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The implementation of information technology (IT) in the dynamic management of coal demand and supply processes

Introduction

The vision of the information system supporting dynamic management of processes related to demand, production, and logistics of hard coal distribution and its contribution to the economy in realising a decarbonised energy mix is based on the concept of collecting data from the area of production (Durlik 1996) and demand and collating these data at the analytical level (IDA 2021–2023). A decarbonisation energy mix is the strategic combination of energy sources to significantly reduce carbon dioxide (CO_2) and other greenhouse gas emissions. This mix typically emphasises the use of low-carbon and renewable energy sources such as wind, solar, hydroelectric, and nuclear power, while minimising reliance on

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fossil fuels like coal, oil, and natural gas. The goal of managing a decarbonised energy mix is to achieve a sustainable and environmentally friendly energy system that supports global climate goals, such as those set out in the Paris Agreement. Decarbonising the energy mix is projected to boost Poland's GDP by 1–2% and create up to 300,000 new jobs (Hauke Engel et al. 2020). This growth is driven by investments in renewable energy infrastructure and the development of new technologies.

The objective of the Coal Platform (the designated name of the information system) is illustrated in Figure 1.

The concept is comprised of two distinct yet interrelated parts: the demand part and the production part. The demand part, as elucidated by Tokarski S. et al. (2021), comprises the following elements:

- The long-term demand consists of:
  - Registration of long-term contracts;
  - Registering continuous coal deliveries.
- Dynamic demand including demand recording for the upcoming season and from end users.
- Decarbonisation mix analysis, where information necessary for multidimensional analysis of thermal coal mining management is collected.

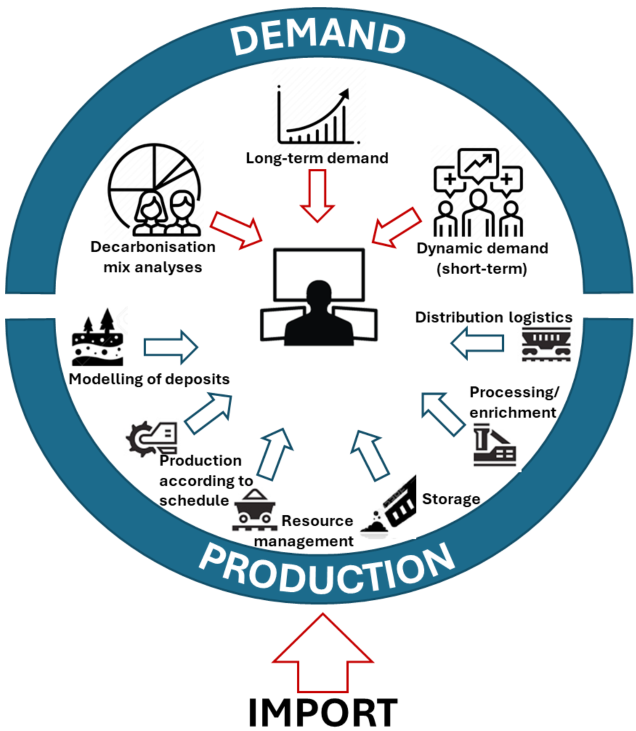

Fig. 1. Target concept of Coal Platform (own study)

Rys. 1. Docelowa koncepcja Platformy Węglowej (opracowanie własne)

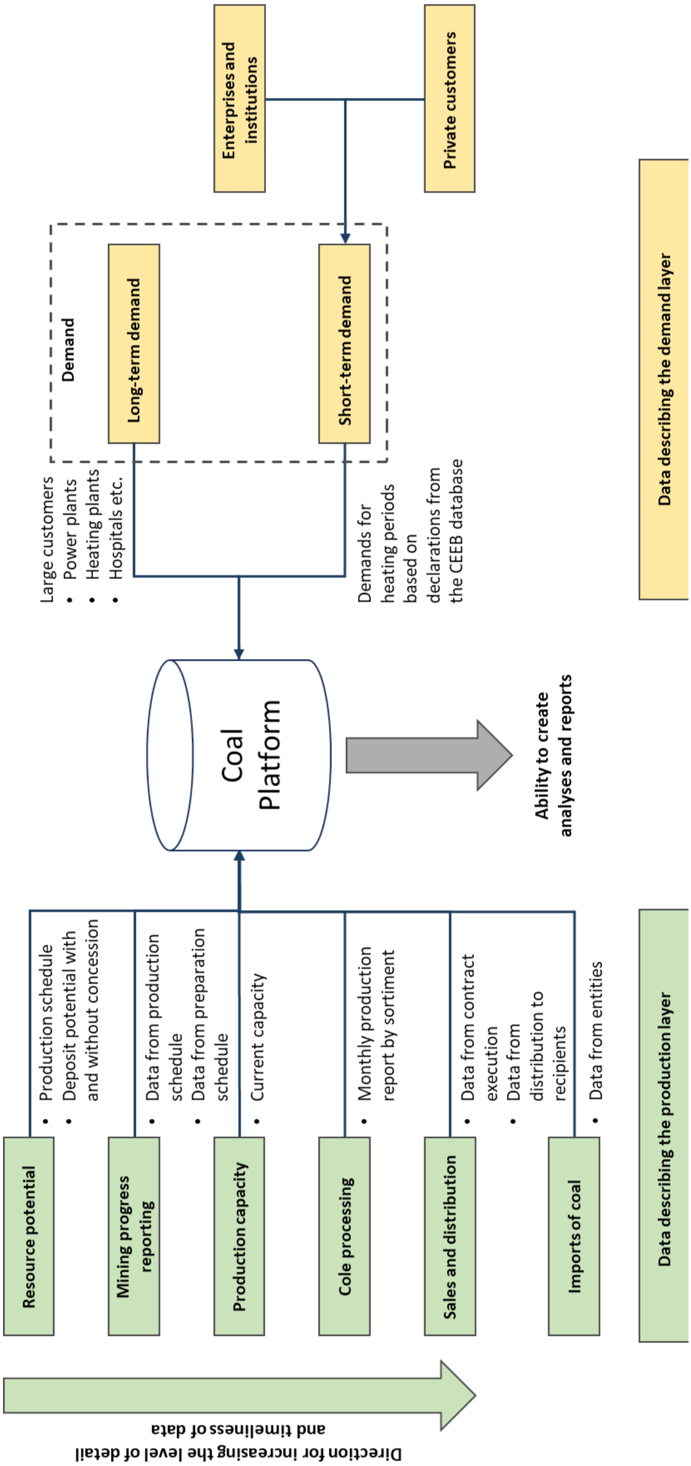

Fig. 2. Data from the production and demand areas feeding the Coal Platform (own study)

Rys. 2. Dane z obszarów produkcyjnych i popytowych zasilających Platformę Węglową (opracowanie własne)

The production section is comprised of the following elements, as outlined by Dyczko A., Galica D. and Kudlak L. (2014):

- The deposit modeling and scheduling process involves the analysis and organisation of data about:
  - the resource potential of the mines;
  - mining schedules and production capacity for individual mines.
- Production, based on data reflecting raw coal extraction (quantitative and qualitative) (Magda et al. 2010).
- Processing, which includes data on finished grades (quantitative and qualitative).
- Sales and distribution, where sales and distribution data are entered into the system, taking into account quality parameters and sorting by grade.

