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Research about building the management for mineral software. Case Study in the Tuyen Quang Province

Introduction

When the economy develops, it is difficult to maintain a highly stable speed of development, mainly due to increasing the production of mineral raw materials, expanding the mineral export and recovering the mineral rent (Ali et al. 2017). Although the direct contribution of solid mineral mining and processing to the national economy is decreasing, this is an important factor which promotes the speed of economic development, contributes to the state budget, solves the employment problem and creates a replication effect in the economy (Ali et al. 2017; Pushcharovskii et al. 2018). Mineral resources are non-renewable resources, limited reserves, and an important infrastructure for social development (Duncan

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and Lach 2006). However, the development of society, the advancement of technology and the rising global population makes the consumption of mineral resources increase more and more; therefore, the depletion of mineral resources happens swiftly. Besides, the more the degree of geological works is advanced, the more difficult mineral resources are investigated. Therefore, the system that authorizes the mining of minerals must be optimized to guarantee the security for natural resources (Kumar et al. 2017). Minerals and metals are essential materials for all social activities and the modern economy. But the process of mining always raises challenges and poses risks to people and the environment. The largest challenge in mining management is contributing safe sustainable development (Gankhuyag et al. 2017). Mining management in all stages from exploration to closing need to carefully consider the impact on society and the environment because in reality, the sustainability of the environment and social benefits hardly care much. Management according to sustainable development should consider changing attitudes to activities that are performed. This is similar to a hierarchical system of new values, instead of direct benefit, the improvement of personal happiness is cared and more outstanding (Radwanek-Bąk 2008). Most of the conflicts happen due to the suitability of the plan of infrastructure development in mines with regard to the demand for natural protection and the economic benefit of the surrounding residents (Furmankiewicz et al. 2019).

With such difficulties in mining, heavy machines and advanced mining technology (bomb or blasting) were used to exploit low quality ore at greater depths; as a result, labor safety and the environment are negatively affected. Therefore, it is necessary to plan, operate and manage the mine environment systematically and strategically based on optimization techniques in order to improve mineral productivity and the efficiency of activities and stability in the mine environment. The development of mineral industry always causes conflict with the environment. Thus, the main components of growth and instructions for controlling development should be clarified to balance economic benefits and the impact on the environment (Thowiba et al. 2021). Statistical data about the formation, development and other activities of mines allows managers to have reliable information to build strategic development policies in accordance with the economic characteristics in each location. This is the foundation that turns the management of mineral resources as one of the levers of increasing production efficiency and tax distribution.

In Vietnam, natural resources are national property. Mineral resources are natural capital which forms different capital investment. The mining sector promotes economic development, contributes to fiscal revenue and income, builds regional infrastructure, and is the basis for creating livelihoods for poorer communities. Due to such importance of natural resources, the Vietnamese Government has promoted policies that help this industry to obtain the long-term benefits to the national budget instead of only contributing to short-term revenue. Significant reforms on the juridical aspect of mining management have created more capital for investment, but these reforms include defects and loosen that cause a lot of undesirable consequences on economy, society and environment (Nguyen et al. 2019; Sokol 2020).

In addition to the obtained results, there are still shortcomings in resource management; many resources have not been exploited and used effectively and sustainably, some of them are over-exploited leading to their depletion. Environmental pollution continues to increase, even seriously in some places. Biodiversity declines, the risk of ecological imbalance happens on a large scale, which negatively affects socio-economic development and people's health. The quality of forecasting and planning is still limited, not keeping up with requirements of development about totality, interdisciplinary and inter-regional. The response to climate change is still passive and at an embarrassing level, natural disasters are more and more unusual, and they cause a lot of damage to people and property. The management, exploitation and usage of natural resources are not effective. Land used with wrong purpose, deserted, encroached appears in some locals that have loose management, this status affects agricultural production and causes loss of state budget. The capacity to exploit mineral resources is weak, and technology is innovating slowly. The coordination of management of mineral resources among regions and locals is not good, which reduces the efficiency of exploitation. The market for mineral resources is slowly formed and non-synchronous. The opinions of promoting the economization of the natural resources and environment sectors are not considered, institutionalized and organized to implement. However, economic development is largely based on exploitation and usage of natural resources beyond the self-healing threshold always has potential risks with regard to transferring losses from resources to ecological environment in the future.

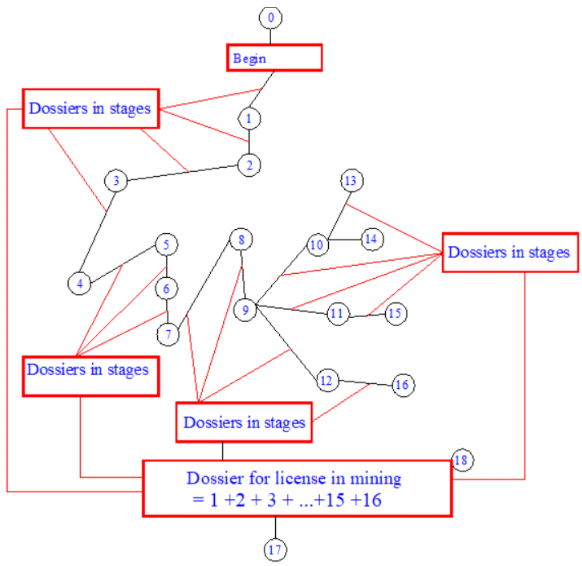
The sustainable use of natural resources requires good governance and management based on suitably scientific information, data and indicators. Documents on natural resource management with its national scale and macroeconomic policymaking are not fully compiled (Bringezu et al. 2016). Therefore, with advances in computers, the demand for managing, storing and displaying data scientifically, easily to understand and visualize is essential request. On the basis of the national mineral development strategy, an increase in the amount of available resources, the resource development policies, and necessary plans for different uses are expected, establishing development programs, methods of organization and monitoring the suitable use of resources in order to avoid abusing the reused resources and protecting them from all risks of resource depletion without passively affecting the environment (Kim et al. 2012; Li et al. 2000). In fact, Vietnam does not have a comprehensive database of minerals to regulate policies effectively. Therefore, it is essential to have a solution to improve poor management by providing a relatively comprehensive database and management method.

