

# Web-Based Database and spatial Database Management System: Application of Disabled Person in Phetchabon Province

Gitsada Panumonwatee<sup>1</sup>, Sudarat paluang<sup>2</sup>, Jittrarat Chantana<sup>2</sup>, Duangdao Sriyakun<sup>2</sup>,  
Santi Lapbenjakul<sup>2</sup>, and Sittichai Choosumrong<sup>1,\*</sup>

<sup>1</sup>Faculty of Agriculture Natural Resources and Environment, Department of Natural Resources and Environment,  
99 Moo 9 Tambon Tha Pho, Amphoe Muang, Phitsanulok, Thailand 65000,

<sup>2</sup>Reoriented Holistic Health Service Delivery Institution, National Health foundation, Ladyao, Chatuchak, Bangkok  
\* **Corresponding author: E-mail:** sittichaic@nu.ac.th

## ABSTRACT

*Nowadays, widely used data warehousing technology is mostly due to its most efficient, easy-access, and analyzable. So, this work presents the approach to developing the service-oriented web-based application with spatial thinking of disabled persons quantitative. The Web-based database management system is one of the essential parts of Database Management System (DBMS) and is used to store web application data. A web-based database management system is used to handle those databases that are having data regarding E-commerce, E-business, blogs, e-mail, and other online applications. Not only has DBMS been implemented but spatial DBMS also has developed. Spatial DBMS can display, query and manage data in a Map format. This solution helps the care manager or disabled personal assistants (PA) manage the disabled person information as the database with the create, read, update, and delete the data (CRUD system) through Website. The application wasn't used only for data storage but also it was reflexed the disabled person needs e.g., job finding, PA-disable person matching, the disabled person mapping, and summarizing the information. The hypertext preprocessor (PHP), JavaScript, CSS, PostgreSQL/PostGIS were used as the backend process of this application, through the hypertext markup language (HTML) with Bootstrap as the frontend development. The web mapping application using Leaflet and showing the summaries disabled person qualitative of each sub-districts, districts, or province. This solution could increase the disabled person database management and motivate the data analysis for better policy in the future.*

## 1. INTRODUCTION

Web service technology is developing based on the concept of service-oriented computing. Service-oriented utilizes the rapid, easy distributed, and low cost that integrated web-based application through connecting and sharing the workflow (Papazoglou and Georgakopoulos, 2003). Web application technology refers to applications operated via multiplatform e.g., smartphone, tablet, and personal computer with the multi-operating system. This can be used on a web browser over the internet and developed using internet browser languages like HTML, PHP, JavaScript,

etc. Sabah (2011) published the approach to developing a service-oriented web application for implement the business process as the customer-supplier interaction. Therefore, Data warehousing can be developing under the Web-based database management system which is the key process of Database Management System (DBMS) and supported the decision support system (DSS).

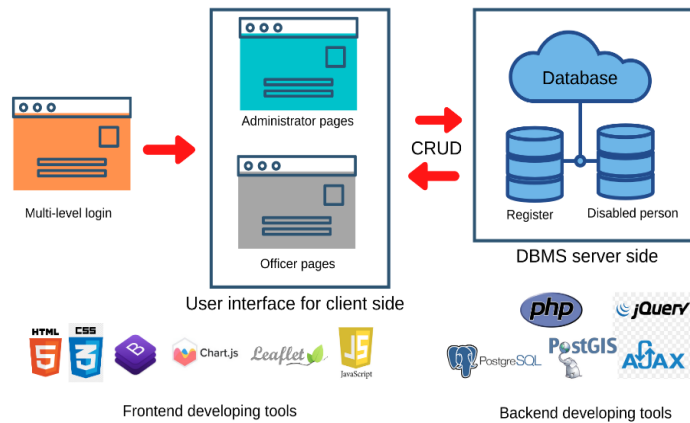
Tongkaw and Tongkaw (2018) studied the geographic information system (GIS) with DSS for disabled person data management in Songkhla province, Thailand. They developed a prototype of a GIS-DSS web-based application for simulating the disabled person facilities tool to the better management plan and planning for Songkhla smart city in the future. GIS can be widely used and associated with decision supporting or spatial thinking. So, this could be appropriate for creating a new spatial database that interpreted especially disabled person information and personal assistants (PA) manage the disabled person information.