The vision for the operation of the Coal Platform is shown in a slightly different cross-section in Figure 2. The left-hand side shows the data that will be entered into the system at different frequencies, taking into account the deadlines defined by the mines, e.g. data on resource potential will be defined once a year, while the production plan will be updated once a month. In the case of data on sales and distribution contracts, the transfer will be on an ongoing basis.

Regarding the feeding of the system with demand data, it is necessary to assume at least two dynamics. Specifically, data regarding long-term demand will be derived from long-term contractual agreements with major thermal coal customers, such as power plants or heating facilities (Wyrwa et al. 2022). A model will be employed to input data characterising long-term demand, thereby enabling the requisite parameters to be identified. Additionally, a projection of the strategic level of demand based on the model will be generated at regular intervals, such as every six months.

The data on dynamic demand will be entered on designated dates by the distribution points, which will be responsible for collecting the pertinent data from individual customers and businesses. The data will be entered via a series of forms, wherein the specifics of each sortie–including its quantity and quality, as well as the type of customer–will be defined (Chodakowska and Nazarko 2020). This method of data collection will facilitate the development of analyses targeting thermal coal customers. The implementation of forms tailored to distribution points within the system necessitates the definition and enactment of pertinent amendments to existing legislation (Department of Analysis and Reporting, Ministry of State Assets, 2023).

1. Formulation of research problem and identification of relevant research literature

Effective IT governance can significantly enhance a company's profitability by aligning IT decisions with business objectives and ensuring accountability (Weill and Ross 2004). Weill and Ross emphasise several key points about the importance of effective IT systems in supporting business processes and one of them is aligning IT with business objectives. Effective IT governance ensures that IT decisions are closely aligned with the company's strategic goals, enhancing overall business performance. In our case, the design of an information system to support activities in the dynamic management of coal demand and supply processes is related to the implementation of the DynGOSP project, which aims to develop a comprehensive system for the management of hard coal from the deposit to the consumer. In the context of the 2050 perspective (Dyczko et al. 2014b), the objective is to determine the demand for hard coal in Poland until 2050. The DynGOSP project, as part of its activities, entails the creation of several models simulating, among other things, the management of raw material streams in the area of Mechanical Coal Processing Plants (MCCPs), which will ultimately result in the implementation of zero waste. The project also encompasses the development of waste coal production technology, the determination of Poland's coal reserves, the creation of models defining the demand for hard coal, and the development of concepts for automated and continuous inventory of heaps and dumps using IoT technologies and modern imaging technologies via unmanned aerial vehicles. For these methods, concepts, and processes to function as intended, it was assumed that information technology would be required to facilitate the rapid flow of information from both the coal supply side (production) and the coal demand side (large and small customers) (Wirth 2015). A significant challenge in the implementation of information technologies is the risk that new technologies may not be tested on a large scale, increasing the risk of failure or technical problems. Also, proper information management is the basis for a proper process of the flow of resources and goods (Szymczak et al. 2018). Hence, there is a need for pilot implementation and an appropriate design approach to minimise the aforementioned risks.

Because the resource base is only in a static form, updated at long time intervals, the project realised a revision of the existing processes related to coal production, as well as an approach to defining demand in such a way that both the demand and supply side can be balanced at short intervals. Accordingly, the basis of the research was not only the proper design of the system and the use of appropriate programming techniques but also the analytical approach, where, knowing the capabilities of information systems, new approaches to data collection (scope of data collected, frequency and data sources) were proposed (Stecuła et al. 2019).

2. Methodological approach to solving scientific problems through the use of information systems

The top-down approach presented above involves defining the high-level assumptions of the system based on the vision of its operation. This means that in the first steps, it was necessary to define the purpose of the system and the main actors. Then, the identified actors of the system, understood as future users, represented by individual roles in the processes, the basic modules of the solution, the expected capabilities of the system, as well as their results, which will be further used by other processes or other information systems, were determined. In this way, the context of the information system, the limits of its operation, and the high-level list of processes to be detailed were built:

- Conducted a process analysis, the purpose of which was to take stock of the processes involved in modeling coal deposit resources (Galica and Kulpa 2018), production planning and scheduling (Grzesica 2014), coal production (mining, processing), and sales and logistics (Dzedzej and Nowicki 2008), as well as the processes implemented on the demand side, i.e. the definition of short-term and long-term coal demand.
- Developed an initial high-level version of the architecture, defining the main modules and functional groups for the target system, which formed the basis for developing the target pool of functional and non-functional requirements (Ross et al. 2010).
- Development of functional and non-functional requirements, defining the capabilities of individual modules in the context of supporting defined processes. Work on functional and non-functional requirements continued throughout the period from the definition of the first version of the architecture to the design of the entire solution (Kotusev 2018).
- Preparation of the solution concept consisting of screen designs (mock-ups) to illustrate the processes within the target tool.
- Developing a data model based on the screens, requirements, and preliminary architecture for the entire solution and broken down into individual modules of the solution.
- Development of the target logical and physical architecture, complementing the preliminary version already developed and supplemented with the elements that emerged during the development of the requirements (especially non-functional), system concept, and data model (Perks and Beveridge 2003).

The whole activity was not implemented sequentially instead according to the approach illustrated in the Figure 3.

The “Top-Down” approach presented above involves defining the high-level assumptions of the system based on the vision of its operation. This means that in the first steps, it was necessary to define the purpose of the system and the main actors. Then, the identified actors of the system are understood as future users, represented by individual roles in the processes, the basic modules of the solution, the expected capabilities of the system, as well as their results, which will further be used by other processes or other information systems, were determined. In this way, the context of the information system, the limits of its operation, and the high-level list of processes to be detailed were built.