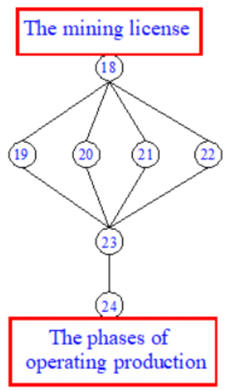
1. The process of implementing the administrative procedures for mineral mining

According to Article 9 of the Law on Minerals No: 60/2010/QH12, the principles for formulating mineral strategies must ensure that:

a) they are compatible with strategies of socio-economic development, defense and security and with general plans of the nation;
b) they ensure the demand of minerals for sustainable socio-economic development, they exploit and use minerals economically while avoiding wasting;
c) they have the ability to supply minerals in the country and to cooperate internationally;
d) they have a premise for the geological investigation of minerals.

This law also stipulates that the local authorities are only allowed to manage some minerals such as: common building materials, scattered minerals and peat. Furthermore, there are some other regulations on state management: the state manages the large-scale projects of industrial exploitation, the local authority manages small-scale projects; strengthening human resources and investing in facilities and equipment must be done to improve the capacity of the state management of minerals at all levels. In particular, it is necessary to





a. The procedure of permission for mining

b. Legal procedures during the stage of mine operation

Fig. 1. Procedures and dossiers of permission for exploting a mineral mine
0 – dossier of development plan of mineral areas; 1 – dossier of applying the license for survey of an area; 2 – dossier of survey and assessment of the area; 3 – dossier for auction of mineral exploration rights; 4 – mineral exploration project file; 5 – dossier of construction results of mineral exploration projects; 6 – dossier of agencies managing and taking over exploration projects; 7 – dossier of decision on approval of reserve; 8 – dossier of design survey; 9 – pre-feasibility project dossier; 10 – feasibility project file; 11 – dossier of environmental impact assessment; 12 – dossier of plan for environmental rehabilitation and restoration; 13 – dossier of construction technical design; 14 – dossier for calculating fees for granting exploitation rights; 15 – dossier for determination of environmental protection fee; 16 – dossier for determining deposit for environmental protection; 17 – dossier of mine closure; 18 – the license for exploiting minerals; 19 – the license for work construction; 20 – the license of using dynamit (dynamit for breaking rock); 21 – the license of using water; 22 – approved land renting documents; 23 – documents of completion for the basic construction phase; 24 – the phase of production operation based on the design

Rys. 1. Procedury i dokumentacje pozwolenia na eksploatację kopalin consolidate and enhance the apparatus of inspection, the examination and control of mineral activities, and the strict handling of violations. There are eighteen types of basic documents in applying for a license of operation at a mine, these are comprised of sixteen types of reports for each stage of implementation, one planning dossier and one mine-closing dossier (Figure 1a). Six dossiers are added in the stage from the beginning of mine operation to gaining the designed capacity (Figure 1b).

On the basis of the planning document for the mining area, in accordance with the regional economic development plan, the mining company applies for a survey license from the government. In this step, professional agencies survey the following together with the mining company:

- considering if the mining area overlaps on the area under the jurisdiction of security defense?;
- survey of whether there are cultural works and archaeological relics in the area;
- survey of whether the area overlaps on the protective and forbidden forests;
- investigating topography, geomorphology, current status of the area;
- survey of economic conditions, infrastructure, population, having the agreement of eleven professional management agencies including agriculture, industry and trade, planning, culture, security, defense, natural resources, land, transportation, construction and district authority, the company makes a dossier and submits it to a higher authority to ask for permission to conduct the next steps.