Create, read, update, and delete the data (CRUD system) is usually a function of database management which normally operates by Structured query language (SQL). This might be a barrier to data exploration and not suitable for everyone. So, web-application can solve this problem through CRUD through the Website. So, developing DNMS for disabled person management with CRUD through the web-based application is interested. This tool reflexes the disabled person's needs e.g., the suitable job finding, PA-disable person matching, the disabled person mapping, and summarizing the information.

So, we present the approach to developing the web-based database and spatial database management for the application of disabled person management in Phetchabun province. The disabled person information e.g., disabled type, location, care plan information, personal needs, and personal information was stored as an online database that can manage everywhere through the internet and smart devices. This solution could be solved the lack of data linking, connected the workflow, and integrated disabled person organization.

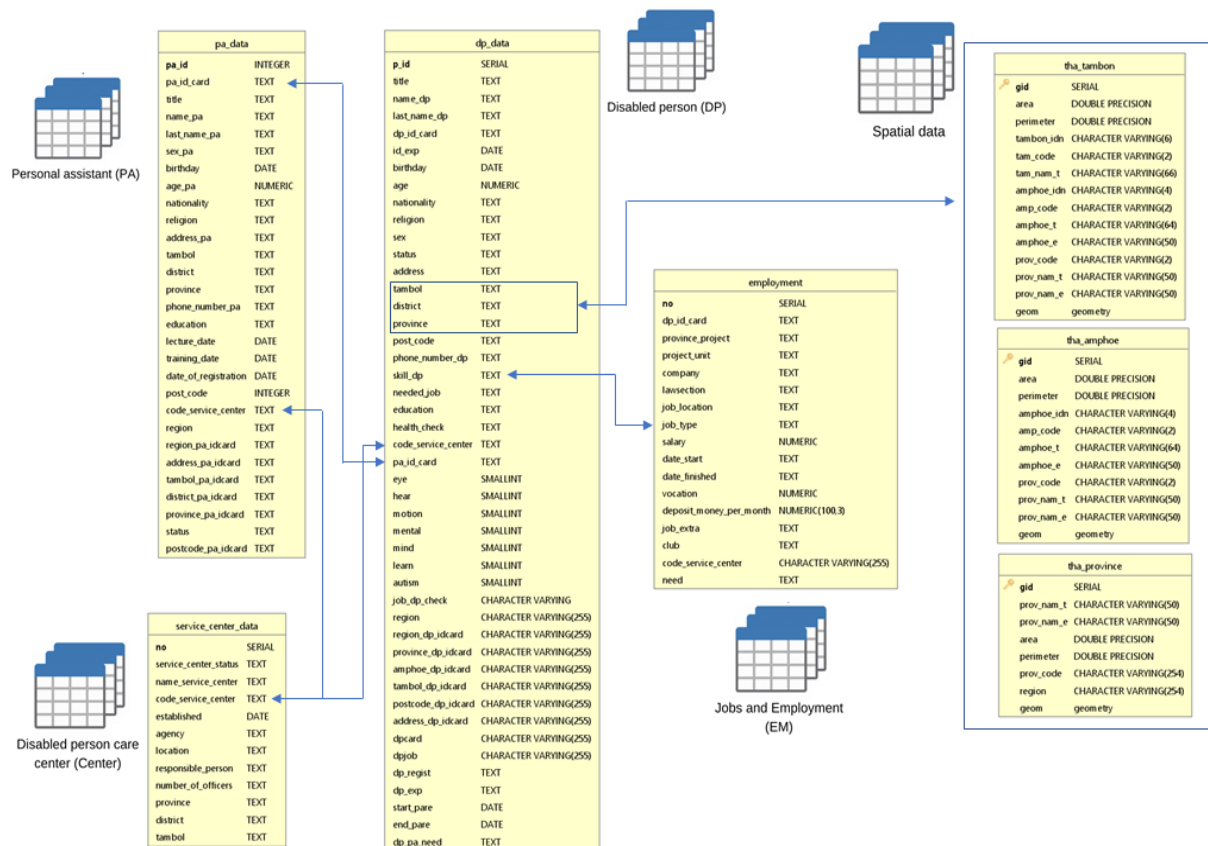
## **2. CONCEPTUAL FRAMEWORK AND MEHODOLOGY**

Figure 1, This study developed 2 sectors including database design and web-based application. The database could be separated into 2 parts: disabled person databased and multi-level user databased. The database operated using PostgreSQL/PostGIS version 5.2 as the relational database management system (RDMS). The frontend was developed using hypertext markup language version 5 (HTML5) with Bootstrap5 as the cascading style sheets version 3 (CSS3). The hypertext preprocessor (PHP), JavaScript were used as the backend.