After defining a high-level list of processes, a description of the system’s operation in the context of the processes was made. Accordingly, it was necessary to first describe the details of the processes and then identify the places in the process that are supported by the system and how. At the same time, in addition to describing existing processes, consideration was also given to areas where activities are not standardised and formalised in process form.

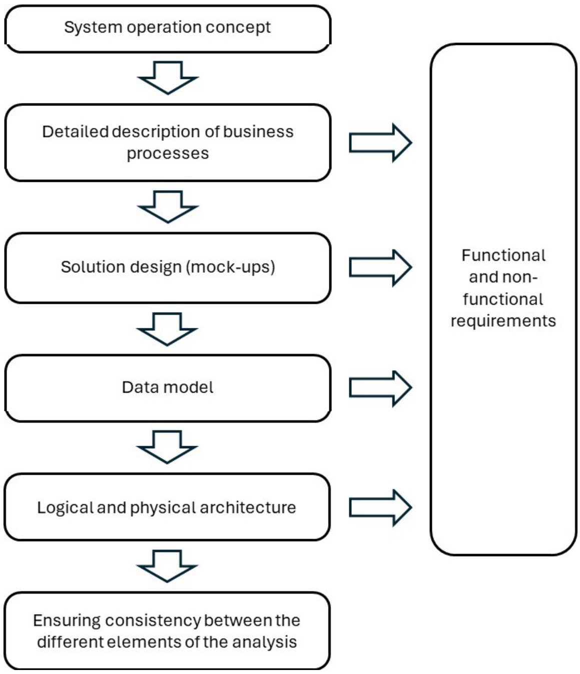

Fig. 3. Diagram of the approach to the development of a pre-implementation analysis (own study)

Rys. 3. Schemat podejścia do opracowania analizy przedwdrożeniowej (opracowanie własne)

In such cases, simplified procedures were proposed so that the system (Coal Platform) could be designed to support the business area in question.

This defined a set of high-level functional requirements, or a list of functional groups, which were detailed in subsequent steps and formed the target set of requirements for the system. As part of the process definition, requirements for business continuity, system speed, or data security were also defined, which directly influenced the basis for creating the list of non-functional requirements. In each of the subsequent steps of the top-down approach, the list of functional and non-functional requirements was updated. It was particularly important that during the completion of each phase (e.g. logical architecture or data model) it was necessary to review the requirements in terms of their validity, wording, and consistency. Thus, the list of functional and non-functional requirements was a list that "lived" throughout the solution design process.

After developing the first list of functional and non-functional requirements, it was possible to proceed to the development of the project, the solution concept, which consisted of mockups of the entire system and individual solutions. To facilitate the work of the team that will be responsible for designing and implementing the solution at a later stage of the DynGOSP project, the Figma tool was used to model the mockups. The developed mockups reproduce the appearance of the Coal Platform both in the substantive part (processing of supply and demand data) and in the user-administrative part (registration and login, user management, dictionaries) (Calder and Moir 2009). An important aspect of the application of the aforementioned tool was the representation of the course of individual processes through links between the designs of individual screens. As a result of these links, it was possible to simulate both the appearance of the application, the areas of data that would be entered or displayed, and the behavior of the application in its operational mode. Similar to the subsequent phases of the system design, discussions with the stakeholders of the designed system allowed us to define additional functional and non-functional requirements, which were included in the list of requirements.

Based on the completed mock-ups of the system, the data model was developed. The data model was predetermined in the very first steps, i.e. during the definition of the system's operational concept. During the definition of the basic modules of the system, the basic areas of data that would eventually be stored in the system were defined. In the subsequent steps, these areas were expanded, while in the step of developing the data model, the collected information was grouped, data types were defined, the storage location was indicated, the sources of external data that will feed the system were defined, and the systems that will be the recipients of data from the Coal Platform were identified - i.e. the scope of planned integrations was also defined. Similar to the previous steps and activities, the list of functional and non-functional requirements was updated as part of the development of the data model.

The last element to be detailed was the architecture, where the logic of the architectural components is developed and the infrastructure elements, i.e. the physical architecture of the target solution, are defined. The work also included additional non-functional requirements regarding physical architecture parameters, security issues, performance, GUI, and other technical areas (Bass et al. 2022).

The prepared documentation is the basis for the proper development of the designed system and represents not only the appearance of the application but also its operation by the defined processes.

3. Detailed description of the Coal Platform design approach

The overall approach was to gradually detail the concepts of how the platform works and to create visualisations that would be helpful to both developers and end users. Developers should have sufficient information to present them with use cases and functionalities, and at the same time show the logic behind the actions, so that the system components created can be used in different places as needed. For end users, it is important to have adequate visualisations and to check that a process can be implemented efficiently when supported by the solution, and that the designed solution is ergonomic.

The following sections aim to give an idea of what elements were analysed and what the end products of the different phases were.

3.1. Identification of processes and their influence on system design and architecture

As part of the process identification, a defragmentation of the concept was carried out, which assumed that on the supply side, data would be collected in the production area at various stages of its implementation, as described in Figure 1. Accordingly, it was tentatively indicated that it was necessary to describe the processes involved in determining resource potential, and the appropriate module in the system to deal with this issue would be the "Resources" module. The other components of the coal value chain were similarly defragmented, and the following sets of processes were ultimately described:

- The process of determining the resource potential of a mine;
- The process of reporting the progress of mine work;
- The process of determining the mine's production capacity;
- The process of coal processing;
- The process of sales and distribution.