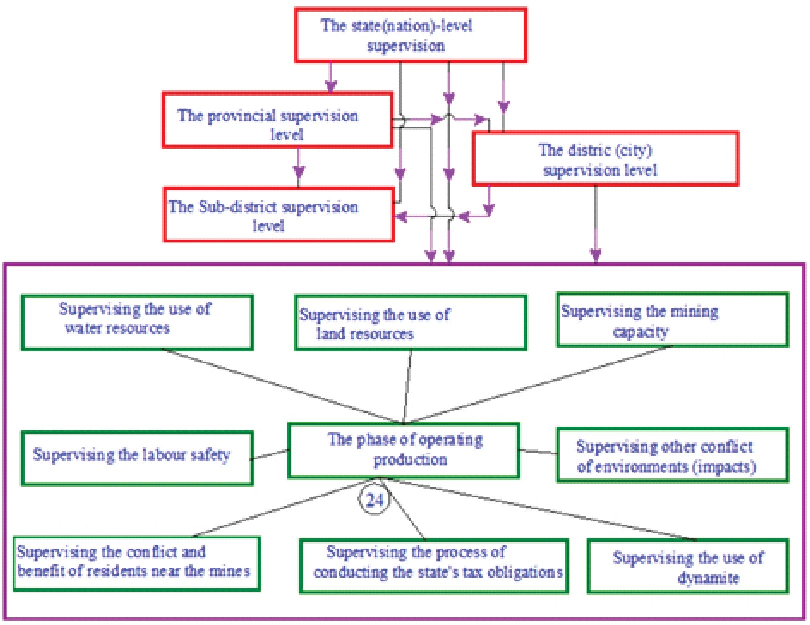


Fig. 2. Process of mining supervision for the state management agencies

Rys. 2. Proces nadzoru górniczego dla państwowych organów zarządzających

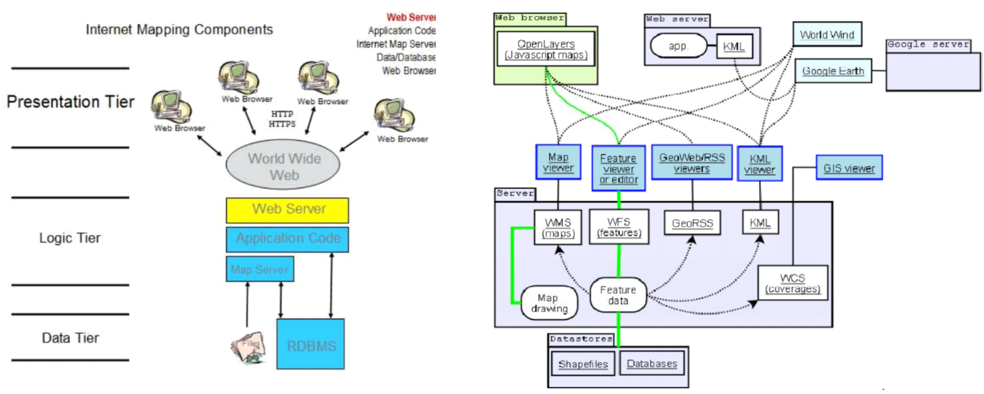
When it is approved by the authorities at all levels (provincial or central level) to take the next steps, the mining enterprise carries out the licensing process as shown in Figure 1. After the mine is operated, the monitoring process is conducted by the governing bodies as shown in Figure 2 in which the higher level authorities manage and supervise the implementation activities of the local authorities and other professional agencies. Process and aspects of management are stored in documents as shown in Figure 2.

2. The method of implementation

Software or applications quickly help find and process data for different purposes, including the effective management of resources (Onuiri et al. 2015). Guide principles of the Rational Unified Process software were adopted with the use of tools such as Bootstrap, PHP, MySQL and HTML. The tools that were created in combination with the GIS geodatabase platform are effective tools for solving weak problems, providing relatively comprehensive data in management and the strategic planning of minerals, the environment, and the economy.

The geographic information system (GIS) is a package of computer software that links information of spatial objects to the data associated with these objects (Radulescu C. and Radulescu V.M.G. 2011; Suh et al. 2017). GIS is considered to be a powerful tool for storing and extracting, transforming and displaying spatial data from the real world for some specific purposes (Banerjee et al. 2014; Bascompta et al. 2016; Radulescu C. and Radulescu V.M.G. 2011). GIS is developed from traditional geographers and cartographers' tools to survey and plan for rapidly expanding the basic technology with a view to understanding our planet and related geospatial opportunities, which promotes the development of a green sustainable world (Craynon et al. 2016; Maryati et al. 2012; Suh et al. 2017). GIS technology narrows the gap between different fields and operates as an integrated interdisciplinary platform for collecting, managing, compiling, analyzing and visualizing geographic space, information time on environment and sustainable ecology (Nusayba 2017; Yousefi and Nykanen 2017; Radulescu C. and Radulescu V.M.G. 2011; Tsangaratos et al. 2010; Uygucgil and Konuk 2015). When applied in mining, GIS usually lies in the 'toolbox' of software. GIS contains different commands that help users perform different discrete tasks, which is similar to word-processing software (Tanmoy Kumar Banerjee et al. 2014; Yosoon Choi et al. 2020). With the development of geographic information systems (GIS), this technology has been applied into the mineral industry (He et al. 2012; Choi and Park 2011; Tsangaratos 2010; Yosoon Choi et al. 2020). Due to the implementation of "Digital Mine", a lot of mining companies and science institutes built the management information system for a large mineral resource (Craynon et al. 2016; Pang Hui et al. 2010). Data on mineral has complex and diverse characteristics, including two-dimensional, three-dimensional spatial data, production reports, mining-site information, sampling results, etc. (Odeh 2019; Bascompta et al. 2016; Kim et al. 2012; Li et al. 2000). The management system of coal-mine information is designed based on GIS, WEB, database and monitoring technologies to digitally manage information according to the C/S + B/S mixed mode. The database system, function of tools, and the WebGIS design diagram are built based on Ajax and ASP.NET (Liu and Yang 2004; Guo et al. 2016). With the management of emissions issues, the environment analyzes the spread of pollutants and their impact on the surrounding areas; if a significantly bad impact is identified, the system will provide minimization advice (Bascompta et al. 2016; Lèbre et al. 2017; Kim et al. 2012; Li et al. 2000; Liu and Yang 2004). The different types of hazards caused by mining are classified into two or three subtopics according to the steps involved the mining procedure, the risk elements need to be processed and the application of the assessment of mining hazards should be further expanded (Li H.-F. and Li J.-G. 2009; Hao Wu et al. 2005; Hong Ma 2013). The web browser is a presentation tier of the web mapping architecture which mainly involves finding the right web page and then making sense of its content (Lèbre et al. 2017). The Uniform Resource Identifier identifies the information resource and may be a web page, image, video, or other piece of content (Jacobs and Walsh 2004). WMSA Web Map Service (WMS) is a standard protocol for serving geo-referenced map images over the Internet that are generated by a map server using data from a GIS database (Orenstein 2010). The WMS contains a HTTP interface for requesting geo-registered maps from different distributed databases.