**Figure 1. Conceptual framework**

Disabled person databased obtained 4 schemes including disabled person data (DP), personal assistant data (PA), employment and job data (EM), and disabled person care center (Center). All of schemes related with the Center code, DP citizen ID, and PA citizen ID. Then, the data visualization was used the ChartJS through the JQuery. The database design was illustrated in **Figure 2**.



**Figure 2. Disabled person database design**

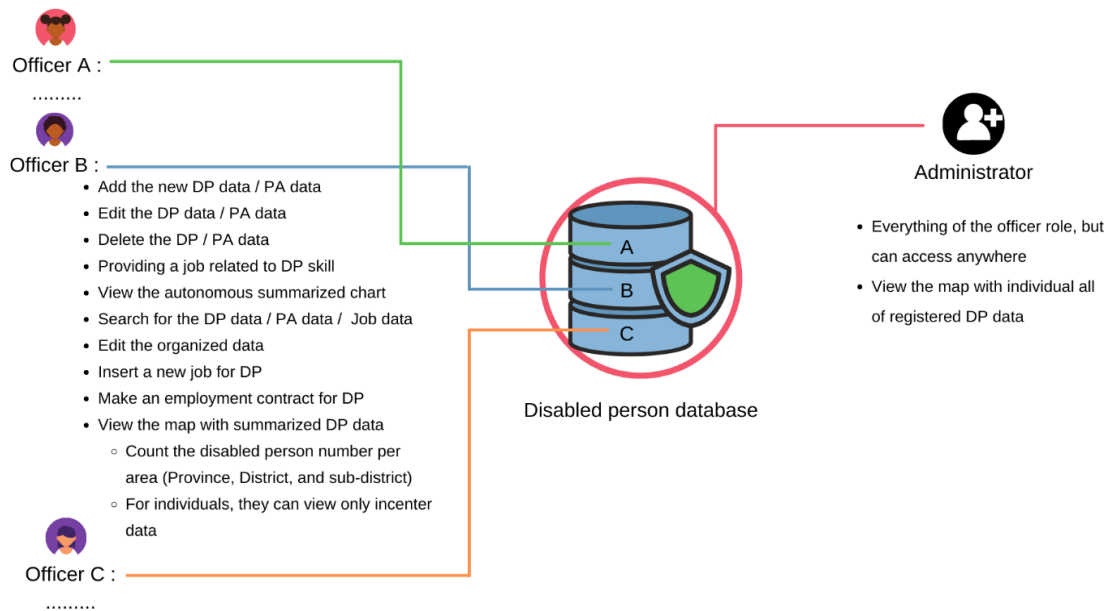
Two-level user database designed to store the registered data e.g., username, e-mail, personal information, and password. The password is encoded as MD5 for the security data. The level is divided into 2 levels: administrator and officer. The officer rules can use CRUD the data of self-organization and disabled person under self-supervision. The administrator can access the data of every organization and can promote someone to the administrator level. The web application was design as the multi-view design relates to the user level. It contained 6 major pages: Dashboard page, DP page, PA page, Center page, EM page, and mapping page.

### **3. BACKEND AND FRONTEND DESIGN**

#### **3.1 Backend developing**

Backend web development acts as the information source of the database that is required to operate the web application. Back-end was used for communication the client side to server side and server to client, likewise through the SQL. The SQL performs specific tasks like create, read, update, and delete; moreover, it can search, count, summation, or other analyses. It contains 3 majors parts: Server, Database, and Application. The server is a computer device that contains the computer program for processing the request through the network resources, normally, for storing the database, application, and web portal. The database collects all of the tables and these consisted of a variety of fields like a matrix of data. Figure 2. Showed the database design of disabled person web application (Browser-server (B/S) architectures) based on monolithic design.

