

A Case of GIS/WFMS Application in Digital Agricultural Project Management

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Abstract - *This paper describes the effectiveness and efficiency of agriculture infrastructure construction, a project management system integrated workflow and Geographical information system (GIS) and a web-based project management system (PMS) for large-scale and complex agricultural scientific research projects which need the cooperation among scientific research institutions located in different areas, including modern robotics and automation. To achieve this, agricultural infrastructure construction project business processes and specific functions were identified, and then the system architecture model based on the WFMC reference, the database model based on spatial database engine (SDE) technology and the functional models were designed. The teamwork system integrated with the modern project management bases on workflow and combined the internet with communication network to manage the research process in a collaborative web environment..*

Key Words: GIS,PMS,SDE,WFMC

1. INTRODUCTION

Agricultural infrastructure construction is one of the most important measures which helps to promote rural economics and improve the modernization of agriculture and rural of our country, even the concept of project management system was built in the 70s and then progressively improved and was applied for different fields including scientific research institutes. A GIS and web-based project management integration will help in modern project management bases on workflow and combined the internet with communication networks to manage the research process in a collaborative web environment. The business process of agricultural infrastructure construction project can be flexibly customized by integrating dynamic workflow management and statically processes, and with the

support of SDE (Spatial Database Engine) and other GIS functions, the other information of project can be seamlessly managed and displayed, also the spatial information can be online submitted, edited and

2. METHODOLOGY

This system consists of administrator management, financial management, achievements management, document management, communication management and progress management as shown fig.1

2.1 FRAMEWORK

The system adopts B/S infrastructure, MySQL as the database server, Apache as the web server, and use PHP language for programming, implementing it in Win2000 and Linux. Groupware was used in this system to keep group in synch with the research team agenda and meetings including video conference, teleconference to enable the project get easily handled in a collaborative web environment. Workflow is an automation of all or part of the business process in the application environment of computer. Simply, workflow is a series of interlocking, automatic business activities and tasks. It is to decompose the work into well-defined tasks and roles, carry out these tasks according to the rules and supervise them, aims to improve the work efficiency, control processes better, enhance customer services, effective management of business processes etc. The project management for agricultural infrastructure construction is a whole process management for its projects from planning, application, approval, project, design, implementation, and evaluation etc., these links relate to departments, constructions, beneficiaries etc., which needs to be handled by persons with different duties and responsibilities, and needs supervision on the whole process tracking. It is a typical workflow management, the internal businesses among various functional departments are complex work processes such as project approval, generally includes project produce, audit, approval, supervision and produce results. Dispatch, filing process, is also an example of workflow management. The business process will use maps and other data frequently, so the

project management of agricultural infrastructure construction requires a seamless integration of workflow and GIS technology.

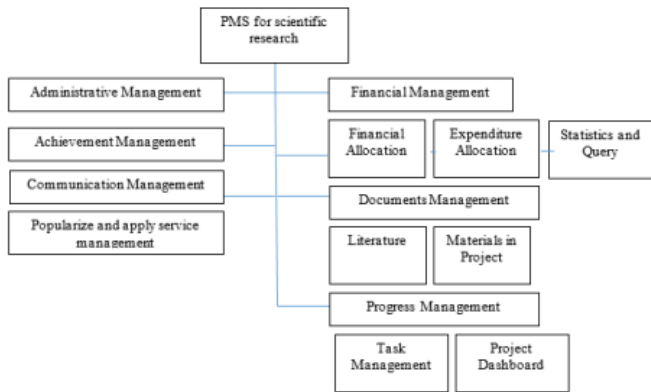


Figure-1: PMS for agricultural scientific research.

2.2 Architecture

To determine places for quality improving every year, where users not only need to consider the land condition but also consider geographic features. In other words, they need deal relatively complex and frequent vector map editor operations. However, commonly WebGIS is suitable for limited function of about vector map editor in current, but seemed far more inconvenient than desktop GIS systems. So, the system pro-posed here is divided into desktop GIS application system, which used to make vector map for implementation area in the project of improving the quality of standard farmland, referred to as Map Draw Tool, and WebGIS-based management system, referred to as Project Management System, which including the parts of map-based query and display, and the parts of business management. In this work, Map Draw Tool is customized for counties cultivated land quality management departments, where the user can export it as an independent file for exchange with other program when the needed vector map is finished. It is worth mentioning that, as it involves more than 80 counties, where they only need their own standard farmland spatial data respectively, in order to solve the inconvenience of data distribution, all data are stored on a network server, and when running, it will firstly automatically obtain local spatial data from server by assigned account in a certain way.

Fig.2 shows this systems architecture, where the processing of projects implementation area vector map of is the core of system. From the top to bottom respectively are user tier, business tier, technology tier and data tier. We can see that it is made by Map Draw Tool, and then the

exported vector file will be uploaded to the Project Management System with applying. The most critical aspect is that, when in the approval process the checking services about the vector map is deal automati-cally by certain applets, and the analysis result according to a predetermined rule will be provided to administrator. Finally the approved projects map will be published by ArcGIS Server, and can be visited in web.