A WMS sends a request to the server defining the map layer and the area of interest in the layer to be processed. The response to the request is generally rendered in a pictorial format such as PNG, GIF or JPEG, or occasionally as vector-based graphical elements as scalable vector graphics (SVG) or web computer graphics metafile formats (WebCGM) (OGC 2002)



a. Components of Web Mapping, (Crocker Farallon Geographics)

b. Relationship between clients/servers and some OGC protocols [0]

Fig. 3. Mechanism of action of Web GIS
a) components of Web Mapping (Crocker Farallon Geographics);
b) relationship between clients/servers and some OGC protocols

Rys. 3. Mechanizm działania Web GIS
a) składniki map internetowych (Crocker Farallon Geographics);
b) relacje między klientami/serwerami a niektórymi protokołami OGC

which can be displayed in the browser. Web Feature Service: The OGC WFS defines interfaces for data access and manipulation operations on geographic features using HTTP as the distributed computing platform. This standard specifies operations to retrieve a description of the maps offered by a service instance, to retrieve a map and to query a server about the features displayed on a map (Hampe and Intas 2006). Data manipulation operations include the ability to create, update, query and delete spatial and non-spatial features. The user generates the request and sends it to a WFS server using HTTP. The WFS server then executes the request. Two encoding defined for WFS operations GET and POST. Figure 11 shows the relationship between different specifications defined by OGC shown in Figure 3a (Dhakal 2010).

Loading data to PostGIS can be performed using the following two methods:

1. Using loader utility: the shp2pgsql command of PostGIS can be used to convert shape-file data into the SQL format. The command used to convert the shape file to an SQL file is as follows:

   shp2pgsql file.shp table_name > file.sql **Loading data in PostGIS**

   psql –u username –d dbname –f file.sql

   Change SRID

   Select updategeometrysrid (‘table name’, ‘tem_col’,)
2. Another way to convert the shape file to an SQL format is by using Openjump. This is also open-source software that can be freely downloaded. Using Openjump, the shape file is converted to the SQL format by loading shapefile file> load datasets from file and selecting the required shape file. The SRID (spatial reference system identifier) is defined as 4326 (Dhakal 2010).

The theory and technologies related to digital mining are the premise of the current development of information technology. How to effectively integrate the system of “technique” and “commerce” is the key for sustainable development and standard management in the mining industry (Li and Zhong 2010). Web applications are increasing in popularity and the number of websites are also on the rise, so the requirements for quality and efficiency need to be improved (Odeh 2019). Requests on websites are a common way for applications to perform interactions between humans and computers but refreshing the entire page reduces the influence of the user experience, increases pressure on the server and slows down the response speed of the program (Wang and Yang. 2008; Wang et al. 2015). Ajax is a new concept proposed in 2005 on the development of web applications. Ajax is an acronym of asynchronous JavaScript and XML (Botín and Palacios 2010). When Ajax appeared, it was quickly applied for web development. The traditional model of web development has a few disadvantages, such as its use of asynchronous interaction – the client waits unnecessarily while the server processes data, but Ajax has overcome these drawbacks. Ajax can create a live web user interface, is highly applicability, more abundant, more dynamic, and closer to a local desktop application (Wang and Yang 2008; Wang et al. 2015). Microsoft’s ASPs NET AJAX framework can greatly reduce the difficulty of programmers in developing AJAX applications (Kim et al. 2012).

The goal is the development of an easy-to-use open source application with a view to it serving as a management assistant of geotechnical data, not replacing the current modeling techniques and the commercial software. The software is built on the basis of the management goal of mining activities, the environment, the status of land use and water, with the role as the state managers and the mine managers. In this way, managers and experts can extract and add data, select the method of processing etc., which saves time and works more efficiently than looking up documents and paper maps. The basic functions provided to the user include:

a) a tool for importing data according to a specific pattern or the structure of the data notebook that is suitable for the needs of the user (Data Input Manager);
b) tools for applying algorithms of simple data mining along with classical statistical analysis to identify similar physical or mechanical characteristics and to draw correlations (Mining data Manager/Statistics);
c) tools for indicating queries (Query Builder Manager);
d) tools for visualizing results in 2D and 3D models (Visual Manager).

This application has a graphical interface and was developed through the use of Visual Basic 6.0 (VB6) or higher versions. The application is built to contain information of mines such as geology, geotechnique, mining methods, mining process, etc. and other related data, which is represented in the cation of application by the structured query language (SQL). The application is implemented on Microsoft Jet Engine, data is stored in Microsoft Access Database, so access is protected and managing and updating data is easy. Clustering algorithms (K-Means algorithms), written in VB6 code or a higher program, are also taken in the source code to cluster similar data, provide the signal of behavior. Finally, the data can be processed and spatially analyzed using the MapWindow GIS ActiveX Control. Complementing interactive plugin, using C, C +, C# programming languages for building mechanisms of process and extracting data according to user requirements, specifically, according to the requirements of the mineral management of state agencies. The database system and function of tools are introduced, the design diagram of WebGIS is based on Ajax and ASP NET.