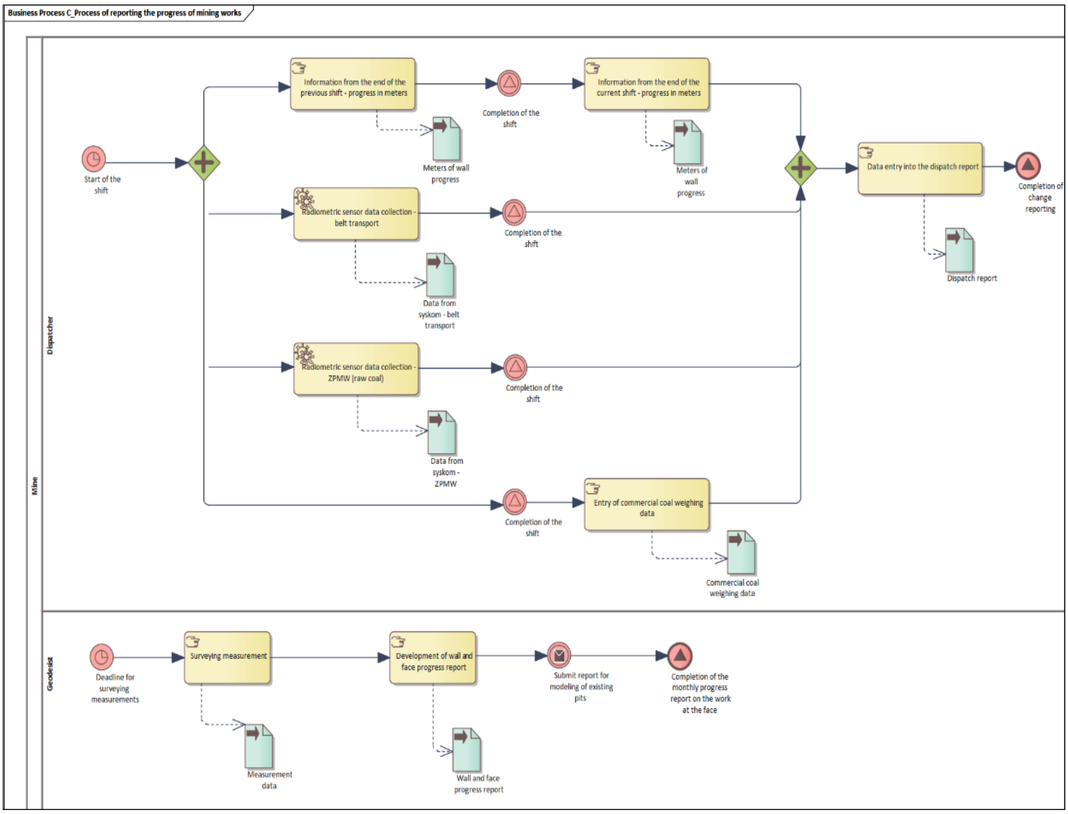

Fig. 4. Mining progress reporting process model (own study)

Rys. 4. Model procesu raportowania postępu wydobycia (opracowanie własne)

The last process described in this phase was the Requirements Determination process, where, unlike the list above, the requirements and process flow were described in concept form.

The remaining processes were described in such a way that the scope of data used during the process or created as part of the process activities was predefined. The process flow was described in BPMN 2.0 notation, which made it possible to mark manually performed activities, activities supported by the information system, places where input data is used (as a group of data), or places where data statements are generated. An example of a process flow described using the BPMN 2.0 notation is shown in the Figure 4.

As part of the transformation of the concept and description of business processes, a list of target system modules was defined (as an action product), which were to be designed and described in detail in the following section.

3.2. Process of defining functional and non-functional requirements and mapping to system modules

Based on the developed business processes and the definition of the solution modules, the functional requirements were described by defining the ID number and the description of the given functional requirement.

The functional requirements were divided into the following groups:

- General requirements;
- Entity requirements;
- Resource requirements;
- Production phase requirement domain;
- Sales and Distribution requirement domain;
- Requirements domain for the Import Phase;
- Requirements domain for the demand phase;
- Reporting and Analysis requirements; and
- System Administration functional requirements.

Non-functional requirements, similar to functional requirements, were collected, described according to the above approach, and divided into the following groups:

- General requirements;
- Architecture requirements;
- Performance requirements;
- Infrastructure and Environment requirements;
- Security requirements;
- GUI requirements;
- Testing requirements.

3.3. Modelling the process flow in the tool – prototyping

Continuing the work, the concept of the system was developed in the form of screen designs, supplemented by a description of the activities that can be performed on a given screen. These descriptions were also used to detail the first version of the list of functional and non-functional requirements.

The developed mock-ups are illustrative and are intended to show the vision of the system, the way data is presented, or how the system is fed with data. This means that at the implementation stage of the solution, there may be slight changes in the platform's GUI or the way individual functions are performed to make them optimal for end users. An example of the screen designed for the system is shown in Figure 5.

All screens were designed in the Figma tool, which also implemented the logic for transitioning between screens and assigned actions for key functions (e.g. approving, expanding bars, etc.) to make the look and feel of the solution prototype as realistic as possible.

The screen prototypes were also intended to create the conditions for describing the end-user test scenarios that would need to be developed during the solution design phase and used during the acceptance of the work.

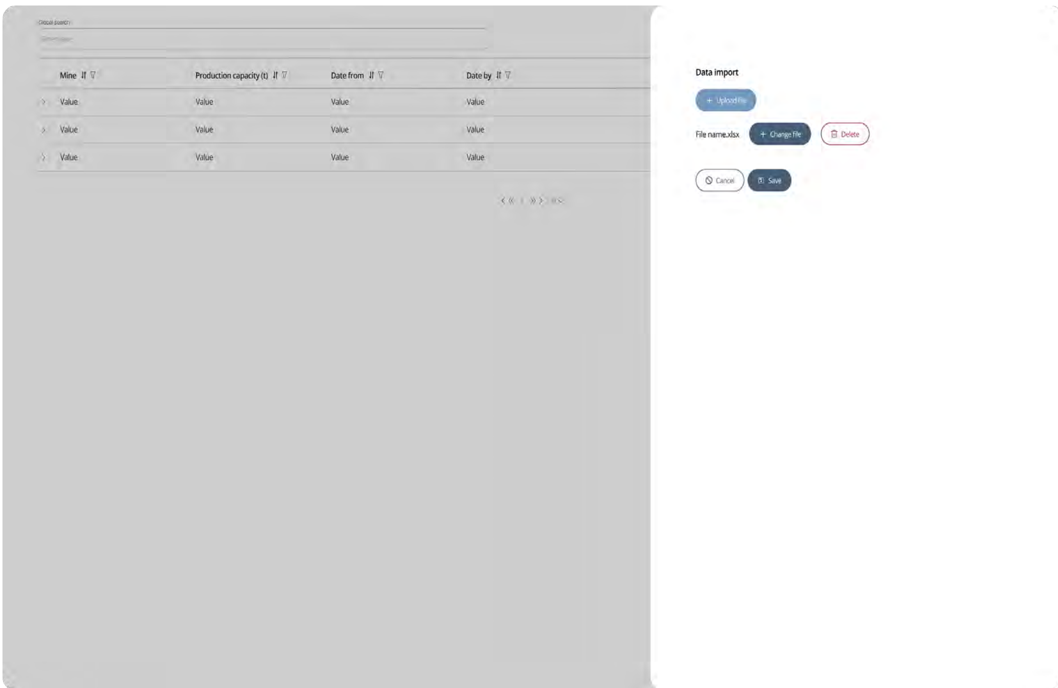

Fig. 5. Example of the system screen showing the input of the sorting density on the heaps (own study)

Rys. 5. Przykładowy ekran systemu przedstawiający wprowadzenie gęstości sortowania na hałdach (opracowanie własne)

As part of the creation of the prototypes, initial frameworks for describing the architecture were also created, which would ultimately be extended and completed during the final phase of describing the architecture and its components.