Figure 2. System Architecture The system users involve management departments (agricultural committee, agricultural bureau etc.), contractors (enterprises, production materials suppliers etc.) and beneficiaries (farmers, professional cooperation organizations etc.). The system needs to integrated the entire work-flow of agricultural infrastructure construction projects from planning, application, approval, project, design, launching and evaluation, realizes the digital recording, reporting, transfer, archiving and collection of the management information in all, produces various statistical reports (including schedule briefing, quarter etc.), the progress of the projects evaluation and analysis, need an early-warning schedule in case (including the image warning of progresses, early warning of the completion of investment and the quality of projects). According to the analysis of users and functions, the system adopts B/S (Browser / Server) structure and the typical 3-layer structure model (see Figure 2), i.e. presentation layer, business logic layer, data service layer.

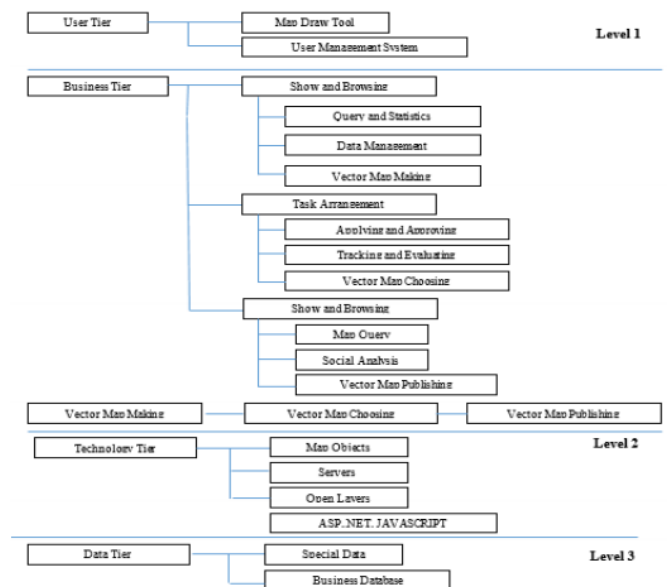


Figure-2: System Architecture.

3. SYSTEM MODULES

3.1 System Administrative Modules

The System administrator can proceed user management, workflow management, menus management, authority setup, parameter setup, and database maintain etc. The user management module allows administrator add, alter, delete the users information includes the role played in the project. The administrator can set rules and conditions of workflow during which documents, information or tasks are passed from one participant to another through the workflow management. The administrator also can setup the authority of the users using the system according to the roles and group definition, even on the individual level. For public service agriculture research project Northern Fruit borer monitoring and research and demonstration on the prevention and control technology the system consists six main roles :the supervisor of first-level cooperation institute and second-level and the third degree, the leading expert, the project coordinator and the ordinary Research fellow in addition with the group defined such as data acquisition people. The leading experts have the highest right to observe all of the data and the other roles can reach to the shared information such as the documents, achievements, the extend information, etc and data belongs to their own institute and the lowers such as the information about the financial and workflow

3.2 Expenditure Management Modules

This part includes three modules: financial allocation, expenditures record and report to the higher level, financial Dashboard. Figure 3 shows the way of first two parts work.

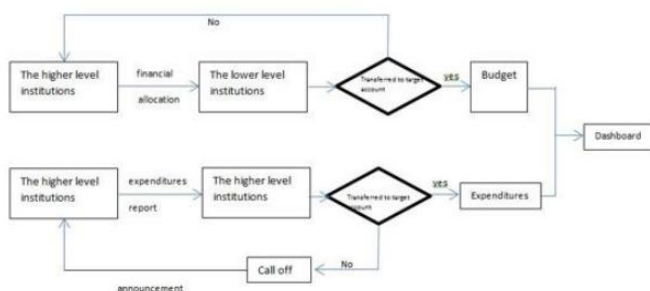


Figure-3: Expenditure Management Architecture.

3.3 Document Management Modules

This module consist of literature database and material database management system .All litterateurs are stored in literature database, for easy access to researchers. It also provides option to download. All materials such as

application, contracts are stored in material database .The project coordinator has authority to custom read and write any catalogue.

3.4 Achievement Management Modules.

The achievements management has the functions of adding, updating, deleting, recalling, counting health record information. Every record must be attached a file such as the pictures or documents as the certification

3.5 Progress Management Modules.

This module provides functionality of project management. It let institutions create project plan and assign them.

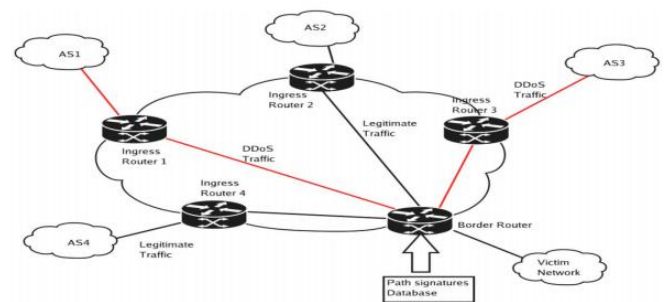


Figure-4: A PMS for Agricultural and Scientific Research.

4. CONCLUSIONS

In order to realize process monitoring, evaluation, monitor appraisal and data-sharing, we introduced workflow technology and GIS technology into the system, based on the analysis of project management for agriculture construction of our country. This system has strong practicability, expansibility, sharing, security and stability, and provides project data/information recorded, reports and statistics analysis, and other functions for all kinds of supervision.

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