3. Steps of building the mineral-management software in Vietnam

3.1. The sequence of building the structure of software

Analyzing for building information database needs to be conducted according to the following steps:

Step 1. Analyzing the content of data: checking and analyzing the content of data and classification and detailed assessment of information for constructing the database; determining management objects such as the mine site, the types of minerals, exploratory investigation, licensing, reserves, photographic materials, related

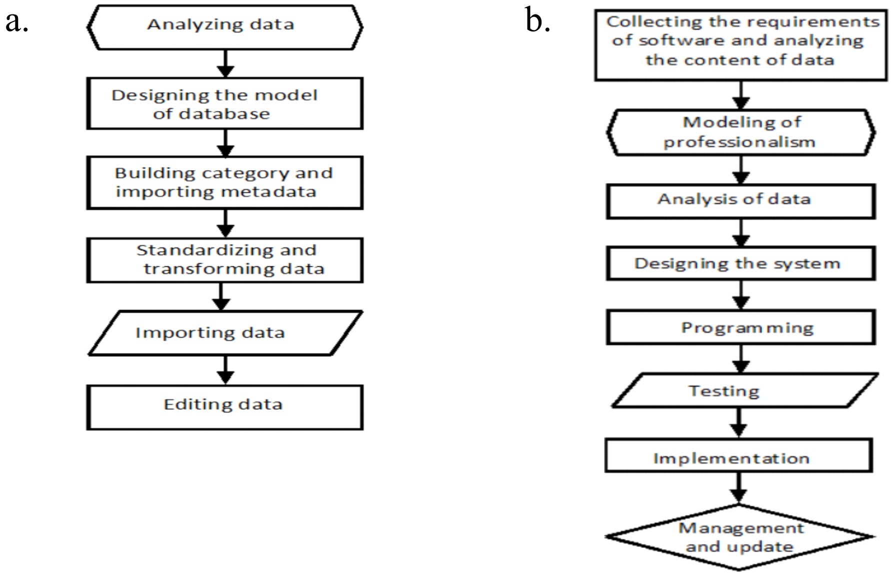


Fig. 4. Block trees diagram of process of building the software in Vietnam
a) procedure of building information database; b) building software

Rys. 4. Schemat blokowy procesu budowy oprogramowania w Wietnamie
a) procedura budowy bazy danych informacji; b) oprogramowanie budowlane

documents, maps or related drawings; defining the detailed information for each object. The mine site includes: mine point, coordinates, place name, governing body, code, defining in detail the relationships between managed objects; determining in detail documents that need to be entered into the database from the keyboard; identifying the framework of the data list used in the database; determining the factors affecting the construction of database; changing the management object.

Step 2. Designing the database model: designing the data catalog model; designing database model on the basis of the analysis of the designed data; importing sample data to test the data model.

Step 3. Building catalogs and importing metadata: building data catalogs; import metadata.

Step 4. Standardizing and transforming data: converting spatial data to coordinate system; standardize spatial data according to data model design; standardization of fonts; tandardization of non-spatial data according to data model design; conversion of the post-standardized data into the data model.

Step 5. Importing data: importing structured non-spatial data; importing unstructured non-spatial data; entering spatial data of the point form elements; entering spatial data of the line form elements; importing spatial data of plane form elements.

Step 6. Editing data: declaring object; checking and correct correlation of spatial data; editing content.

Step 7. Checking products: checking data model; checking the database; checking metadata; building the software in accordance with the three steps shown in Figure 3b.

Step 8. Collecting software requirements and analyzing the data content, which is work for determining the functional and non-functional requirements of the software and includes tasks such as: collecting software requirements (functional and non-functional requirements); defining functional requirements; identifying and describing the impact factors of the software, use cases and factors affecting the complexity of each use case; identifying non-functional requirements (the need for building the software, the complexity of software installation , security, multi-user; changing use case; analyzing of data content; determining that the management objects are similar to building the presented database; determining descriptive information for each object; determining the binding of each managed object.

Step 9. Modeling professionalism: building the user professional model; determining the catalog of professional processes and describing them in detail; building the use-case professional diagram; identifying the professional use cases, the professional factors, the relationship between the professional factors and the professional use case, the relationship between professional use cases.

Step 10. Designing the system. Designing the system architecture design: WebGIS is built to provide geographic information services by web service technology. Therefore, any WebGIS must satisfy the common three-tier architecture of a web application. The three-tier architecture of WebGIS is described including the presentation layer, the transaction layer, and the data layer (Figure 5).

Designing the activity diagram; designing the sequence diagram; designing the class diagram; designing the database model, including entering sample data for testing; designing the interface.

Step 11. Programming. The management software for geological and mineral information database in Tuyen Quang province is built by ASP.NET MVC5 technology using the programming language C# and the SQL server database. Due to having been run on the Web platform, users do not need to install any software on their personal computers, they just need to access the address on the web browser to be able to exploit the database information. To ensure that the system can run well in the conditions of many users, the project uses an open source code platform, such as QGIS, PostGIS.

Step 12. Testing. This step helps to detect software errors so that they can be repaired with a view to adapting to the mentioned requirements. The work needs to be done as follows: testing the source code according to the standard of programming rules; checking the component level; checking the system level.