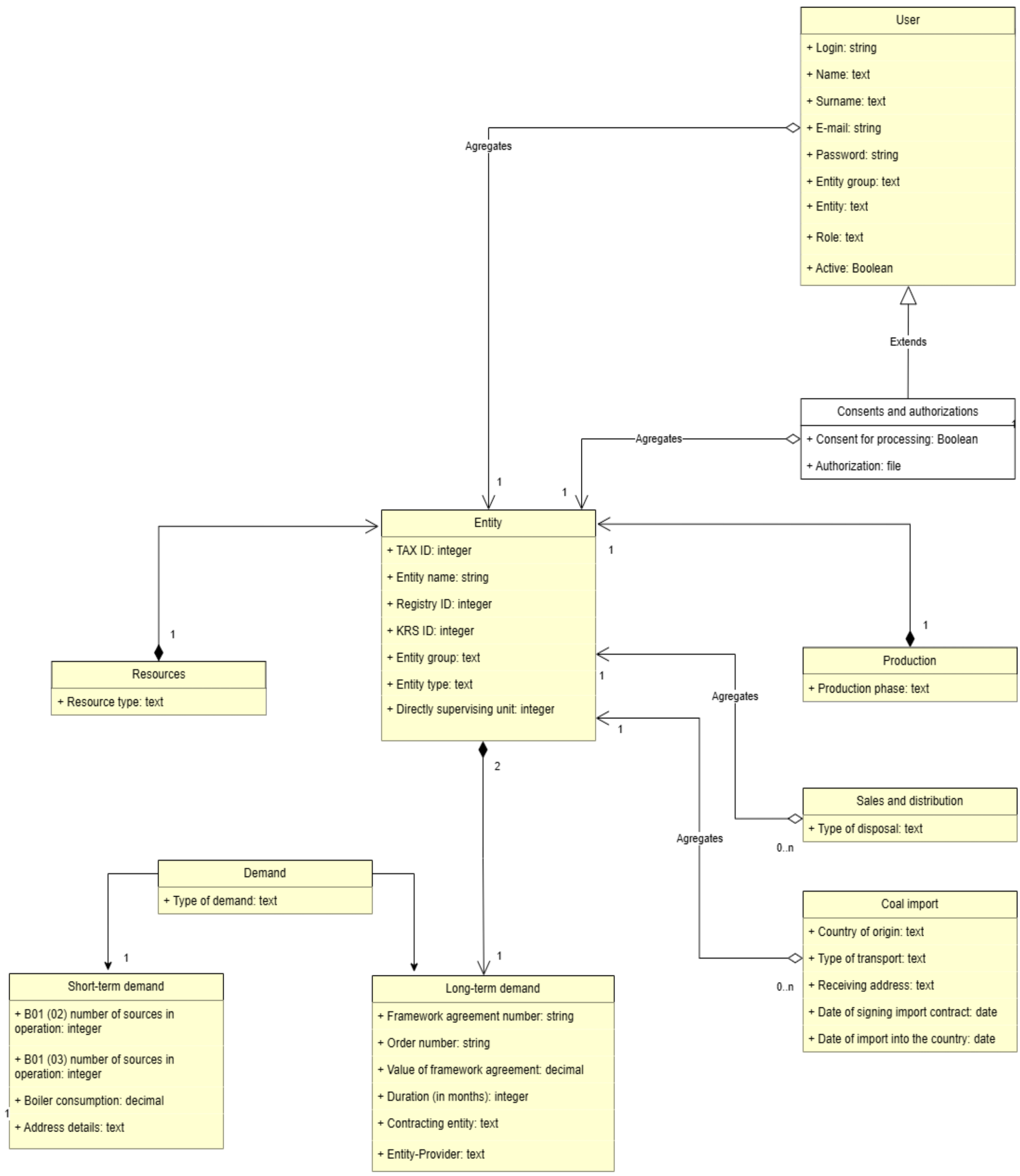

Fig. 6. General data model (own study)

Rys. 6. Ogólny model danych (opracowanie własne)

3.4. Data modelling

Based on the architecture and module descriptions detailed by the flow modelling, it was possible to proceed with the data modelling.

The whole process consisted of collecting elements relating to the resulting data sets in the system and identifying the input data for the Coal Platform. All the data was then grouped and the relationships between the groups were identified. The overall data model is shown in Figure 6.

In the following steps, the individual data groups were refined not only on their affiliation to one element (e.g. entity) but also in the context of their surroundings, i.e. links to other groups. The following is an example of data detailing for the data group "Entity" (Figure 7).

