certification of degree of building damages and human suffering in the family. After this identification of victims, they can identify the victims who should be proposed to apply to this program by comparing victims who have already applied with victims who have not applied yet.

By following this method, local responders in Kashiwazaki city identified accurately 121 victims who can receive more emergency aid, and proposed them to apply to this emergency aid. Finally, 119 of 121 victims (about 97%) applied to more emergency aid by proposition from local responders. And local responders recognized why the other 2 victims had not applied yet. In this way, VMDB and VMDBMS enabled Kashiwazaki city to provide aggressively and completely all the necessary services for the affected people's life recovery in an integrated fashion.

Especially, Granted Certification of the Degree of Building Damage that is one component of VMDB was developed with geo-reference, so they can also grab the whole picture of the progress of victims' life recovery geographically. They urged victims one by one to apply some relief programs that they did not applied yet. This function of geographical visualization helped local responders to provide the necessary services for the affected people more.



### **5. CONCLUSION**

This research aims to explore the possibility of Victims' Master Database in the process of victims' lire recovery. But in Japan, there is no scheme of VMDB so we have never had VMDB in the affected city once disaster occurred. Through this research, we designed and developed VMDB by connecting basic master databases for daily business routines and other databases that manage the progress of victims' life recovery. Furthermore, we developed a management system for VMDB called VMDBMS, and verified the validation of VMDB at Kashiwazaki City that was affected by Niigataken Chuetsu-oki Earthquake in 2007.

In the verification of VMDB, local responders provided a high quality services to disaster victims by managing of VMDB continuously. Relief programs were activated only when victims themselves took action for accessing to consultation services and applying for the relief programs. Kashiwazaki City Recovery Division figured out who got the services and who did not access the service yet. Kashiwazaki implement the victims' support aggressively using this system.

On the next step of this research, we are planning to standardize the database scheme of VMDB and to share this scheme as data model for victims' life recovery. What is more, we will try to promote the web-based infrastructure to support local government to use VMDBMS quickly. When these are implemented, many local governments would provide a high quality services to disaster victims rationally and effectively by managing standardized Victims' Master Database.

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