From Figure 1., two types of login systems are allowed. The officer is responsible for add, edit, delete, and search, DP information e.g., Name, Last name, Citizen ID, address, disabled types, skill, and care plan. The permission was allowed only self-organization that was provided by the administrator. The center code was used for grouping the data and separation the permission of the officer. The address data of DP is linkage to the spatial data table. The geometry data was queried and showed on the mapping page. So, this could be applied to summary data such as disabled person per area, disabled person type per area, etc. Furthermore, the admin roles are showing more access to every center's data. The action of the officer/administrator was concluded and showed in Figure 3. In this section, many tools were applied to this work including AJAX-jQuery, PHP, and SQL for developed the CRUD system.



**Figure 3. The backend design of web-application**

PostgreSQL/PostGIS was used as the spatial mapping tool. The geography data of provinces, districts, and sub-districts were kept in the geometry type on the database. This function was design to generate the location of a disabled person without a geographer technician. Moreover, the advantage of geometry data is analyzable. This function could help the officer or administrator (user) to manage the DP by spatial thinking. In addition, our solution motivated to help DP needs especially job-finding or job-matching. Spatial thinking enormously helps to match DP-job in the same area or in the range of agreement. Besides, the other functions like DP number per area (province, district, sub-district) nearest hospital or health promotion center, and disabled type per area were included in this work.

For the register database, we design to separate the database into another. The register database contained username, password, user information (name, last name, email, etc.), and user level. Start, we added the first administrator-level account for promotion to the other. The registration system was designed using object-oriented PHP with SQL.

### 3.2 Frontend developing

Frontend web development is programming which focuses on the visual elements of an application that a user will interaction with the backend. They work together to create a dynamic website and allow the user to make the interactive activities: typing the data, submit the data, dynamic display, and everything as you see. For the better user experience, the frontend should break apart interesting with design engaging. Moreover, it should develop based on the user needs.

This work developed the responsive web application which supporting multi-platform access (mobile-friendly). The coding consists the HTML5, CSS, and JavaScript.

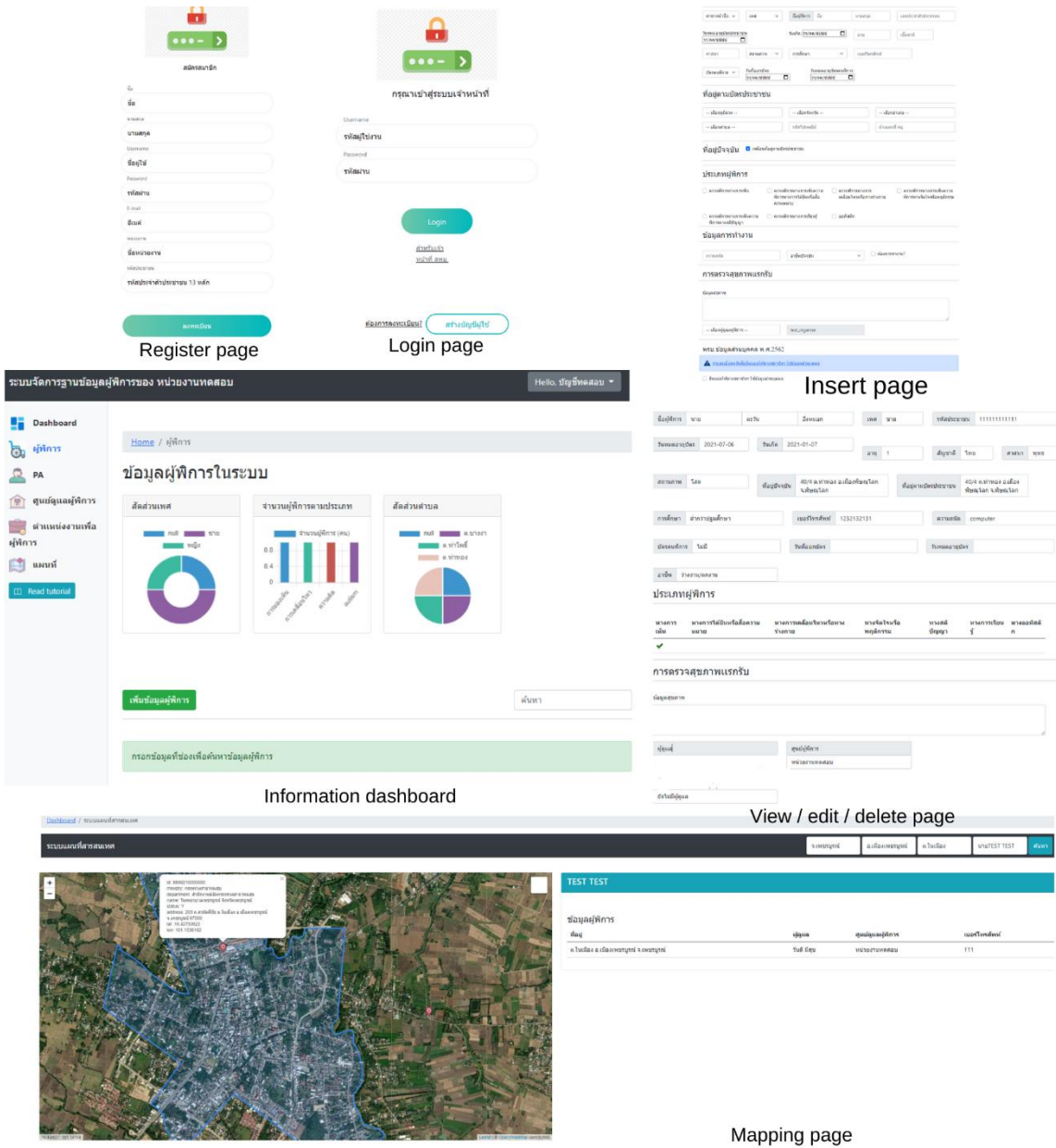
Bootstrap in one of the most popular open-source CSS framework for developing the responsive website. It contains the based components for design: forms, button, navigation, and grid. Bootstrap also comes with several JavaScript in the form of jQuery plugin. The HTML structure, CSS decorations, and accompanying JavaScript was included the Bootstrap framework. The basically layout component generating responsive design called “container”. Precompiled of Bootstrap is available in the form of one CSS file with three JavaScript. The frontend design was showed as Figure 4.