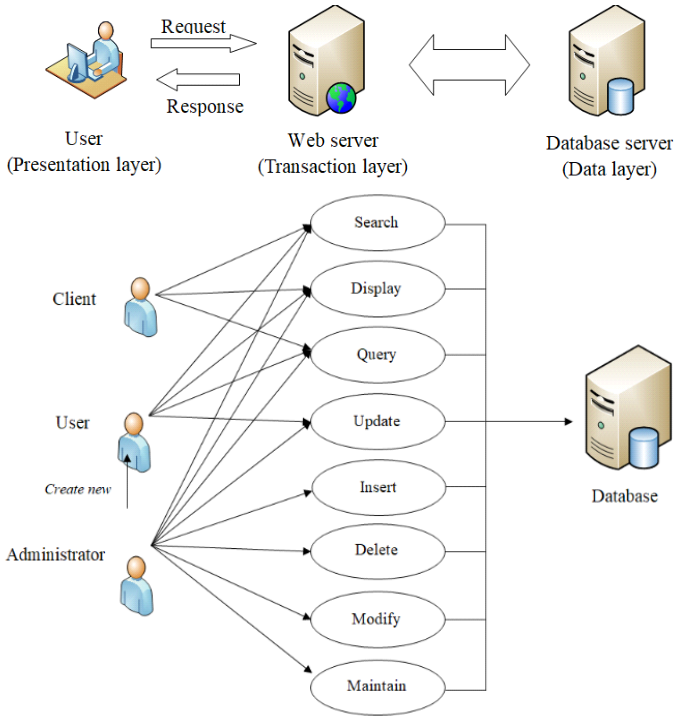


Fig. 5. Design the structure of the system

Rys. 5. Projekt struktury systemu

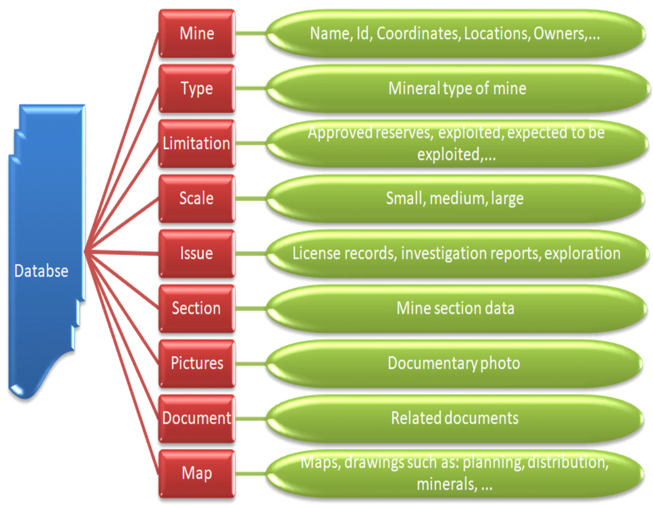


Fig. 6. Database model diagram, include sample input data for testing

Rys. 6. Diagram modelu bazy danych, zawiera przykładowe dane wejściowe do testowania

3.2. Several code paragraphs for programming of building the database – case study in Tuyen Quang province

```
public List <TQG_HoSo> SelectByMaLoaiHoSo ( string strMaLoaiHS )
        {
            List <TQG_HoSo> objs = new List <TQG_HoSo>();
            obj s = ( from m in this . db. TQG_HoSo.Include (( TQG_HoSo m) =>
m. TQG_LoaiHoSo). Include (( TQG_HoSo m) => m. TQG_ToChucDoanhNghiep )
                    where m. IsActive == true && m. LoaiHoSo . ToLower () ==
strMaLoaiHS . ToLower ()
                    select m). ToList <TQG_HoSo>();
            List <string > lstLoaiKS = new List <string >();
            if ( objs != null )
            {
                foreach ( TQG_HoSo item in objs )
                {
                    if ( item . LoaiKhoangSan != null )
                    {
                        lstLoaiKS = new List <string >();
                        List <string > loaiKs =
item . LoaiKhoangSan . Split ( new char []
                        {
                            ','
                        }). ToList <string >();
                        for ( int i = 0; i < loaiKs . Count ; i ++)
                        {
                            int maLoaiKS = int . Parse ( loaiKs [ i ]);
                            TQG_LoaiKhoangSan lks =


public int ThemHoSoChuTruongHDKS( TQG_HoSoChuTruongHDKS_VM obj , string
userName )
        {
            TQG_HoSo hoso = new TQG_HoSo();
            hoso . MaHoSo = obj . MaHoSo;
            hoso . LoaiHoSo = obj . LoaiHoSo ;
            hoso . MaMo = obj . MaMo;
            hoso . DoanhNghiep = obj . DoanhNghiep ;
            hoso . ChuDauTu = obj . ChuDauTu;
            hoso . DiaChiChuDauTu = obj . DiaChiChuDauTu ;
            hoso . GiayDKDN_SoHieu = obj . GiayDKDN_SoHieu ;
            hoso . GiayDKDN_NgayCap = obj . GiayDKDN_NgayCap;
            hoso . GiayDKDN_NgayHetHan = obj . GiayDKDN_NgayHetHan ;
            if ( obj . LoaiKhoangSan == "[object Object]" )
            {
                hoso . LoaiKhoangSan = hoso . LoaiKhoangSan ;
            }
            else
            {
                hoso . LoaiKhoangSan = obj . LoaiKhoangSan ;
            }
            hoso . DienTich = obj . DienTich ;
            hoso . ViTriMo = obj . ViTriMo ;
            hoso . ToaDoKhepGoc = obj . ToaDoKhepGoc;
            hoso . CreatedDate = DateTime . Now;
            hoso . CreatedBy = userName ;
            hoso . UpdatedDate = null ;
            hoso . UpdatedBy = null ;
            hoso . IsActive = true ;

            hoso . DienTic h = obj . DienTich ;
            hoso . ViTriMo = obj . ViTriMo ;
            hoso . QDPDBaoCaoDGTDMT_SoHieu = obj . QDPDBaoCaoDGTDMT_SoHieu;
            hoso . QDPDBaoCaoDGTDMT_NgayBanHanh =
obj . QDPDBaoCaoDGTDMT_NgayBanHanh;
            hoso . GiayPhepKTKS_SoHieu = obj . GiayPhepKTKS_SoHieu ;
            hoso . GiayPhepKTKS_NgayBanHanh = obj . GiayPhepKTKS_NgayBanHanh ;
            hoso . GiayPhepKTKS_NgayHetHan = obj . GiayPhepKTKS_NgayHetHan ;
            hoso . QDPDTruLuong_SoHieu = obj . QDPDTruLuong_SoHieu ;
            hoso . QDPDTruLuong_NgayBanHanh = obj . QDPDTruLuong_NgayBanHanh ;
            hoso . TruLuongKhaiThac = obj . TruLuongKhaiThac ;
            hoso . CongSuatKhaiThac = obj . CongSuatKhaiThac ;
            hoso . ThoiGianKhaiThac = obj . ThoiGianKhaiThac ;
            hoso . QDChuTruongDauTu_SoHieu = obj . QDChuTruongDauTu_SoHieu ;
            hoso . QDChuTruongDauTu_NgayBanHanh =
obj . QDChuTruongDauTu_NgayBanHanh ;
```