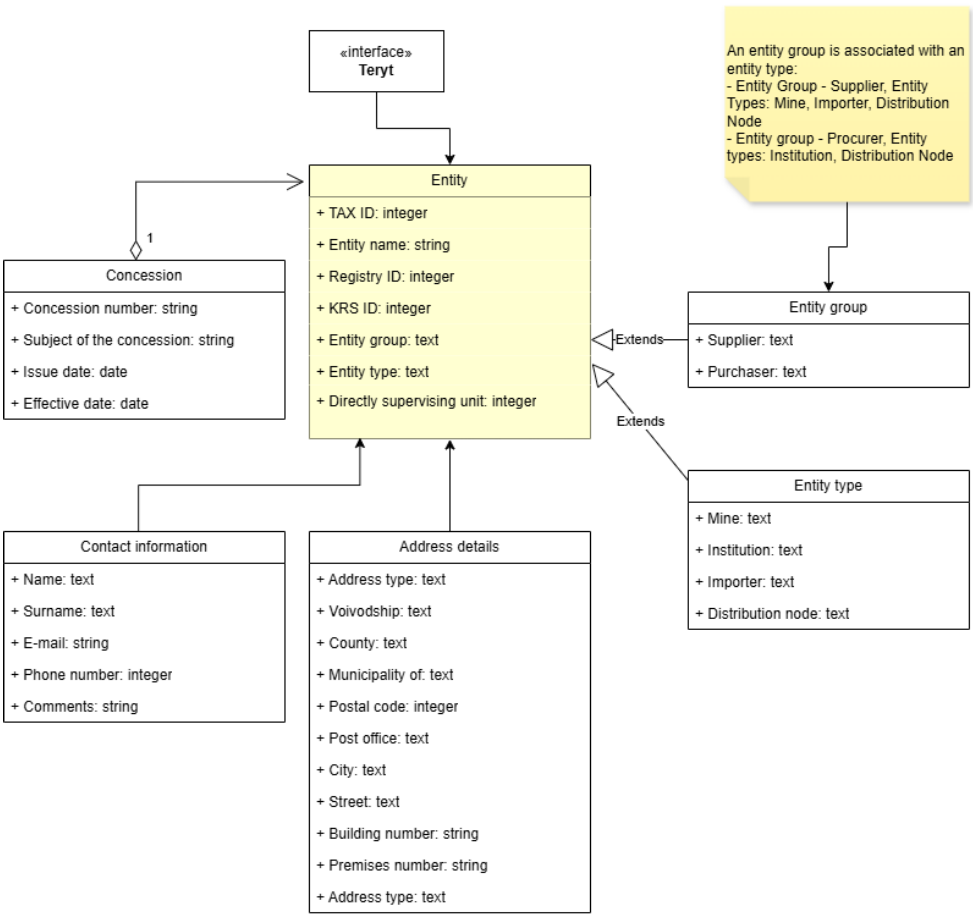

Fig. 7. Data model describing the Entities (own study)

Rys. 7. Model danych opisujący Jednostki (opracowanie własne)

3.5. Description of the TO-BE architecture and its components

Based on the material collected and developed, it was possible to refine the already predefined architecture of the Carbon Platform (Ross et al. 2010).

The Carbon Platform was divided into a part dedicated to producers and consumers of the carbon market and a part dedicated to institutional users. The architecture was divided into the following components:

- user access layer (both for producers and consumers and for institutions);
- presentation layer for the portals;
- transactional layer for portals;
- analytical layer for the portals;
- technical layer for the Carbon Platform.

The overall architecture diagram of the solution is shown in Figure 8.

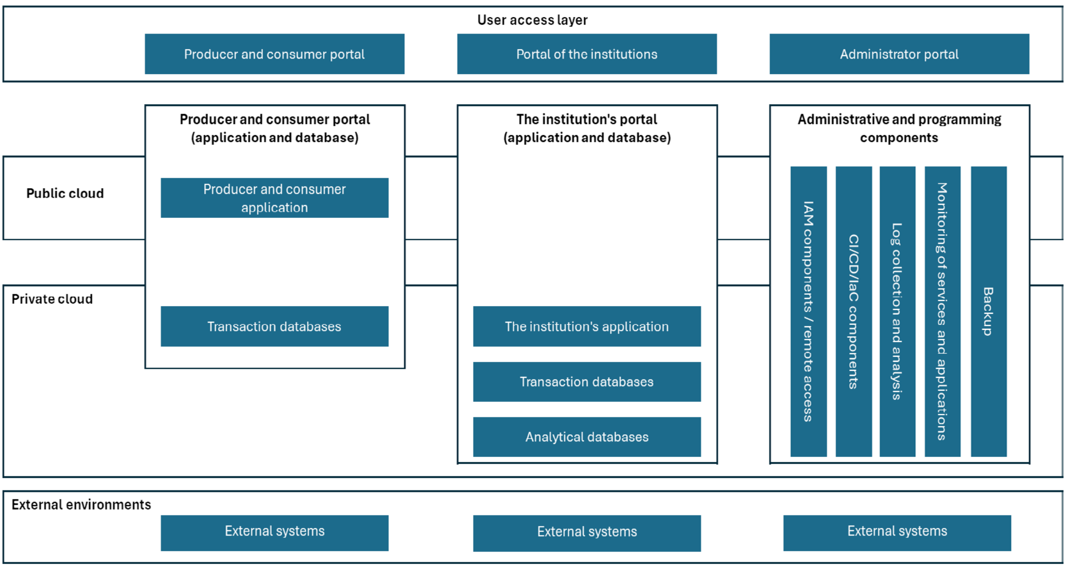

Fig. 8. Architecture of the Carbon Platform solution (own study)

Rys. 8. Architektura rozwiązania Carbon Platform (opracowanie własne)

3.6. Agile Model for development of Coal Platform

The agile model emphasises iterative development, where requirements and solutions evolve through collaboration between cross-functional teams. This approach is particularly effective for complex projects like managing coal resources, where flexibility and responsiveness to change are crucial. Key components of the algorithm are iterative development, collaboration, and communication as well as flexibility and adaptability.

Using the agile model for the development of the Coal Platform enables a project to be divided into small, manageable units called sprints, typically lasting 2–4 weeks. Each sprint focuses on delivering a functional increment of the system, allowing for continuous improvement and adaptation. This model encourages constant communication between stakeholders, including developers, engineers, and end-users. Regular feedback loops ensure that the Coal Platform design meets the evolving needs of the industry. The agile model allows for quick adjustments based on feedback and changing conditions in the coal industry. This method should be also used in the implementing phase to prioritise features and improvements that deliver the most value to users.

4. Conclusions

The design of the information system for coal resources management was implemented in an agile model due to the novelty of the approach and the lack of global solutions in this area.

The use of an Agile approach to the design of the Fuel Platform provided, first of all, design flexibility. The agile approach allowed the solution design to be quickly adapted to changing requirements and conditions, especially in an area that is currently not so precisely and clearly defined in business terms. It can be said that in the mining industry, the approach to managing fossil fuel resources is carried out individually by the mining stakeholders, and there are no uniform standards developed for the processes and the amount of data that is collected.

Another value has been the involvement of stakeholders at every stage of the analysis and design work, which has not only made it possible to accurately gather requirements and expectations for the Coal Platform, but also to ensure high quality solution design.