Leaflet is a free open-source JavaScript library for interactive map, one of the mapping Application programming interface (API). It designed with simplicity, usability, and multi-platform work-well. Leaflet has an ability to project the geographic data into online-mapping and work-well with the Google maps API. Figure 4 was showed the mapping web-application using leaflet, the geography data with related DP information was queried through the backend process.

ChartJS was used for visualizing the data to graph. It is a free open-source JavaScript library which supports many types of charts: bar, line, area, pie, etc.

#### **4. THE IMPLEMENTATION SPATIAL THINKING FOR DISABLED PERSON MANAGEMENT**

Our approach motivated us to develop the web application for DP information management. The data was stored in the database which has the ability to analyze. This application helps the officer and administrator can managing the data everywhere through various device types: smartphone, tablet, and personal computer. This work contained geospatial and non-geospatial information. The geospatial information is used for spatial thinking to planning the policy that might suitable for each area.



**Figure 4. The frontend design of web-application using Bootstrap5, the mapping using Leaflet**

For example, in an area that contains a high number of blind persons, there should be developing suitable facilities for the blind. The hospital geospatial data was projected. This could be used for finding the nearest. For non-geospatial information, PA could communicate with the Center, and access information of DP which care by himself e.g., health information, address, and work. The job-hiring for DP will be easier through our solution. The DP skill is the one of criteria for matching the job. The employment contract was stored on the database which is impartially

both of employer and employee. Finally, this application facilitates the officer who working for DP care. The data was analyzed into a real-time graph or table. This might motivate the data analysis for the better plan with support the policy makers.

## 5. CONCLUSION

A web-based database and spatial database management system for disabled persons in Phetchabun province was developed in this work. We designed a database to handle the disabled person information and the spatial database for the non-technician users. The backend and frontend were developed using the open-source library while showing effectiveness. This application presented the approach to spatial thinking for the decision support system. For the future, we suggested that gathering the coordinates data of each disabled person. This data might increase the function of applications like nearest hospital route, and the density of disabled persons per village.

## 6. ACKNOWLEDGEMENT

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