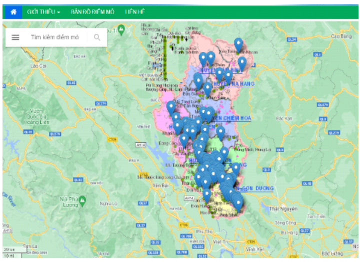
```
public List <TQG_HoSo> SelectByMaLoaiHoSoByRoleDvhc ( string strMaLoaiHS ,
List <int > lstDvhc , bool isAdmin )
        {
            List <TQG_HoSo> objs = new List <TQG_HoSo>();
            objs = ( from m in this . db. TQG_HoSo.Include (( TQG_HoSo m) =>
m. TQG_LoaiHoSo). Include (( TQG_HoSo m) => m. TQG_ToChucDoanhNghiep )
                    where m. IsActive == true && m. LoaiHoSo . ToLower () ==
strMaLoaiHS . ToLower ()
                    select m). ToList <TQG_HoSo>();
            //Check dử liễu theo đƠn vỉ hành chính => đang toi vội Host,
Admin
            if (! isAdmin )
            {
                var lstResult = new List <TQG_HoSo>();
                foreach ( var dvhc in lstDvhc )
                {
                    var res = ( from m in objs where
m. TQG_Mo.MaPhuongXa. Replace ( " " , "" ). Split ( new
char []{ ',' }). ToList (). Contains (( dvhc + 1000 ). ToStrin g())
                              select m). ToList <TQG_HoSo>();

                    if ( res != null && res . Any())
                    {
                        var lstNew = res . Where( p => ! lstResult . Select ( m =>
m. HoSoID ). Contains ( p. HoSoID )). ToList ();
                        if ( lstNew . Count > 0)
                            lstResult . AddRange( lstNew );

public TQG_HinhAnhDiemMo GetHinhAnhByGuild(string guild)
        {
            new TQG_HinhAnhDiemMo();
            return
this.db.TQG_HinhAnhDiemMo.SingleOrDefault((TQG_HinhAnhDiemMo m) => m.GuilD
== guild);
                }

  for (int i = 0; i < dghc.Count; i++)
                string strMaMo = tailieu.MaMo;
                TQG_Mo mo = this.db.TQG_Mo.SingleOrDefault((TQG_Mo m) =>
m.MaMo.ToUpper().Equals(strMaMo.ToUpper()) && m.IsDelete == false);
                string arg_1AE_0 = tailieu.Description;
                this.db.TQG_HinhAnhDiemMo.Remove(tailieu);
                if (arg_1AE_0 .Equals("Hình ạnh điềm mọ") && mo != null)
                {
                    mo.Avatar = null;
                }
                if (arg_1AE_0.Equals("Hình ạnh 3D") && mo != null &&
!string.IsNullOrEmpty(mo.HinhAnh) && mo.HinhAnh != "[]")
                {
                    List<string> lstHinhAnh =
JsonConvert.DeserializeObject<List<string>>(mo.HinhAnh);
                    if (lstHinhAnh.Contains(tailieu.GuilD))
                    {
                        lstHinhAnh.Remove(tailieu.GuilD);
                        mo.HinhAnh =
JsonConvert.SerializeObject(lstHinhAnh);
                    }
                }
                this.db.SaveChanges();
            }
            catch (Exception arg_238_0)
            {
                throw arg_238_0;
            }

public bool CheckTonTaiHoSo(int id)
        {
            string maMo = this.SelectByMoId(id).MaMo;
            return (from m in this.db.TQG_HoSo
                    where m.MaMo.ToUpper().Equals(maMo.ToUpper()) &&
m.IsActive
                    select m).ToList<TQG_HoSo>().Count > 0;
```

Fig. 7. Some paragraphs of code

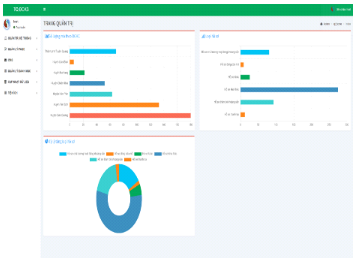
Rys. 7. Niektóre fragmenty kodu

4. Results and discussion

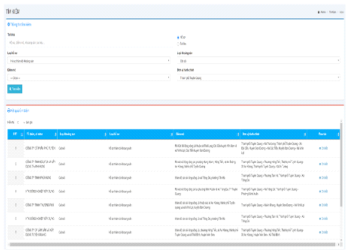
The software is a tool for supporting, processing data and solving problems of the information management of mines, unit of mine manager, and all kinds of documents such as



a. The main interface on the background of the mining planning map



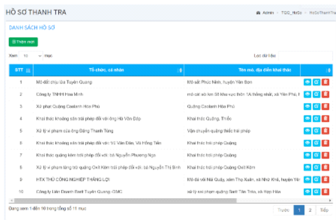
b. The dashboard analyzes data into administrative management units



c. Management of the mining sequence through time

d. Display mine information according to geographical location, current status

e. Update the exploitation current status of a mine



f. Manage the dossier during the operated process

Fig. 8. Some management functions of application
a) the main interface on the background of the mining planning map; b) dashboard analyzes data into administrative management units; c) management of the mining sequence through time; d) display mine information according to geographical location, current status; e) update the exploitation current status of a mine; f) manage the dossier during the operated process

Rys. 8. Niektóre funkcje zarządzania aplikacją
a) główny interfejs na tle mapy planowania wydobycia; b) analiza danych w jednostkach zarządzania administracyjnego; c) zarządzanie sekwencją wydobycia w czasie; d) wyświetlanie informacje o kopalni według położenia geograficznego, aktualnego stanu; e) aktualizacja stanu eksploatacji kopalni; f) zarządzanie dokumentacją w trakcie obsługiwanego procesu

documents of policy, mining, exploration and inspector. The software can search digitized files more quickly and easily than traditional management.