The design of the information system for coal resources management was implemented using an Agile model due to the novelty of the approach and the absence of global solutions in this area. This decision was driven by several key factors, namely design flexibility, stakeholder involvement, and addressing industry-specific challenges.

The Agile approach provided significant design flexibility, which was crucial given the innovative nature of the project. In an industry where the management of fossil fuel resources is typically handled on a case-by-case basis by different stakeholders, there are no established standards for processes or data collection. This lack of uniformity means that requirements can change rapidly as new insights are gained or as external conditions shift. Agile methodologies, with their iterative cycles and regular reassessment of project goals, allowed the design team to quickly adapt to these changing requirements and conditions. This adaptability ensured that the solution remained relevant and effective throughout the development process.

Another critical advantage of the Agile approach was the continuous involvement of stakeholders at every stage of the analysis and design work. This ongoing engagement was essential for several reasons:

1. Accurate Requirement Gathering: By involving stakeholders from the outset, the design team could gather detailed and accurate requirements. This direct input helped ensure that the system would meet the actual needs of its users, rather than relying on assumptions or second-hand information.
2. Expectation Management: Regular communication with stakeholders helped manage their expectations and kept them informed about the project's progress. This transparency reduced the risk of misunderstandings and ensured that any concerns could be addressed promptly.
3. Quality Assurance: Continuous feedback from stakeholders allowed for ongoing quality assurance. Issues could be identified and resolved early in the development process, leading to a higher-quality final product.

The mining industry presents unique challenges for information system design, particularly in the management of coal resources. The lack of standardised processes and data collection methods means that each project can have vastly different requirements. The Agile approach's emphasis on flexibility and stakeholder collaboration was particularly well-suited to this environment. It allowed the design team to tailor the system to the specific needs of the industry, ensuring that it could handle the diverse and complex data involved in coal resource management.

In summary, the use of an Agile approach in the design of the Fuel Platform for coal resources management provided several key benefits. It offered the flexibility needed to adapt to an evolving and poorly defined business environment, facilitated accurate and detailed requirement gathering through continuous stakeholder involvement, and ensured a high-quality solution through regular feedback and iterative development. These advantages made Agile an ideal choice for this innovative and challenging project.

5. Further activities and directions of possible development of the Coal Platform

The currently designed system is at the stage of starting production and implementation as a pilot of an approach to managing processes related to demand, production, and logistics of coal distribution and its contribution to the economy in achieving the decarbonisation energy mix.

In line with the above, the next activities related to the application of information technology after the implementation of this pilot solution will be the following tasks, namely:

- development of standards to be used in the operation of the Coal Platform, in particular, those related to data exchange;
- development of the demand forecasting model currently being developed for the Coal Platform.

The implementation and commercialisation of a given solution will consist of the development, implementation, and launch of a platform to be used by the relevant ministry after the implementation of the relevant legislation taking into account the creation of the Coal Platform.

5.1. Development of standards

The development of standards includes the definition of standards for the information to be provided by the different actors in the target system. In addition, the analysis of the pilot solution, which will involve a limited number of institutions, will gather experience and recommendations on how to improve the processes currently being prepared, particularly about automating data collection and ensuring the quality of the data collected. In addition, the automation activities will have an impact on reducing the time associated with data provision to the minimum necessary.

5.2. Development of the demand model

About the demand definition model, this is an area that requires further work to analyze and refine the assumptions made so far. At present, it is necessary to conduct a pilot project using the developed model to collect data and estimate the level of deviation, as well as to identify additional parameters that should be included in the demand definition model to be fully consistent with the real state.

The approach to demand modelling in the Coal Platform system is based on the following assumptions (Guminski 2014):

- The Coal Platform is a centralised platform that will collect timely and strategic data from both the production (supply) and demand sides of thermal coal.
- Ultimately, the Coal Platform will collect data from all producers in the context of supply data.
- Coal Platform will be a tool that can accurately and quickly provide information on the amount of coal on the domestic market in the perspective of one production month (the granularity of the data will be at the level of one month), as well as determine the level of demand for a short period (up to 1 year), tactically (a period of up to 2 years) and strategically from 2 to 20 years.
- According to the demand, which will be regulated by limits resulting from policies (climate, production, clean air, etc.), it will be possible to control the production and supply of coal from outside Poland.
- Finally, the Coal Platform will be a single place for reporting demand (short and long-term) and information on planned and realised imports, with data coming from end users and companies involved in coal imports.

- The tool will be a source of data for various simulators where it will be possible to simulate prices in the event of a change in demand levels.
- At this stage, it is not anticipated that workflow will be implemented in the tool and that the tool will be treated as a case flow or carbon management tool, but this element should be considered for future use and development of the solution.

How demand is currently defined in the context of its management in the Coal Platform is shown in Figure 9. The figure shows the breakdown into:

- Demand (long term and short term).
- Production, including strategic data (production capacity) and operational data (actual data from mine plans and operational execution).
- Imports – data on coal entering Poland in the long term and the short term (intervention purchases)

In the current model, demand consists of long-term demand derived from contracts with suppliers (broken down by assortment) and short-term demand derived from orders placed