In addition, the application has a navigation function, it can survey the area of the field decentralizing management from the center and the province, to lower localities, managing map data, text files, decentralizing to each group of professional management according to its assigned functions. The software can extract data related to minerals, the environment, the status of the dossier, the status of the mine operation in stages. The data is regularly updated according to the regulations of the current Law on Minerals of Vietnam.

Conclusions

Reasonably exploiting and using economically and sustainably natural resources in general and mineral resources in particular is an indispensable component of the program of national sustainable development, a content of being special priority. Therefore, mining-development planning data needs to be synchronized with plans of the infrastructure and economic development of each locality. To do this, it is highly necessary to develop an information system to manage programming and mining. Based on this, the information is quickly extracted, handling methods are proposed for managers, policy makers on minerals, and policies of economic development balance among sectors.

The software of mining operations management is a supporting tool which ensures that mineral resources are used rationally and economically, impacts on the environment are minimized, national defense and security is guaranteed, the environment is protected, and social order and safety is maintained in mineral exploitation. The software is built on the map of planning of use, exploitation and processing. State management agencies and localities, including Tuyen Quang province, have published maps of mineral mining plans; they have methods to more effectively manage mineral resources in the area. Data is imported and extracted quickly and time and human resources are saved. Due to placing mineral information on the planned map, the software can visually compare the mineral mining development plans with other plans of construction and economic development in the region. This tool unifies information at levels and fields, participates in supporting and advising state management on mineral resources, including environment and social security in order to achieve the sustainable development in accordance with the national goal.

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RESEARCH ABOUT BUILDING THE MANAGEMENT FOR MINERAL SOFTWARE. CASE STUDY IN THE TUYEN QUANG PROVINCE

Keywords

mineral resouces, state management, data base, software, code

Abstract

Mining industry is an important sector that produces materials for other industries, also plays an important role in economic and social development, especially in a developing country like Vietnam. However, mineral mining can destroy the environment and deplete resources over time. The biggest challenge for state managers is to balance the conflict between the mining planning, development planning of other economic sectors and environmental issues. One of the solutions is to replace backward, manual extraction tools with the application of the modern computer (Modernize government administration).

In Viet Nam, at present, the provincial management agency of mines faces up with difficult problems such as: backward management method, lowly informative level, not using the current data effectively, even some areas can manage data well but can hardly and lowly share them, the current softwares are mainly document management, most of maps are stored on paper, digital map manage is not really cared. The traditional procedure and technology needs to be innovated by the way of enhancing to synthetically manage mineral resources, this can advance speed and quality of data processing, reduce the burden on employees and raise the level of office automation. The article uses the open code ASP.NET combined with GIS (Geographic Information Systems), based on the mineral economic development planning map in Tuyen Quang province, tools for editing, storing and extracting informaion are built detailedly for activities in mines from the beginning to the end of mining process. As a result, managers and authorities can easily search information for their work.

BADANIA NAD BUDOWANIEM ZARZĄDZANIA OPROGRAMOWANIEM GOSPODARKI KOPALINAMI. STUDIUM PRZYPADKU W PROWINCJI TUYEN QUANG

Słowa kluczowe

zasoby mineralne, zarządzanie państwem, baza danych, oprogramowanie, kod

Streszczenie

Przemysł wydobywczy jest ważnym sektorem produkującym surowce dla innych gałęzi przemysłu, odgrywa również ważną rolę w rozwoju gospodarczym i społecznym, zwłaszcza w kraju rozwijającym się, takim jak Wietnam. Jednak wydobycie kopalin może z biegiem czasu niszczyć środowisko przyrodnicze i sczerpywać ich zasoby. Największym wyzwaniem dla dyrektorów spółek państwowych jest zrównoważenie konfliktu między planowaniem górniczym, planowaniem rozwoju innych sektorów gospodarki oraz kwestiami ochrony środowiska. Jednym z rozwiązań jest zastąpienie prymitywnych, ręcznych narzędzi do zarzadzania wydobyciem kopalin przez nowoczesne komputery (modernizacja administracji rządowej).

W Wietnamie regionalna agencja zarządzania kopalniami boryka się obecnie z trudnymi problemami, takimi jak: zacofany sposób zarządzania, niski poziom informacyjny czy nieefektywne wykorzystanie aktualnych danych. Obecne oprogramowanie to głównie zarządzanie dokumentami, większość map jest w wersji papierowej, zarządzanie mapami cyfrowymi nie jest tak naprawdę ważne. Tradycyjna procedura i technologia wymagają innowacji poprzez usprawnienie syntetycznego zarządzania zasobami mineralnymi, co może przyspieszyć i poprawić jakość przetwarzania danych, zmniejszyć obciążenie pracowników i podnieść poziom automatyzacji biura. Artykuł wykorzystuje otwarty kod ASP.NET w połączeniu z GIS (Geographic Information Systems), w oparciu o mapę planowania rozwoju gospodarki surowcami mineralnymi w prowincji Tuyen Quang, narzędzia do edycji oraz przechowywania i wydobywania informacji są budowane szczegółowo dla działań w kopalniach od początku do końca procesu wydobycia. Dzięki temu kadra zarządzająca i władze regionalne mogą łatwo wyszukiwać informacje dotyczące swojej pracy.