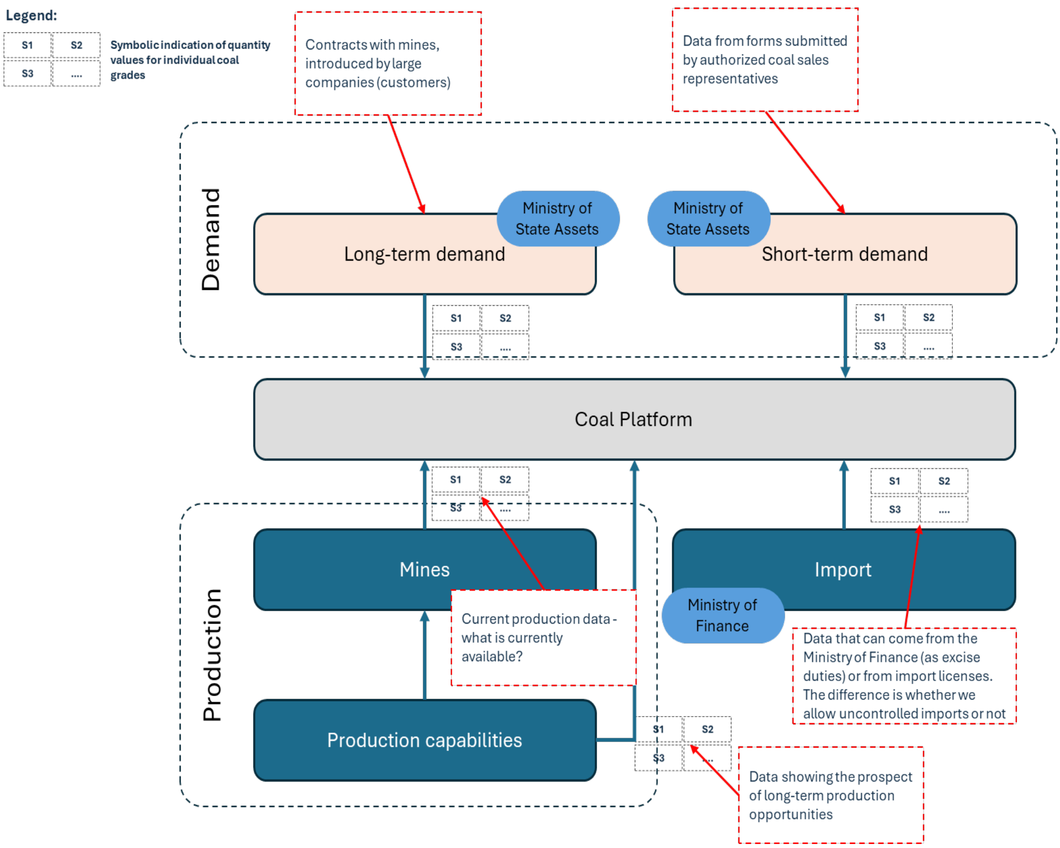

Fig. 9. High-level demand model (own study)

Rys. 9. Model popytu wysokiego poziomu (opracowanie własne) with authorised sellers. The collection of short-term demand data requires appropriate changes in legislation. As part of short-term demand, data on the internet and local sales should also be processed.

Finally, a complementary measure should be the inclusion of demand from the area of restrictions modelled in the context of climate policy or national energy policy, indicating a high level of demand, possibly broken down by type of coal or customer.

5.3. Integration with existing solutions and information systems

Regarding the existing Fuel Platform, consideration will be given to identifying elements that can be shared between the platforms to ensure synergies in their operation (e.g. a common cap module). Furthermore, in addition to fossil fuels (oil, coal), for which solutions are currently in place (Fuel Platform) or are planned to be implemented (Coal Platform), other solutions should be considered, including processes related to the provision and distribution of e.g. natural gas, as well as other raw materials, to manage the full range of energy sources in terms of demand and supply, both in the context of achieving policy objectives (e.g. European Green Deal), but also to ensure energy security for Poland.

Further consideration should be given to developing the tool with additional technologies. Leveraging new technologies such as AI and IoT for better tracking and management of coal should be one of the directions to be considered. Streamlined logistics supported by IT systems and almost online data analysis can boost economic growth by reducing delays and improving the reliability of supply chains.

There are also risks associated with implementing an information system. Increased reliance on digital systems can expose supply chains to cyber-attacks.

The Authors have no conflicts of interest to declare.

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THE IMPLEMENTATION OF INFORMATION TECHNOLOGY (IT) IN THE DYNAMIC MANAGEMENT OF COAL DEMAND AND SUPPLY PROCESSES

Keywords

Information technology (IT), IT architecture, prototyping, carbon management

Abstract

The article presents a methodological approach that encompasses the conceptualisation of a design idea and the implementation of an information technology (IT)-based solution to support models developed for energy mix management. It identifies the key elements that influence the definition and subsequent creation of an IT solution, focusing on processes that reflect both the demand (coal demand) and supply sides.

In terms of the supply side, the IT solution will be equipped with planning information:

- Regarding minable resources, including general data on the resources currently held and the planned annual resources to be mined (qualitative data will not be included),
- The mining plans for each mine are accompanied by qualitative data (data that are standardised to ensure the quality of the production data collected.

In addition to mining plans, the supply side will have up-to-date information on coal already mined. This information will be presented in quantitative and qualitative terms at various stages of the product life cycle, which begins with the mining of raw coal and ends with the formation of a finished product that can be sold and transported to the customer.

The article indicates the key elements that must be precisely defined for the correct definition of processes on the demand side and the supply side, and in what order actions should be taken by IT specialists so that this solution fully satisfies the teams managing the processes dynamically.

WDRAŻANIE TECHNOLOGII INFORMATYCZNYCH (IT) W DYNAMICZNYM ZARZĄDZANIU PROCESAMI POPYTU I DOSTAW WĘGLA

Słowa kluczowe

techniki informacyjne (IT), architektura informatyczna,
prototypowanie, zarządzanie zasobami węgla

Streszczenie

Artykuł zawiera podejście metodyczne obejmujące zakres od inicjowania idei projektowej do momentu wdrożenia rozwiązania opartego na technikach informacyjnych (IT) dla wsparcia modeli opracowanych w zakresie zarządzania miksem energetycznym. Wskazane zostały kluczowe elementy, które mają wpływ na definiowanie i następnie tworzenie rozwiązania informatycznego, przede wszystkim procesy, które są odzwierciedlane zarówno po stronie popytu (zapotrzebowania na węgiel), jak i po stronie podaży.

Ze strony podażowej rozwiązanie informatyczne będzie posiadać informacje planistyczne, dotyczące:

- informacji związanych z zasobami możliwymi do wydobycia (ogólne liczby dotyczące posiadanych zasobów oraz planowanych rocznych zasobów do wydobycia – bez danych jakościowych),
- planów wydobycia dla poszczególnych kopalni z danymi jakościowymi.

Dodatkowo, oprócz planów wydobycia, strona podażowa będzie posiadać aktualną informację o wydobytym już węglu. Informacje te będą prezentowane w ujęciu ilościowym oraz jakościowym w różnych etapach życia produktu, który rozpoczyna się od wydobycia węgla surowego, a kończy na powstaniu gotowego sortymentu możliwego do sprzedaży oraz transportu do odbiorcy.

Artykuł wskazuje, jakie są kluczowe elementy, które wymagają precyzyjnego określenia dla poprawnego zdefiniowania procesów po stronie popytu oraz po stronie podaży, oraz w jakim porządku powinny być podejmowane działania po stronie specjalistów IT, aby to rozwiązanie w pełni satysfakcjonowało zespoły zarządzające dynamicznie procesami.